PREDICTION OF AESTHETIC RESPONSE:

A COMPARISON OF DIFFERENT PHILOSOPHICAL PARADIGMS' PREDICTIVE UTILITIES OF AESTHETIC RESPONSE TOWARDS NATURAL LANDSCAPE SCENES

by

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(ABSTRACT)

Three issues related to the prediction of aesthetic response of natural landscapes were investigated. First, information regarding the degree of correspondence between two conceptually different yet commonly used criteria of aesthetic response--ratings of scenic quality and preference ratings--was sought. Second, the relative efficiency of and interrelationships between predictor variables stemming from different philosophical paradigms of landscape aesthetics was of interest. Examination of such a variety of predictors towards the same criteria utilizing the same settings as stimuli had not been previously researched. Direct comparison of types to one another, and in combination as predictors, would indicate both whether different approaches were measuring similar aesthetic response variance, and in what ways they differed. Third, the extent to which a motivational choice model based in expectancy theory could predict environmental preference was of interest. This model represented an aesthetic predictor

in terms of environmental utility, i.e., meaningfulness within the context of potential activity, and was thus a departure from traditional predictors based on design elements and the arrangement of physical features.

Data were gathered from a total 354 subjects responding to 60 different natural landscape scenes (color slides) from a wide variety of United States' biomes. Results indicated that the two aesthetic criteria were nearly identical, both in relation to one another ($r = .98$) and through their correlate patterns to 33 predictor variables. Predictor variables from three paradigms: the psychophysical (physical features of the environment), the cognitive (transactional variables involving interpretive patterning of physical variables), and the experiential (environmental utility in terms of potential for activity) were all highly effective. Multiple regression equations for specific types had predicted R-Squares ranging from .47 to .84. In turn, detailed analyses of the transactional and utility variables via multiple regression (using the physical variables as predictors) indicated they could be defined by these managerially controllable terms. Finally, the environmental utility variable was examined in more detail through a variety of expectancy models. Of major interest was that environmental familiarity was a strong moderator of the utility effect, with highly familiar settings yielding more accurate prediction than unfamiliar settings. A number of managerial implications and suggestions for follow-up research are made.

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A Brief Introduction to Scenic Quality Analysis

Over the past two decades there has been a growing concern for the management and preservation of this nation's natural resources. Part of this attention has focused on the actual aesthetic quality of the landscape--conceived as one more natural resource that deserved study, enhancement, and protection through active management. Numerous legislative mandates adopted over the years attest to this concern; among them, the Multiple Use-Sustained Yield Act of 1960, the Highway Beautification Act of 1965, the National Wild and Scenic Rivers Systems Act of 1968, the National Environmental Policy Act of 1969, the Coastal Zone Management Act of 1972, the National Forest Management Act of 1976, and the Surface Mining and Reclamation Act of 1977 (Feimer, 1983).

Much of the early aesthetic research conducted in response to passage of these acts was directly management oriented. For instance, early interest focused on whether or not a concept such as landscape aesthetic quality or "scenic beauty" could be accurately measured, and if so whether standardized systems for doing so could be devised (see Bacon, 1979; Daniel & Boster, 1976; Daniel & Schroeder, 1979; Litton, 1968; Ross, 1979). The development of such measuring instruments was a necessary first step in the field, for only after their development could one reliably inventory the landscape for the presence of this natural resource.

Related research attempted to locate salient and potentially changeable aspects of the physical environment that could be directly related to ratings of aesthetic quality. In a sense, such investigations attempted to see if it were possible to operationalize scenic beauty in concrete, manageably controllable terms (e.g., Shafer, 1969; Shafer, Hamilton, & Schmidt, 1969).

Finally, practical research efforts focused on the relationship between scenic beauty estimation techniques carried out in the natural environment versus those based on simulation or abstract representation, whether through photographic slides, films, models, or maps (see Craik, Appleyard, & McKechnie, 1982; McKechnie, 1977; Shuttleworth, 1980). The practical implications for these kinds of questions were important in regards to how easy it might have been to include public opinion in the assessment of lands, or to acceptance of proposed management interventions without having to require this public to make on site evaluations. In addition, the use of simulations might yield more reliable and cost effective assessments in the long run.

Due to the broad scope to which these mandates apply and to the wide areas of applicability of aesthetic issues in general, research in the field has been both multidisciplinary and multidirectional (Zube, Sell, & Taylor, 1982). As a result, a diffuse and often unrelated set of studies and findings has emerged.

This fact has had both its advantages and disadvantages. On the positive side, multiple perspectives offered from those in geography, forestry, landscape architecture, recreation behavior, and psychology have not allowed the premature adoption of any single approach to defining the problem, selection of relevant variables for investigation, or operationalization of these variables. Unfortunately, professionals within these varied fields have not often taken the opportunity to integrate ideas from their respective disciplines. Rather, what one finds are programs of research that represent an adoption of a single philosophical or methodological paradigm. This trend is especially evident when one notes that most research programs seem to have adopted either a mainly pragmatic or (less often) purely theoretical focus. As a result, they ignore potentially valuable information and insight relative to the field, available from the work of other researchers (Zube, Sell, & Taylor, 1982).

Despite this characteristic however, the research shows several general themes (Feimer, 1983). First, the research has been, and is still, mainly problem oriented. The focus is often on specific geographic localities and/or a narrowly defined resource management problem (e.g., the effects of different means of mining, oil exploration and extraction, road construction, or silvicultural practices). Second, most of the research has centered upon just the visual or scenic aspects of aesthetic experience with the land. Although there is no necessary theoretical reason for doing so, this practice is likely the result of a belief held by resource managers and scientists alike that the visual modality is the most important channel of persons' aesthetic experience. A third common theme is that research has focused upon natural or recreational environments. This most likely reflects the recognition that such areas currently hold the highest levels of this scenic resource and are also the most potentially threatened by man-initiated management and/or construction. Finally, there has been an ever increasing emphasis on the use of quantitative versus impresise, categorical assessment systems in ranking or rating scenic quality of the landscape. Thus, although researchers from varied disciplines have addressed the issues involved with perception and management of aesthetic resources from numerous paradigms, there still exists some common grounds for communication.

In summary, then, this field is held together through means of several loose research emphases, rather than through any systematic theoretical perspective. It is this very lack of a common theoretical orientation that has propagated the continued multi-directional, problem specific nature of the research. Although such individual efforts have led to various effective management programs, the solutions offered by each differ widely. Several authors in recent reviews of the major research paradigms and/or orientations utilized in this area (Daniel & Vining, 1983; Zube, Sell, & Taylor, 1982) have noted that the adoption of one paradigm over another may lead to very different managerial and theoretical implications. Yet no one paradigm has proved so powerful as to surpass all others on both pragmatic and theoretical grounds.

A following section (on page 13) will present a brief review of those paradigms most commonly adopted by this field's researchers. These paradigms represent general philosophical/theoretical orientations that: 1) define what scenic or aesthetic quality is; 2) thereby suggesting which independent variables should be functionally related to its determination, and 3) thus identify which should be the focus of study and potential management intervention.

<u>Scenic Quality Criterion Measures</u>

A necessary prerequisite to discussion concerning which variables may predict or determine scenic quality is to define the term itself. Unfortunately, the inability of researchers in this field to agree on one definition is likely a main reason why so many different emphases and directions in research programs have been evident. The definition one adopts will both suggest and set limits upon which variables are appropriate for investigation into its determination. Two somewhat different approaches to defining this concept have predominated. The first envisions the criterion as narrowly defined to refer to only visual properties of the environment. Daniel and Vining (1983) note that:

> Often landscape quality is defined as including a wide array of environmental/ecological, sociocultural, and psychological factors: [but] The term landscape clearly focuses upon the visual properties of the environment--thus biological functions, cultural/historic values, wildlife and endangered species, wilderness values, opportunities for recreation activities, and a large array of tastes, smells, and feelings, are not included. This is not to say these facilities are not important to the quality of the human environment, but they must be assessed and considered separately from landscape quality.
>
> The implication for landscape assessment is that landscapes should be located along a quality dimension. . . (the degree of excellence which a thing (a landscape) possesses). . . with some landscapes being more beautiful (or providing more pleasure to the senses) than others.
>
> Landscape quality assessment, then, involves systematic assignment of numbers to landscape instances so that at least ordinal excellence relationships are indicated (p.41-42).

Laurie (1975) also supports this view, although from a more artistic perspective. Landscape assessments involve a:

> process of recording visual quality through an observer's aesthetic appreciation of intrinsic visual qualities or characteristics within the landscape (p. 103).
>
> The aesthetic terminology of artists and designers is widely used and is accepted in some measure in all art forms as a working analytical means of giving verbal description to aesthetic qualities. . . The terms derive generally from the concept of order in nature and from man's ability to create visual order so as to stimulate and satisfy pleasurable feelings and emotions he calls aesthetic. The assumption is that man can have an intuitive understanding of the mathematical laws of nature, that the eye and brain are infinitely subtle instruments for assessment.
>
> Common terms used in art and design to describe the concept of an ordered relationahip from the interaction of aesthetic factors are unity and composition, Additional descriptive terms include variety, contrast and balance, form, mass, shape and outline, space, spatial relationships and enclosure, proportion and scale, texture and pattern, rhythm, light, and color and color relationships (p. 105).
>
> [In this light,] measures of <u>general preference</u> [emphasis added] for different types of landscapes are an inadequate guide to inherent aesthetic quality, and could be grossly deceptive and unacceptable, because they contain a variable "utility preference element" (that is, a response based on associating the landscape with some forms of use or activity) (p. 106).

Although these authors may not agree upon the exact form an assessment rating should take (quantitative rating along a global scale of beauty versus categorical description with artistic terms), they do agree that scenic or aesthetic quality should be distinguished from the thoughts, attitudes, or emotions people may associate with a particular environment. Rather, it is a characteristic that should be determined by analysis of (visual) aspects of the landscape alone.

Other investigators use more leeway when defining the concept. Feimer (1983) notes that the point of scenic quality evaluation is to assess "the aesthetic response of individuals to visually perceived features of the landscape" (p. 37). Such aesthetic response can be broadly defined as any "affective or evaluative responses (Wohlwill, 1976) that reflect pleasure or displeasure (Berlyne, 1974). Defined in this manner, aesthetic responses may be assessed through verbal, psychophysiological, and behavioral measures (Berlyne, 1974; Wohlwill, 1976)" (Feimer, 1983, p. 135). Although these authors still maintain that the impetus for evaluations lie in a physical landscape, that alone is not enough; meaningful interpretation of the landform beyond it's physical elements is a necessary condition for aesthetic response.

The use of one of two generally used criterion measures in scenic quality research mirrors in part the aforementioned definitional differences. Both involve a self-reported verbal response to a set of landscape stimuli. The first involves direct attempts to obtain a broad measure of scenic or visual quality (e.g., Briggs & France, 1980; Brush & Palmer, 1979; Daniel, Wheeler, Boster, & Best, 1973; Jones, Jones, Gray, Parker, Coe, Burnham, & Geitner, 1975;

Zube, 1974), visual attractiveness (e.g., Brush, 1979), or scenic beauty (e.g., Arthur, 1977; Daniel & Boster, 1976; Feimer, Smardon, & Craik, 1981; Patey & Evans, 1979; Schomaker, 1978; Schroeder & Daniel, 1981) along a numerical scale. Although not necessarily limited to the strict definition of scenic quality, these measures certainly minimize the potential for associational factors affecting the ratings, at least compared to the second major criterion measure used--ratings involving landscape preferences.

Preference measures of landscape stimuli have involved obtaining rankings of stimuli from the most to least preferred (e.g., Carls, 1974; Jackson, Hudman, & England, 1978; Shafer, Hamiliton, & Schmidt, 1969; Shafer & Tooby, 1973), the rating of one's relative preference for landscapes on a numerical scale (e.g., Hammitt, 1979; R. Kaplan, 1977; Kaplan, Kaplan, & Wendt, 1972; Propst & Buhyoff, 1980; Wohlwill, 1968), or use of a paired comparison technique between combinations of stimuli (e.g., Bernaldez & Parra, 1979; Buhyoff & Leuscher, 1978; Buhyoff, Leuscher, & Arndt, 1980; Buhyoff, Leuscher, & Wellman, 1979; Buhyoff & Riesenman, 1979; Buhyoff & Wellman, 1979, 1980; Buhyoff, Wellman, Harvey, & Fraser, 1978; Macia, 1979; Wellman & Buhyoff, 1980).

As noted, use of such ratings should be considered less appropriate by theoreticians who conceptualize landscape quality as entirely a function of the physical environment. Preference ratings do nothing to suppress any cultural, individual, or associational biases in interpreting a landscape scene, and may even include such factors in scenic judgements.

The importance of this distinction in criterion measures is not unique to this area of study. Craik (1972) notes that "modern philosophers of esthetics and art are in general agreement in differentiating evaluative esthetic judgements, akin to verdicts and findings, from appreciative esthetic judgements expressing affections, preferences, and antipathies" (p. 256).

Although there is some psychological research to back this distinction relative to general aesthetic response (Child & Iwao, 1968; Coughlin & Goldstein, 1970), the distinction may not be so clear when applied to landscape quality. Only a few studies have directly addressed this question, yet they suggest a fair degree of correspondence between the two types of measures. Zube, Pitt, and Anderson (1975) noted a high correlation (r= .80) between scenic quality and preference ratings , although this fact alone may have inflated the ratings. Daniel and Boster (1976), however, compared the convergence between these types of measures utilizing composite preference and scenic beauty judgements of independent groups of subjects. The ratings resulted in an identical rank ordering of four study areas. Specific design characteristics may again be identified as potential causes for inflating the degree of correspondence. Besides directing the subjects to base their preference judgements specifically on scenic quality, the small number of environments to be rated increased the likelihood of achieving identical rankings of preference and scenic quality.

Given some of the methodological drawbacks present in these studies, a definitive answer regarding the degree of correspondence between such measures is yet unknown, although the evidence gathered thus far suggests similarity between them. Even those theorists who conceptualize scenic quality as a product of the physical landscape alone realize its measurement as such may be next to impossible. Laurie (1975) noted that:

> associational reactions are innately bound up with aesthetic emotion engendered by all objects. It is arguable that they cannot be separated although techniques of assessing purely aesthetic factors using descriptive design terminology and of anlayzing the visual impact attempt to reduce or eliminate these associational reactions. On the other hand, evaluations of general preference of landscape tastes attempt to measure mainly associational reaction" (p. 105).

Daniel and Vining (1983) note that "neither approach can avoid basing landscape assessments on human, subjective value judgements" (p. 43).

Given these admissions, one wonders about the logical soundness of adopting an "inherent in the land" perspective. A plausible alternative voiced by many researchers is that aesthetic quality is the result of an interaction between physical landforms and the human interpreter, such that considering associational relationships may be relevant. Even so, empirical differences could exist between aesthetic judgements and preferential ones. A call for basic research to assess the validity of the distinction between these two has been voiced by numerous authors (Craik, 1972; Feimer, 1983, Zube, Sell, & Taylor, 1982). Are the two conceptually distinct as evidenced by differential patterns of descriptive correlates (Craik, 1972)?

A thorough analysis to this effect would be more than just theoretically valuable. The empirical findings would have direct implications for management of scenic resources, for even if aesthetic responses were shown to be empirically distinct from personal preferences and less bound to associational influences, the degree to which they might be related to associational variables (those other than physical features of the landscape) would be of interest. Such would point towards theoretical limits of how much one could manage the land's aesthetic resources by physical preservation or alteration alone, and how much might depend upon managing these other associational factors.

As of yet, no systematic comparisons have been made that distinguish just how much these types of measures relate to one another and how they differ in terms of their relationships with other variables. Such comparisons could unite separate research emphases and provide a common ground for discussion among investigators.

It is appropriate at this time to briefly introduce those major paradigms that have been adopted in field research thus far, thus identifying what independent variables might be incorporated within such a comparative study.

Major Philosophical Paradigms

Several authors have compiled recent reviews that attempt to categorize much of the landscape quality research into major models or paradigms (Daniel & Vining, 1983; Zube, Sell, & Taylor, 1982). The basis for these groupings is multidimensional. One of the main distinctions differentiating approaches concerns which variables each considers important in either predicting or determining the landscape aesthetic response. They are also distinct as to how they define the response itself (as one would expect from reading the previous section); however, there appears to be some latitude in accepting various operationalizations of the concept across orientations.

The following synopsis mergers the schemes put forth by Zube, Sell, and Taylor (1982) (i.e., four general paradigms of landscape perception research) and Daniel and Vining (1983)(i.e., five landscape assessment models or conceptual approaches) into two major foci that have predominated the landscape perception field.

Focus 1--A Management/Prediction Orientation

The first focus interprets scenic quality mainly as a naturally occurring feature of the environment. This perspective has predominated the research of those professions (e.g., landscape architecture, forestry) where management of scenic quality as a natural resource is a major goal. This conceptualization is not surprising given the goals of those in these professions; with it there is the logical suggestion that all one needs to alter, preserve, and/or restore are the physical features of the land itself. One need not worry about differential interpretation of such features by individuals, each of whom might have their own conception of beauty. Thus, the management problem is phrased in a manner that makes its objectives more easily obtainable.

The Psychophysical Paradigm: Within this general foci, two main approaches have predominated. The first has been labeled the Psychophysical Paradigm (Zube, Sell, & Taylor, 1982) or Psychophysical Model (Daniel & Vining, 1983).

Research undertaken under this scheme mainly concerns itself with assessment of precise features of the landscape (e.g., relative amounts of water, vegetation types, topographies) and how they mathematically relate to a specific psychological response (a judgement of scenic beauty, aesthetic quality, or preference). Statistical techniques involving regression analyses are typically used to develop an equation that allows one to predict one's criterion (e.g., scenic quality) from specific physical properties of the landscape. These equations are typically based upon the combined response of large samples of the population. Since it is assumed that the criterion is an inherent quality of the physical stimulus array, individual differences in response by members of the population are irrelevant; rather, they are conceived as merely a sample of measurements of this landscape value. If enough are collected, a "true" value of beauty may be determined, from which the degree to which landscape properties relate to these values may be determined statistically.

The long term value of such research rests upon how well such predictive efforts are realized for a variety of environmental types using a variety of subjects making the ratings. If fairly accurate and reliable predictions of persons' perceptions of landscape quality can be obtained merely by collecting measures of objective physical features of the landscape, and calculating their combined effects in predicting the human response, then there will be less need to directly assess specific landscapes and/or proposed landscape alterations by landscape planners, managers, and the general public. Such assessments could be made more reliably, more quickly, and with less cost, utilizing developed landscape assessment equations.

Interestingly enough, the predictive ability of such variables has been relatively high (e.g., Buhyoff & Wellman, 1980; Daniel & Schroeder, 1979; Patsfall, Feimer, Buhyoff, & Wellman, 1984; Shafer, Hamilton, & Schmidt, 1969), thus supporting in part a "stimulus-response conception" of the relationship between features of the environment and human aesthetic response. Such perception is not simply in the eyes of the (individual) beholder. However, neither has accounting for these variables alone accounted for all the variance in such responding. Clearly, there is room for inclusion of individually based predictive variables.

Research efforts in this paradigm are not without their drawbacks, however. Three such problems are noted here.

1) As Weinstein (1976) notes, care must be taken whenever one utilizes a regression format that one not over-emphasize the percentage of variance accounted for in the criterion. Such values may be artificially inflated, as the general linear model, the basis of most regression

techniques, capitalizes on any random variance in one's measures in determining an equation offering the best fit to the data sampled. Since individual irregularities in the data would not be present in other data samples, the true relationship between predictors and criterion may be inflated. The problem can be eliminated however, if cross-validation procedures or predicted R-Squared estimates are provided whenever reporting results utilizing these techniques.

2) A related theoretical issue that arises, particularly in light of how likely it may be to someday make landscape assessments on the basis of objective measurements of landscape features alone, is the potential generality of results obtained through these techniques. The use of environmental simulations (i.e., photographs or slides) as a basis of representing the "to be rated environments" is not a problem regarding how effective these representations are at yielding similar environmental assessments to those achieved from on site visits (Daniel & Boster, 1976; Shafer & Richards, 1974, Shuttleworth, 1980). However, the very nature of the predictor variables used may seriously inhibit the generality of findings from one study setting to another, especially when one is dealing with settings representing different biomes.

As previously mentioned, objective measurement of physical landscape properties is usually quite specific (e.g., area of sharp mountains, proportion of forested area, lbs/acre of grass) and terms utilized in final equations may even represent transformed data (e.g., area of water squared, area of water multiplied by area of intermediate vegetation (Shafer, Hamilton, & Schmidt, 1969)). When such values are derived from slide or photographic representations they may vary greatly, depending upon even slight alterations of the camera angle at which the view is framed. The problem involves utilization of specific and idiosyncratic predictors, given the nature of one's specific set of environmental representations, to estimate a more general response. Although highly reliable and even valid for the specific set of environmental representations utilized in the research, the results would not be highly generalizable to other environments with their own specific (idiosyncratic) sets of environmental features.*

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*It should be mentioned here, however, that this problem may be more limiting in theory than in practice. Highly predictive and reliable equations can be developed for areas that utilize physical measurements taken from the actual groundsites, instead of measures taken from photographs of those same sites. Such measures have included basal area, average tree height, average dbh (diameter at breast height), diversity of species ratings, and percentage of slash and downed material (Buhyoff, Gauthier, & Wellman, 1984; Vodak, Roberts, Wellman, & Buhyoff, 1985). Although still somewhat limited in predicting response towards a different environmental type, problems related to the specific values held by independent variables due to photographic angle, composition, etc. are minimized.

3) A third drawback is that although this procedure may provide managers with the ability to predict environmental aesthetic response relatively well, its emphasis is not towards insight into what factors might affect or determine human aesthetic responses in general. Thus, although leading to highly practical results, they are, in the way typically used, of limited theoretical value.

This problem has been noted by several authors (e.g., Daniel & Vining, 1983) who call for research investigating what relationships exist between physical environmental predictors and psychological/cognitive ones. One would then get the best of two worlds--a highly reliable and sensitive set of physical feature predictors of aesthetic response, linked to more abstract theoretically compatible predictors. Generality of prediction might be better accomplished also--as managers might attempt to structure environments such that they would yield settings that could be explained in psycho/cognitive terms (e.g., complexity, congruity, mystery) as a function of specific physical features. Here, slightly different sets of environmental features yielding similar psychological/cognitive ratings should yield similar overall aesthetic judgements as well.

<u>The Expert Paradigm</u>: A second approach to landscape assessment still within the broad focus that characterizes the psychophysical approach has been variously labeled the

Expert Paradigm (Zube, Sell, & Taylor, 1982) or the Formal Aesthetic Model (Daniel & Vining, 1983) of assessment. Here, as before, scenic quality is conceived as a property inherent in the landscape itself. Management of this resource, however, would involve the manipulation and arrangement of "landforms", or control of one's viewing access to scenic vistas, in order to accentuate the best combinations of line, form, textures, and color; thus achieving an artistic balance, unity, and/or harmony in the landscape.

The assessments are typically made by experts or professionals who have had design training and specific instruction in the rating system to be used. Advantages of this approach point mainly to cost effectiveness. Only a few experts are needed to assess rather large expanses of land, and in addition, systems have been developed (e.g., Litton, 1968, 1973) that permit evaluations by refering to already available sources, like photographs or topographic maps. Several disadvantages of these approaches are evident though.

First, studies have shown that the reliability of obtained landscape ratings are lower than would normally be considered acceptable by those in the research professions (Feimer, Craik, Smardon, & Sheppard, 1979; Feimer, Smardon, & Craik, 1981).

Second, the type of ratings this type of assessment yields are not typically congruous to those obtained by the other major assessment techniques. Instead of providing average ratings or scores on some ordinal or interval scale for such criteria as scenic quality or preferences, the judgements are mainly categorical. The landscape is usually classified as belonging to a certain landform type, with qualifications that further describe specific aspects of it using artistic concepts (e.g., color, texture, color, balance). A final summary evaluation is usually provided that combines both a general visual landscape quality value (based on these artistic concepts) with a landscape's sensitivity rating, which refers to how much change a landscape might endure before such would alter the general scenic quality of the region (see Bacon, 1979; Daniel & Vining, 1983, p. 50-51; Ross, 1979). For instance, certain landform types and/or feature compositions might be inherently more sensitive than others. Additionally, the visibility or relative access the public has to a certain area might affect sensitivity. Those regions that are highly secluded might be considered less sensitive to human interventions, since they would be noticed by relatively few individuals.

Final summary evaluations, in turn, usually have direct reference to allowable management alternatives for the region assessed. These might range from "Preservation" or "Retention" to "Maximum Modification". Unfortunately, the final ratings are not highly sensitive themselves. Rather than yielding a score on a continuous scale of measurement of general scenic quality, only a few categorical summary ratings refering to management objectives (and only indirectly to scenic quality) are produced. This makes precise differentiation between landscapes impossible.

Third, the particular independent variables used to form overall judgements have not reliably been shown to relate to overall ratings themselves, thus questioning the basic validity of using of aesthetic concepts as a means of rating or describing the landscape, even when these ratings are being compiled by supposedly competent experts (Feimer, 1981; Feimer & Craik, 1979).*

Finally, a philosophical dilemma exists concerning this approach's reliance on expert judgements alone. Is scenic beauty and aesthetic quality a distinction obtainable only through trained experts, or should these standards be reflective of a larger public's opinion? Answers to this question are especially pertinent in light of research that

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*This problem may, however, stem more from the typical means through which ratings are derived, i.e., utilizing only a few "experts" in making the ratings, rather than from a lack of validity of the concepts used in the assessment. In general, the fewer raters a system utilizes, the less reliable measures of rated concepts are likely to be. This in turn sets a ceiling on validity.

suggests that experts' opinions regarding landscape preferences differ from those of a more general public (Buhyoff, Wellman, Harvey, & Fraser, 1978).

Focus 2--A Research/Theoretical Orientation

A second major focus exists among those involved with landscape perception research. This perspective differs from the aforementioned one in several ways. First, it tends to be adopted by those professionals more interested in research per se than in direct management application.

Not surprising then, the focus is more geared towards understanding and explaining landscape perception and aesthetic responses rather than just predicting them. The choice of independent variables deemed appropriate for investigation is much broader. Typically, scenic quality is viewed as more than just a consideration of the physical environment. Rather, factors involving both human interpretations of the actual environment observed and personal characteristics of the observers are examined.

Obviously, the implications for managing lands given this perspective differ greatly from those given the previous one. No longer can one simply alter physical aspects of the environment in order to achieve certain scenic quality outcomes. Rather, personal perception of such changes is also seen as an important determinant, and hence, effective management would additionally involve either public education (to alter such perceptions) or a survey of the population and specific catering to majority perceptions.

The Cognitive Paradigm: As was the case with the first focus introduced, this one is represented by two main approaches. The first has been variously labeled as the Cognitive Paradigm (Zube, Sell, & Taylor, 1982) or Psychological Model (Daniel & Vining, 1983). Research here is characterized by attempts to locate relationships between variables that represent human interpretation of the environment via various summary concepts (i.e., through transactional variables like complexity, congruity, mystery, novelty, or spatial enclosure of the stimulus array)(e.g., R.Kaplan, 1975; S.Kaplan, 1975, 1979; Kaplan, Kaplan, & Wendt, 1972; Wohlwill, 1976).

Alternatively, studies linking individual differences and environmental aesthetic response have been carried out, examining such factors as demographic differences (e.g., Zube, Pitt, & Evans, 1983), personality characteristics (e.g., Macia, 1979; Winkel, Malek, & Thiel, 1969), and familiarity with the environmental type (e.g., Hammitt, 1979; Herzog, Kaplan, & Kaplan, 1976; Lyons, 1983; Pederson, 1978; Penning-Rowsell, 1979).

In addition, some research efforts under this general approach do not just expand the number of independent variables examined. The criterion itself may include numerous types of responses: behavioral, attitudinal, physiological, and/or emotional. Although environmental perception is thus conceived as a multidimensional response, such studies will not be further considered here, as their emphases are distinct from those of this project, which requires the more common aesthetic criteria.

The main advantage of this approach is that it avoids the necessity of restricting one's predictions to specific combinations of physical variables that stem from a particular set of landscape views. Variables typically chosen for investigation (e.g., complexity or congruity of the environment, personality, past experiences) logically transcend specific environmental features. Hence, any relationships uncovered are likely more generalizable.

Interestingly, this feature, viewed as an advantage to the researcher who is attempting to better understand environmental aesthetic response, may also be considered a leading disadvantage by the practicing manager, who simply wishes to predict it. When physical features are related to this criterion, obvious alternatives are indicated to change or alter aesthetic response to an area. One simply changes the physical properties of the land itself. However, managerial solutions are not so obvious when dealing with predictor variables like mystery, complexity, and/or congruity. The exact relationship between such variables and physically alterable features of the land is at this point unclear. Managers would likely have even fewer ideas about what to do in response to research that indicated that aesthetic response was due in part to an individual's past experiences or personality, something over which they have no control.

As was suggested by Daniel and Vining (1983), and was alluded to earlier, investigations into the relationships between transactional variables, like those mentioned above, and specific physical features of the land are needed. This would aid the landscape manager in utilizing generalizable psychological concepts by suggesting specific operationalizations, i.e., physical features of the environment that could be altered to affect change in transactional variable values, and hence, change in one's aesthetic response.

The Experiential Paradigm: A final general approach that has been adopted by some researchers and falls under this interactive focus of scenic quality assessment has been called an Experiential Paradigm (Zube, Sell, & Taylor; 1982) or Phenomenological Model (Daniel & Vining, 1983). While the emphsis of the aforementioned Psychological/Cognitive approach was upon the importance of considering individuals' interpretation of the physical environment, the

Phenomenological approach places emphasis on individual experience. While the cognitive approach dealt with the human as an important element in aesthetic response, the important concepts utilized to describe and explain such, were expected to be similar across particular groups of people. Hence, certain personality types, members from similar socio-economic groups, or those familiar with a particular environmental setting, would be expected to react to similar environments the same way. Likewise, under a cognitive approach, the use of transactional variables like complexity or congruity were examined to determine how well humans in general would interpret the physical environment in terms of such abstractions.

The phenomenological approach, however, taking a more extreme position, holds that environmental perception and cognition are truly individual events. Such cannot adequately be described or explained through concepts generalizable across the population. Understanding a person's responses to the environment is only revealed when one looks at the specific meanings environments have for individual people. Such meanings require examination of each person's unique history of past environmental interactions, interpretations, and perceptions.

Obviously, the disadvantages of such an approach are numerous. Since information can only be gathered via timeconsuming means, e.g., interviews, its cost effectiveness is low. Besides, the very emphasis of such an approach is somewhat antithetical to the purposes of both the resource manager and research scientist. Results would never be generalizable, for experience is viewed as a uniquely individual event. In fact, an individual's perceptions would not even be expected to remain stable over periods of time, as new experiences received between assessments would likely alter one's future perceptions. Theory in science assumes the presence of general laws, not entirely individualistic determination.

Logically, such an approach gives the resource manager very little with which to work. First, aesthetic response is supposedly determined more by persons' individual past experiences than by the environmental setting per se. Second, since even that part "determined" by the environment affects each individual in a unique way, the manager is left with a dilemma. Change in that which he has control over (the environment) would yield no predictable response for people in general, nor even for targeted groups, since experiences are both uniquely personal and subject to change over time.

On the other hand, some of the philosophical undercurrents housed within this approach are potentially important to improving both prediction and understanding of the human aesthetic response. A phenomenological approach need not imply independence from predictive research and empirical verification. As Canter (1983) notes when discussing his (phenomenologically based) facet model of environment (place) evaluation: "a central proposition of the proposed model is that the fundamental underlying human experience of places are consistent across people and places. It is the content of these processes and their emphases that will vary in important and identifiable ways from one person to another, and from one place to another" (p. 660).

Such a distinction is important and requires elaboration. Typical predictive research, especially that which strives to be parsimonious, may look for relationships between specific variables or concepts, and look for general "laws" that apply to a phenomenon or group of people as a whole. Such efforts have been successful, yet they constitute looking for relationships of similar "content", rather than attempting to describe a more general process.

Such has been the case when examining the effects of specific variables in past aesthetic perception research. Some relationships have been found between certain personality, familiarity, transactional, and/or physical characteristic variables, and the degree of one's preference for a landscape. Yet a phenomenologist would argue that these variables fall short of offering a fuller understanding, as they have not been incorporated within a larger scheme or descriptive process outlining this phenomenon. Such would allow for the fact that at various points in the process, particular individuals will be concerned with different content entirely (e.g., not everyone is subject to familiarity effects in making assessments) or differentially emphasize process contents that are similar (e.g., not everyone is affected by an environment's complexity to the same degree).

Thus, although a phenomenological perspective may not be the most pragmatic, empirical investigations involving process might lead to better understanding (and hence prediction) of the phenomenon involved. In any such investigation variables so included should both be amenable to: (a) individual qualification (Are they important to this individual?), and (b) individual quantification (How important are they to the individual?). Have writers and researchers within the environmental perception field suggested any such broad schemes or variables compatible with a phenomenological approach?

Interestingly, numerous authors have called for a uniting of the field's varied emphases under a more comprehensive theory of environmental perception and cognition. Yet, so far none of these ideas have been incorporated into any quantifiable test for verification of their importance. For instance, Stokols (1976, 1978) stresses the need for a theme that would underlie all research into aspects of environmental psychology--that of human environment optimization. Under this theme he suggests that all:

> the various modes of transaction between people and their surroundings (i.e., interpretive, evaluative, operative, and response modes) are organized in relation to prioritized goals and plans (1978, p.279).
> people ideally strive to achieve "optimal environments" or those that maximize the fulfillment of their needs and the accomplishment of their goals and plans. . . Specifically, the optimization theme suggests that people orient to the environment in terms of existing information, goals, and expectations. . .and they evaluate the quality of the environment as a context for future activity and goal attainment (1978, p. 258-259).

Similar notions have been voiced by other authors in terms of value-methodological trends in the field (Proshansky & O'Hanlon, 1977), an interactive model of environmental stress (Lazarus & Cohen, 1977), perception of the urban experience (Ittelson,1978), or an Organismic Developmental perspective for understanding man-environment transactions (Wapner, Kaplan, & Cohen, 1973). All these authors adopt experientially-laden perspectives which hold that perception of the environment involves more than an analysis of its physical features alone. Such features are non-interpretable unless placed in a context of what they mean to human actors within an environment.

> The structuralization of the environment is not in terms of inert things, or entities, but in terms of the relevance and meaning of features of the world for [one's] plans and actions. . .One does not come to a new environment as an inert passive entity. One goes to a new environment with certain purposes in mind. . . and with a certain projected schema of what the new environment will be like. This projected schema typically derives from certain norms established earlier in life, norms built up in environments in which one has long sojourned. One carries various stereotypes of place and persons which enter into one's expectations of what will be found, what one will be able to do, etc., in the new context (Wapner, Kaplan, & Cohen, 1973, p. 258).

Ittelson (1978) notes that: "Environmental perception is not only dependent upon the physical, interpersonal, and cultural aspects of the environment, but also upon the status of the person, including needs, actions, motives, cognitive processes, and so on" (p. 197).

Landscape Aesthetic Perception Themes: One notes that the above theoretical statements refer to relationships that should exist between personal needs, goals, plans, and future activity, related to environmental perception as a whole. How, however, are such concepts logically related to the topics at hand: to landscape perception specifically, or further still to aesthetic response of natural landscapes?

Several authors have noted that landscape perception differs in a fundamental way from all other object perception (Ittelson, 1973; Unwin, 1975; Zube, Sell, & Taylor, 1982). Thus, although aesthetic response to both specific objects and the natural environment should entail the same processes in general, this distinction between the two may be relevant to the question at hand.

Landscape perception necessarily involves a different perspective from that of most other objects. Landscapes surround people, and viewing and evaluation of such always involves perceiving something in which one is immersed. There is less possibility for a detached perception, as would be the case when viewing something of which one is not a part. One specific consequence of this immersion is that landscape perceptions are concurrently made while the observer is involved in specific activities.

Zube, Sell, and Taylor (1982) note that: "Landscape perception always involves action. Landscapes cannot be passively observed; they provide opportunities for action, control, and manipulation" (p. 22).

Since people always encounter environments in the midst of activity, would not subsequent perceptions of it be related to activities associated with it (especially if these activities were related to one's future plans or goals)? Although it is certainly a logical leap to infer that aesthetic response may, too, be specifically affected by such associations, such an effect may occur indirectly. For instance, Unwin (1975) suggests that such associations affect one's perceived image of the environment, which in turn is the basis from which aesthetic evaluations are made, rather than the visual images themselves.

> In forming opinions about the landscape, observers are reacting not to the independent objective landscape, nor to the viewform landscape, but to their own image of the landscape. This image will bear some relationship to the viewform landscape, but will be an abstraction or elaboration of the real physical landscape according to the way in which the individual responds to and structures his world as a result of his physical perceptual capacities, socio-economic, cultural, personality, experiential and other characteristics. It is this personal image which will be evaluated in the forming of landscape preferences and judgements. . .
>
> Since the landscape is a surrounding environment, its perception is almost always involved with action of some kind. . .
>
> This suggests that both perceptions of and preferences for the landscape need to be examined in light of various types of activity, with the expectation that different activities will be associated with different types of landscape response. Perhaps, therefore, there is a need for landscape evaluation to be carried out with reference to specific activities (p.132).

To summarize, the point of whether such an effect would be direct or indirect is somewhat moot, since to date, no research has yet been carried out regarding the very existence and/or degree of any such relationship. However, 1) given the above arguments concerning the relationship between activities and landscape perception in general, 2) the proposition that people would prefer an environment that is related to valued activities, and 3) a general definition of aesthetic response provided earlier [i.e., one's responses of attraction to an environment (see Feimer, 1983)], investigation into the effects of perceived activities related to a particular environment and one's aesthetic response towards it seems warranted. As the nature of activities' relevance would likely vary greatly across different persons, both in terms of the numbers involved, the types considered, and their varied importance, investigation of such a variable might best be framed from a phenomenological perspective.

Research Emphases of the Current Proposal

The research proposed here will deal with three major foci.

1--Research is needed to clarify the distinctions between two of the currently most used criteria for measuring aesthetic response to natural environments: scenic quality ratings and preference ratings. Statistics regarding how much such ratings correspond directly to one another, and comparisons as to how various "predictors" of the aesthetic response are differentially related to these two will be examined.

2--Research has been called for that would compare and/or combine the use of those predictor variables commonly utilized in research undertaken from different research paradigms or models. In their reviews of the literature, both Feimer (1983) and Daniels and Vining (1983) expressed a specific need to examine the extent to which physical predictors of environmental aesthetic response are related to the more psychological or transactional predictors. Feimer (1983) notes that "Since transactional variables emphasize the organization and abstraction of physical environmental elements, a greater understanding of the manner in which physical properties are combined to produce those abstractions would lead to a better understanding of the nature of aesthetic responses" (p. 140).

The advantage of potential generality of relationships between psychological variables and aesthetic reactions will not be realized until such are related in turn to more manageable psychophysical predictors. Thus Daniel and Vining (1983) state that "While neither the Psychophysical nor the Psychological Models are sufficient alone, a careful merger of these two approaches might well provide the basis for a reliable, valid and useful system of landscape quality assessment" (p. 80).

Zube, Sell, and Taylor (1982) also call for a more integrative approach, one concerned with more than prediction alone, that encompases the relationships between managerially manipuable variables and more cognitive-theoretical ones.

In addition, given that these paradigms suggest relatively different types of variables as important to the prediction and understanding of human aesthetic response, and given that separately they have been able to do so fairly well, by combining them into single predictive equations, one might increase the amount of variance accounted for beyond that previously achieved.

Regression equations examining both the relative and combined predictive ability of psychophysical and cognitive/psychological variables will be calculated for aesthetic response to the same environmental stimuli. In addition, measures of correspondence between such predictors will be examined.

3--Numerous authors have pointed to the theoretical importance of including variables related to human needs, goals, plans, and potential activities when dealing with human evaluation of environments (Ittelson, 1978; Lazarus & Cohen, 1977; Proshansky & O'Hanlon, 1977; Stokols, 1978; Unwin, 1975; Wapner, Kaplan, & Cohen, 1973; Zube, Sell, & Taylor, 1982). The importance of such variables stems from a belief in the necessity for examining more than just the structure of a physical array in determining aesthetic response. Content and meaning should also be important. No empirical research to date has investigated such suggested relationships.

Research does exist that shows that human aesthetic response can be substantially altered by one's interpretation of specific physical features of a landscape (Buhyoff, Leuschner, & Wellman, 1979; Simpson, Rosenthal, Daniel, & White; 1976). Further, differential interpretation may explain why landscape ratings differ between individuals with different personalities (e.g., Craik, 1975; Macia, 1979; McKechnie, 1977; Winkel, Malek, & Thiel, 1969) or who have different familiarity with the environment (e.g., Lyons, 1983; Pederson, 1978; Penning-Rowsell, 1979).

One common notion discussed relevant to these general themes has been that of environment-behavior relationships. Since people are always engaged in activity when in different places, and as they likely choose to travel to specific locations as a function of what behaviors they will carry out therein; a probable relationship between perceived activities and place meaning is hypothesized.

Genereux, Ward, and Russell (1983) have, in fact, presented research that suggests people do distinguish and differentiate places on the basis of associated activities. Within their model of place behavior associations, people choose specific locations in which to carry out general plans of action. Choice of a specific location takes into consideration what people know or expect about such a place in terms of: (a) its suitability for intended behavior, (b) the expectation of what behaviors are likely to occur there, and (c) place cost. Behavioral suitability refers to how a place may physically and affectively meet the requirements for engaging in a particular activity. Behavioral expectation refers more to a place's social context. Are there social laws, norms, or expectations that dictate that certain behaviors would be unacceptable in a specific environment, even if it physically conformed to required standards? Place cost refers to the effort and expense required to get to or act within a specific place.

Their research has demonstrated that people both distinguish among places using the first two concepts, and that such distinctions account for up to 50% of the variance in global dissimilarity ratings between places. Further, the specificity that certain places held over others (certain places were reliably associated with only a few behaviors, others with many) led them to postulate: "that it may strongly influence place selection. All other things being equal, a person may prefer to choose a place with many behavioral associations (such as a beach) rather than one with a few (such as a swimming pool); one reason being that if execution of the original plan is thwarted, there are more alternatives in the former than in the latter" (p. 54).

Two individual difference measures will be examined in the current research. One will deal with the activities that can be associated with environments, following up the research efforts just mentioned. The second, familiarity with the environment, will investigate a variable that has been used successfully in past landscape perception research. Its inclusion here will permit examination of whether perceptions of environments' suitability for activities are differentially related to peoples' familiarity with those environments. The following section of this report examines in detail the theoretical framework under which such variables were framed for empirical study in this research.

Environmental Utility--A Phenonemologiaclly Conceived Variable of Activity-Place Associations

Before proceeding with an outline of the methods used in conducting research covering these three general foci, a more detailed examination of the third is required, especially as this approach has not yet been directly attempted in the past. Two important issues need clarification. First, given the extremely broad nature of the environment-behavior concept; how should it be conceptualized, if the concept is to be conceived under the guise of a phenomenological approach? Second, how should it be operationalized, such that its investigation remains manageable within the context of the other two research emphases being examined?

Related to the second question, an obvious issue concerns "what types of activities to consider". Reanalysis of the logic behind suggested inclusion of the place-behavior concept in this research suggests that we need include only those types of activities that would likely enhance the environment's utility to those persons considering it.

A definition of utility here may be taken from the context of Genereux, Ward, and Russell's (1983) research and model of place-behavior associations. The model they present proposes that people use knowledge of place-behavior relationships to better achieve plans and goals. People select those environments to go to that are more likely to support a desired activity, i.e., that have immediate utility. They also suggest that when several environments are available, people might prefer the one that is more suitable for engagement in other (related?) activities as well, such that if when arriving at the selected environment, initial plans are thwarted, other options are readily available. Following this line of reasoning, what is being suggested here is the conceptualization of an environmental utility measure incorporating persons' perceived environment-behavior relationships. Attractiveness of and/or preference for specific settings should be a function, in part, of such perceived utility.

What types of activities are associated with natural landscape scenes that would both have high utility, but also be unique to the outdoor setting?* A major type of activity meeting these requirements and relevant to most people is probably outdoor recreation. Recreational behaviors in general are valuable in providing a number of beneficial psychological outcomes to participants (Driver, 1976b), and hence, would have utility by the standards set here. By definition, they would be fairly unique to the natural environment.

In addition, tentative evidence exists indicating that differential participation in such activities is predictive of what types of features people prefer in outdoor recreation settings. Over the years, Driver and his associates (Davis, 1973; Driver, 1976a; Knopf, 1972; Manfredo, Driver, & Brown, 1983; Roggenbuck, 1975; Roggenbuck & Dawson, 1979) have examined the relationships between recreationists' behaviors, their motives for recreating, and the managerial policies and environmental features they perceive best fit their needs.

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*Logic suggests that we limit our selection of activities to those that are not supported equally well by more common environments like one's home or neighborhood. Although basic activities like eating, socializing with others, or sleeping might be carried out as well in natural landscapes as "at home" (although this is questionable), since the cost of doing so is higher (in time and expense to get there) the specific selection of these environments for carrying out such basic activities would be unlikely.

Much of this research (in recreation behavior and leisure science) has used a general theoretical orientation described by Driver (1976b) which stresses the importance of recreation behavior as a function of benefits the participant receives from participation in specific activities. Man is conceived as an "information processing and problem solving organism" with a "goal directed nature, or purposefulness of recreation behavior" (p. 171). Driver describes a "recreation experience" in rather broad terms--a sum of a participant's mental, physical, spiritual, and other responses to a recreational engagement. However, he also specifies several "levels" of recreation experience--ways that individuals may perceive or describe an experience, and ways that managers should perceive the recreation experience in terms of what types of outcomes or conditions are "demanded" by recreation consumers.

These demands are arranged in a somewhat hierarchial order roughly arranged according to (a) how likely it is that recreationists are consciously aware of the demand, and (b) how difficult the demand may be to measure. These four levels are: (1) demand for specific environmental (physical) attributes (e.g., nearby water, clear trails) or managerial conditions (e.g., fees for entrance, restriction of numbers of people allowed in one area); (2) demand for specific activity opportunities (e.g., picnicking, swimming, hunting); (3) demand for specific psychological outcomes (e.g., a sense of acheivement, an opportunity to take risks, improvement in social status); and finally (4) demand for longer range physiological, psychological, or sociological outcomes (e.g., improvements in personal well being, functioning at work, personal relationships at home).

Within the context of the goal directed man, Driver proposes that people might select those activities (level 2) that are perceived as related to fulfilling certain psychological outcomes (level 3).* In addition, people may seek out specific environmental settings (level 1) that may support engaging in certain recreational activities (level 2).

To this point, research in the field has mainly looked for generality across people, calculating (across group) correlation coefficients between values of psychological outcomes and rates of participating in specific activities (e.g., Davis, 1973; Knopf, 1972, Manfredo, Driver, & Brown, 1983), or between psychological outcomes and site

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*Psychological outcomes have been defined by Driver and his associates (e.g., Driver, 1976a; Knopf, 1972; Roggenbuck & Dawson, 1979) through subjects' responses to a set of over 40 scales that measure "psychological consequences of recreational behavior". For the most part, they can be conceived of as intrinsically rewarding experiences either received or anticipated as a function of one's involvement in specific recreation activities. The scales are reliable across settings and subjects and include measures of consequences related to such concepts as achievement, autonomy, risk taking, affiliation, self-awareness, stress reduction, and knowledge aquisition.

characteristics (e.g., Haas, 1979; Roggenbuck & Dawson, 1979).

The linking of separate results across studies suggests that knowledge regarding what activities a person engages in or enjoys may predict certain types of environmental features that a person favors or prefers. This would follow if one assumed different types of recreation activities required different environmental features in order to best be carried out.

Specifically, studies have shown that participation in different recreation activities corresponds with different patterns or clusters of expected psychological outcomes (Davis, 1973; Knopf, 1972; Manfredo, Driver, & Brown, 1983; Roggenbuck, 1975). Further, recreationists displaying different psychological outcome values prefer different sets of environmental features. For instance, in studies of backcountry hikers, Roggenbuck and Dawson (1979) noted that those with different experience preferences (anticipated satisfaction with desired psychological outcomes) also prefered different types of environmental features. Haas (1979) also found differential relationships among hikers. Those who had received different psychological outcomes on trips reported different satisfaction levels with various physical resource attributes encountered thereon. Manfredo, Driver, and Brown (1983) report that different recreation user types (based upon similar clusters of desired psychological outcomes) significantly differ from one another in terms of their preferences for engaging in specific recreational opportunities, environmental settings, and management policies.

Considering activity engagement and preference for specific environmental features both relate to differential patterns of psychological outcomes; might not the two be directly related? Once again, such circumstantial evidence warrants further investigation of activities as they relate to environmental utility.

An Expectancy Model as Theoretical Basis for Operationalization of Environmental Utility

Having decided that the use of recreation activities is an appropriate means for limiting the content area of the place-behavior variable, a proper model allowing operationalization of this concept still needs to be chosen. How can the associations persons hold between a particular environment and multiple behaviors be combined into a single measure representing environmental utility? Further, can utility be operationalized within a phenomenological perspective, since it is likely that the specific activities people each consider could differ, or at least differ in importance? Might not individuals also differentialy perceive how suitable activities are for varied environments?

One model that would be able to fulfill most requirements set forth by phenomenological standards, i.e., inclusion of only those factors deemed important by each individual, allowance for differential weighting of importance of factors included, and accounting for some effects of differential experience, would be an expectancy model, as presented by Vroom (1964). In addition, it would permit empirical verification of specific factors' importance across individuals as a whole.

Use of an expectancy model as a means of predicting landscape aesthetic response has not previously been attempted. However, the expectancy approach itself has been successfully used to predict a variety of human attitudes and behaviors, especially related to the industrial setting (see Lawler & Suttle, 1973; Mitchell, 1974; and Wanous, Keon, & Latack, 1983 for reviews). More recent studies note the utility of the model in predicting levels of effort one puts forth on the job (Dachler & Mobley, 1973; Lawler & Suttle, 1973; Shiflett & Cohen, 1980), one's choice of job (Arnold, 1981) or task (Fusilier, Ganster, & Middlemist, 1984), efforts extended to get a job (Stahl & Harrel, 1983), one's actual choice of post-high school careers (Schmitt & Son, 1981), the attractiveness of and effort one would put forth to enter a graduate school (Wanous, Keon, & Latack, 1983), grade point average (Malloch & Michael, 1981), or effort put forth to improve course grades (Stahl & Harrell, 1981), actual time spent engaged in "student related" activities (Kennedy, Fossum, & White, 1983), one's intent to reinlist (Shiflett & Cohen, 1980), or even job satisfaction (Pulakos & Schmidt, 1983; Shiflett & Cohen, 1980).

In all cases, the model showed predictive utility, although results varied widely, and in many cases, a fair amount of variance in criterion measures was left unaccounted for. On one level, such widespread support in terms of general predictive utility suggests the appropriateness for adopting such a model here. However, the lack of consistency in degrees of utility across studies raises questions concerning this conclusion. If the model is to be used as the basis for an important variable in this research, the opportunity to investigate its various nuances should not be wasted. The current research will therefore examine several forms of the model itself, thus further elaborating upon the validity of the model as originally proposed, and as altered by subsequent researchers.

Variations in Expectancy Model Operationalization

What are the reasons that results have varied? A short review of some reasons is offered here. First, a wide variety of criteria have been sought predicted; and many have not conformed to Vroom's (1964) original conception of what the model was designed to predict--that is, motivational force to act or make a choice amongst several alternatives, and not behavior itself (e.g., grade point average, occupational choice).*

A second reason why differences have existed across studies again stems from the fact that some researchers have altered the original model formulation. In incorporating motivational force scores as predictors across subjects, one is utilizing a between subjects conceptualization of the model, which assumes all subjects utilize identical scaling schemes concerning their beliefs about values of outcomes associated with specific behavioral choices, and expectancies that specific choices will be linked with specific outcomes; such that their resulting motivational force scores are directly comparable.

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*In fairness to researchers who utilized this model to predict behaviors, they often did so utilizing the motivational force scores as only one variable in prediction of the behavior. For instance, Malloch and Michael (1981) used ability scores in addition to expectancy model variables in predicting grade point average, and Schmitt and Son (1981) utilized measures of parental income and academic achievement in addition to expectancy variables in predicting post high school career choices.

Vroom's original conception of the model did not necessarily assume across subject comparability. Rather, in line with a more phenomenological approach, the model was conceived as a within subjects model of choice. Motivational force scores derived for each available choice would be calculated for each subject individually. The model predicts that a person will choose that alternative that yields the highest motivational force score. Thus, tests of model effectiveness should more likely entail a hit rate of correct choices for individual subjects or for such subjects totalled, and not necessarily involve measures of correspondence between motivational force scores for one outcome (choice) compared to actual rates of choosing that outcome across all subjects, via a correlation coefficient. Some authors (Kennedy, Fossum, & White, 1983) have noted that although both conceptualizations seem to yield predictive ability, the within subjects approach is more successful.

A third reason for variability in results is that not all researchers actually test or employ the full model. In addition, researchers have examined a variety of ways of combining the original variables stated as important by Vroom. Vroom's (1964) original work offered two separate but related models. The first one predicted motivational force and was as follows:

$$Fi = \sum_{j=1}^{n}(EijVj) \qquad \text{where:}$$

Fi = the force on the individual to perform act i,

Eij = the strength of the expectancy that act i will be followed by outcome j,

Vj = the valence of outcome j,

n = the number of outcomes.

Thus, the motivational force present on an individual to perform any act is related to the sum of the products of the strength of one's expectancy that the act will be followed by attainment of a set of outcomes, and the valences of all of these outcomes.

Expectancies were conceived as an individual's beliefs concerning a subjective probability (ranging from 0 to 1) that one's action would be followed by a specific outcome. There was no theoretical limit set upon the number of outcomes that would be relevant. Anything that the individual might want to attain or avoid could be defined as such, and each outcome's valence was a measure of the strength of one's affective reaction towards it. These values could be positive or negative (with a range between -1 and +1) and might be conceived as levels of anticipated satisfaction or dissatisfaction.

The motivational force equation, then, was to be used to predict which option or choice a person would make when presented with a situation requiring one to choose from several alternative courses of action. Motivational force scores for each act (choice) were to be calculated and the act that corresponded to the highest Fi score was theoretically the one a person would choose to pursue.

Vroom's second model, the valence model, was essentially an elaboration of the Vj term in his motivational force model. It was as follows:

$$Vj = \sum_{k=1}^{n}(VkIjk) \quad \text{where:}$$

Vj = the valence of outcome j,

Ijk = the perceived instrumentality of outcome j to outcome k,

Vk = the valence of outcome k,

n = the number of outcomes.

Thus, the total valence of any outcome is a function of the sum of the products of the person's conception of that outcome's instrumentality for attaining other (secondary) outcomes, and the valences of all of these secondary outcomes.

The instrumentality concept was defined as a belief of the individual, that a particular outcome would correspond or coincide with the occurance or attainment of other secondary outcomes. Its value could range from -1 to +1. Each secondary outcome likewise has its own valence.

This equation then, could be used to predict the total valence for each major outcome considered in the Fi equation, by noting how these outcomes related to more detailed outcomes on their own, and their respective valences. Thus, the two equations could be combined thus:

$$Fi = \sum_{j=1}^{n} [Eij \; (\sum_{k=1}^{n} Vk \; Ijk)]$$

Researchers have taken much latitide in applying these original theoretical outlines to specific situations. As a result, it is no surprise that the degree of successful prediction of behavior varies from study to study. Many researchers only include one of the two equations in their research, and hence only address part of the whole model when making conclusions about the theory's adequacy. In addition, many researchers examine the predictive ability of the various theory's components alone, or in additive combinations, on top of the theory's proposed multiplicative combinations (e.g., Arnold, 1981; Fusilier, Ganster, &

Middelmist, 1984; Lawler & Suttle, 1973; Pulakos & Schmitt, 1983; Shiflett & Cohen, 1980; Wanous, Keon, & Latack, 1983). For instance, some researchers have found that use of single terms alone (i.e., instrumentality) are just as good at predicting as is use of the suggested multiplicative combination (i.e., instrumentality * valence)(Schmitt and Son, 1981; Wanous, Keon, and Latack, 1983). However, others still maintain the multiplicative combination of terms is superior to other means of prediction (Arnold, 1981; Fusilier, Ganster, & Middelmist, 1984) or that the use of a multiplicative or additive model depends upon individual subject differences (Stahl & Harrell, 1981).

Two more reasons that results may differ across studies, regards the way the specific theory components have been operationalized. Although Vroom (1964) conceptualized valences as indicators of one's anticipated satisfaction for specifc outcomes, other operationalizations have been used, including ratings of importance (e.g., Lawler & Porter, 1967), preference (e.g., Galbraith & Cummings, 1967), desirability (e.g., Lawler & Suttle, 1973), or attractiveness (e.g., DeLeo & Pritchard, 1974). The ramifications of these differences in operationalization are not known, although Pecotich and Churchhill (1981) note that measures of Anticipated Satisfaction versus Importance correspond highly.

Vroom's conception of the instrumentality and valence components of the model also calls for them to vary from negative to positive values. Yet, according to Mitchel's (1974) review of the literature, few investigators do. This could lead to serious discrepancies between alternative models' predictions, based on just this scaling difference alone.

> Few investigations have treated [instrumentality] in the manner suggested by Vroom. This is crucial when one realizes that valence measures are also meant to vary from positive to negative. At the two extremes (a Negative Valence * a Negative Instrumentality or a Positive Valence * a Positive Instumentality) we should have the same force. Thus a -3 instrumentality (when scaled from 3 to -3 multiplied by a -3 valence (also scaled from 3 to -3) would produce a force of 9 (the same would be true for a 3 times a 3). However, scoring instrumentality as a probability (let us say from 1 to 7) creates problems because a low score should represent a negative instrumentality. A 1 (instrumentality scored from 1 to 7) times a -3 (valence scored -3 to 3) produces a score of -3 as opposed to a 21, when you have 7 instrumentality times 3 valence. Scoring both instrumentality and valence with all positive numbers does not remove the problem. In this case 1 * 1 = 1, while 7 * 7 = 49.
>
> Empirically, this issue is important. For example, an individual might feel that good performance would detract from the chances that his peers would like him (e.g., an instrumentality of -3) but that he did not want his peers to like him anyway (e.g., a valence of -3). Vroom's model would predict that this IV had as much positive contribution to the overall valence of performance as an IV where an individual thought good performance would contribute to peer attraction (3) and wanted his peers to like him. When either or both instrumentality and valence are scored with only positive scale values, the above extremes produce different forces. The impact of this problem is still unknown since no one to date has compared the predictability of the different procedures (Mitchell, 1974, p. 1064).

Other differences between studies which likely lead to differential predictive ability are the number of outcomes one utilizes in one's equations, whether outcomes are intrinsic or extrinsic, and/or whether they are researcher-provided or self-generated (Mitchell, 1974). There is some evidence however, suggesting that one need not consider large numbers of outcomes in order to maintain predictive ability in one's model (Shiflett & Cohen, 1980).

To conclude, in spite of differences in how the model is specifically conceptualized, its terms operationalized, and its use applied to predict a variety of different behaviors, efforts to behave, or attitudes, it has received substantial support. For instance, Lawler and Suttle (1973) noted a statistically significant expectancy-behavior relationship in 18 out of the 18 studies they reviewed. Wanous, Keon, and Latack (1983) noted similar support for a within subjects conceptualization of expectancy theory in their review of 16 studies. The fact that it does so well under such a variety of conditions and alterations attests to its general robust nature and at least some generally valid theoretical merit.

In addition to this point, several other characteristics of the model suggest its appropriateness as the theoretical basis into which the environmental utility concept will be framed in the present research.

1) Although not fully representative of a phenomenological approach to aesthetic assessment, the model's components lend well to measuring concepts that would relate to individual meaning, e.g., individualized expectations concerning the suitability for a particular environment to support engaging in valued activities, or personalized values involving the importance of participating in various activities.

2) The model, in its original conception as a within subjects model of choice between several alternatives, mirrors some of the philosophical values held by phenomenological theorists, i.e., it allows consideration of individual differences in determining what is meaningful for individuals. Different sets of outcomes (activities) might be considered by different people (a zero valence level means an outcome is non-existent for a particular subject). Persons' past experiences can be incorporated via the expectancy term--which might be conceived as representing knowledge of environmental contingencies.

Thus, the model has as its basis a phenomenological perspective, however, a between subject approach can be utilized to make the model compatible with other theoretical paradigms (i.e., the psychophysical or psychological). This is an important point, since the current research will necessarily be using such an approach in conjunction with its investigation of paradigms that encompass average group behavior (rather than individual) levels of analysis.

3) As the model predicts motivational force rather than actual behavior, it is especially appropriate towards being applied to predict aesthetic response. Such a criterion itself, is not a behavior; in fact, if defined as an attractiveness or "pull towards the environment", aesthetic response is quite conceptually compatible with a predicted motivational force.

Research Model Representing Environmental Utility

Figure 1 outlines the expectancy model utilized in this research. As designed here, the model represents an environmental utility concept that is used to predict aestheic response.

The model is based upon Vroom's (1964) expectancy conceptualization. The motivational potential to act, or force (Fi), is a final value calculated across individuals to predict a criterion. In the current research, this criterion was generally defined as "aesthetic response to natural landscape scenes", that is, one's tendency or force of attraction felt towards an environment. Specifically, two of the most commonly used criteria in environmental aesthetic research were used--personal ratings of preference and of scenic quality for specific landscape scenes.

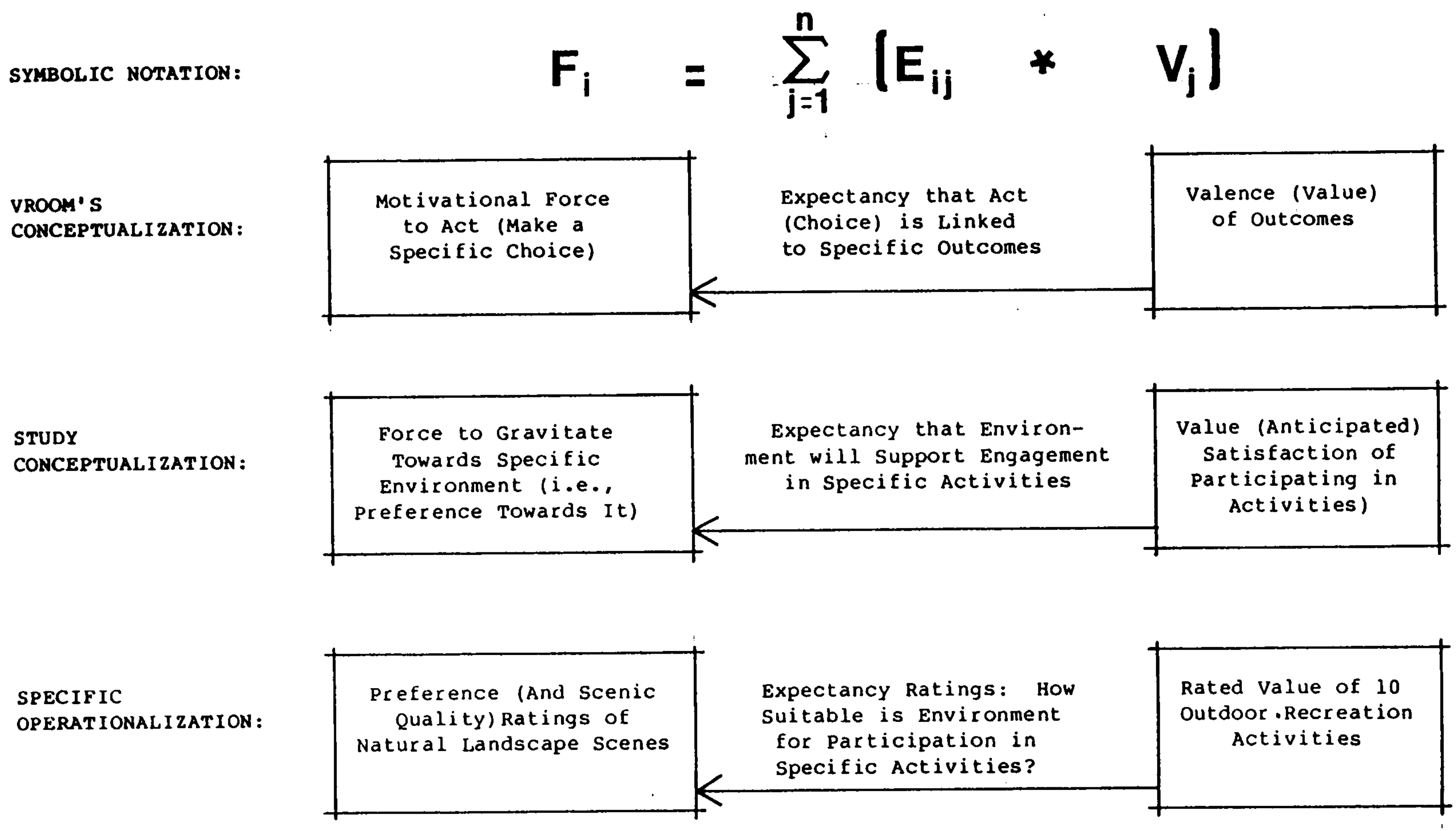

FIGURE 1

EXPECTANCY MODEL DETAILING THE THEORETICAL AND OPERATIONALIZED COMPONENTS OF THE ENVIRONMENTAL UTILITY VARIABLE USED IN THIS RESEARCH

Force is conceived as a function of the sum of expectancies that an act will lead to a specific outcome multiplied by the valences (subjective value) of each respective outcome. In this case, the expectancies were defined as the expectancy or probability that one felt that a specific environment would be able to support successful engagement in several outdoor recreation activities. The valence values were one's personal levels of anticipated satisfaction felt likely received after engagement in these activities. Thus, attraction for an environment (force felt towards it) was envisioned here, in part, as a function of one's estimates of its utility for the individual--in that it would support participating in specific valued (recreational) activities.

Familiarity With the Environment

Lawler (1973) has noted several factors that should affect expectancy values an individual will hold. In addition to the actual situation contingencies, increased communication with others and past experiences with similar situations will allow one to better estimate the so called "true expectancy" value offered by the environment.

Given the current problem, one would expect that those more familiar with an environment would be more aware of the utility of that environment--of what opportunities for activity are possible. The more familiar one is, the more options for action would likely be known, and hence the more likely its attractive force. Individuals less familiar would likely have non-specific expectations or fewer expectations in general, hence a decreased attractive force felt towards such an environment.

As has been explained previously, familiarity with an environment may correspond to higher preference ratings for that environment (Herzog, Kaplan, & Kaplan, 1970; Lyons, 1983) although this relationship may be complex, depending upon how familiarity is defined and/or what environments are examined (Pederson, 1978; Penning-Rowsell, 1979). It has even been questioned in general by others (Wellman & Buhyoff, 1980). If empirically demonstrated here, its relationship to a utility analysis of the environment (via an expectancy model) may shed some light on why it is important. In addition, any differential relationships noted between it and scenic beauty versus preference ratings would further delineate the meanings carried by these two aestheic criteria.

Research Hypotheses

In general, this research investigates the degrees of correspondence between types of variables, more so than it concerns itself with the testing of specific hypotheses. However, some general notions are offered here, phrased as hypotheses. As such, they may guide the reader toward the kinds of research questions that will be examined.

1) There will be a high degree of correspondence between ratings depicting a landscape's "scenic quality" and "preference value".

2) Since preference ratings (conceptually) should be influenced more by associational factors not directly related to aesthetic quality than should ratings of scenic quality, such preference ratings will be more variable (i.e., exhibit larger variances).

3) Given that preference and scenic quality ratings may be measuring similar yet not identical landscape aesthetic qualities, the extent and nature of their correspondence will be partially revealed by examining how they differentially relate to major types of predictor variables--physical, transactional, and individual differences.

4) Given that some authors view aesthetic quality mainly as a function of an environment's visual elements alone (and not by various associational elements), and that scenic quality ratings should be, by definition, a closer approximation of measuring such "aesthetic qualities" than preference ratings, those variables that conceptually tap

individual differences between viewers, i.e., "familiarity" and "environmental utility" will correspond less highly to such scenic quality ratings than to preference ratings.

5a) When comparing the predictive utility of physical, transactional, and individual difference variables in general, those that are the most parsimonious will be the most predictive (i.e., "physical", followed by "transactional" (abstract concepts), followed by "individual differences" (theory derived)).

5b) Since these variable types are derived from different philosophical paradigms, to the extent that they are measuring different aspects of a similar phenomenon (natural landscape aesthetic perception), their combined predictive ability will significantly pass that of any one type's individual predictability.

6) Given that the various individual transactional variables differ conceptually amongst themselves, the patterns and degree to which physical variables correspond to them will also differ.

7a) According to expectancy theory, the environmental utility score (Fi) will be more predictive of environmental preferences than will be any of the individual components making up this score (i.e., environmental suitability (Eij) or outcome importance (Vj) scores).

7b) According to expectancy theory, the environmental utility scores will be better predictors of environmental preference if the outcome importance (Vj) components of the model utilize both positive and negative values, rather than just positive ones.

8a) Within the framework of an expectancy model, familiarity with the environment will be indirectly related to environmental utility (Fi) through its relationship with the environmental suitability component (Eij), more so than with the outcome importance component (Vj).

8b) More familiar environments will have higher environmental utility (Fi) scores than those less familiar, since they correspond to settings where people are more aware of potential environmental opportunities for action (number of outcome options) and have higher Eij values (environment-behavior suitability expectations).

8c) Those settings higher in familiarity will collectively display lower variances in their environmental suitability scores (Eij) for each recreation behavior examined than those low in familiarity.

METHOD

As a short review, the research proposed here had several main emphases.

1) One emphasis concerned investigation of whether an environmental utility variable was predictive of aesthetic response. This variable was conceptualized under an expectancy model approach. Specifically, Vroom's motivational force equation was tested, where the relationship between one's attractiveness to a particular environment was conceived in part as a function of what recreational activities one might believe the environment could support, and of the inherent value to the individual, to participate in such activities.

2) In addition, the relative predictive ability of transactional and physical variables alone and in coordination with utility measures was examined.

3) The study also offered investigation of the degree of correspondence between two types of scenic quality ratings. Any differential patterns of predictive correlates found, would aid in further outlining a conceptual distinction between these two.

4) Finally, the effects of familiarity with an environment was examined relative to aesthetic response--as a moderator variable that might differentially affect one's

expectancies of possible behavior (activities) allowed within an environment.

Subjects

Subjects were 354 undergraduate students (155 males and 199 females) who were enrolled at Virginia Polytechnic Institute and State University during the Fall, 1985 quarter. The subjects ranged in age between 17-22 years ($\bar{X}$=18.5). Most were either Freshmen or Sophomores (93%), and they represented a broad range of majors typical of the large university setting. Subjects received extra credit points towards their final grade in an introductory psychology course for participating in the research. Previous research has demonstrated that visual preference ratings for natural landscapes for subject groups such as these are representative of the general public (Buhyoff & Leuscher, 1978; Schroeder & Daniel, 1981).

Environmental Stimuli

A set of 60 color slides of outdoor western United States landscape scenes was used to represent natural settings from which subjects' aesthetic responses were obtained. The specific slides selected were part of a larger set of 100 slides that had been used in a pilot study. The scenes depicted a variety of topographical and vegetative landtypes, viewed from both panoramic and immediate perspectives.

Based upon data obtained through the pilot study, the 60 slides were chosen to yield a final set representing a wide range of average scenic quality and preference values. Subjects viewed the slides projected on a white screen in a large semi-darkened room. The image size was approximately 4 by 6 feet.

Since when conducting analyses, the main unit of analysis (n) for this type of research is the particular set of slides rated, and not subjects, not every subject rated every slide. Rather, groups of approximately 20-25 subjects each (X=22, sd=5) rated subsets of 15 slides. In this manner, stable average ratings were obtained for each slide for the variables being investigated. Due to the extent of information collected from each subject, providing ratings for more than 15 slides at one time would have led to considerable subject fatigue.

The 60 different slides used in the study were broken down into 4 groups of 15 slides each. An attempt was made to include an equal proportion of slides representing different biome types in each slide group. In addition, pilot data indicating the slides' average scenic quality rating were utilized to compose groups that were near equivalent on this dependent variable. Thus, 4 semi-equivalent slide groups were developed.*

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*Descriptive statistics for the 4 slide groups developed were as follows: Group 1(X=3.53, sd=.91); Group 2(X=3.52, Each of these groups was, in turn, rated by 4 different subject groups, such that a total of 16 individual subject groups existed, with each slide receiving an approximately equal number of ratings (X=88.5, sd=6.2). Each time a slide group was rated, the slides were presented in a different random order, and the order of the rating questions was altered via a Latin Square design, such that each of 4 major question groups appeared only once in each of the 4 possible order positions across the 4 groups rating each slide group (see Figure 2). With such a design applied to each of the 4 different slide groups, a total of 16 subject groups existed.

Procedure

Subjects were handed a questionnaire and rating scale packet (see Appendix A) and were then read the following introduction:

> We are doing some pilot research in the area of the psychological importance of specific environmental settings and how they relate to various recreation opportunities. This type of work is important for those involved with recreation planning and management. If such relationships exist, then we might specify what types of features are required for specific activities, and then plan and provide for them better, depending upon what opportunities we wish to offer. For the purposes of this study we'll be dealing with only some outdoor recreation activities/opportunities. We'll be asking you to make some ratings about how you personally feel about certain activities, and others about your beliefs concerning how some environments may

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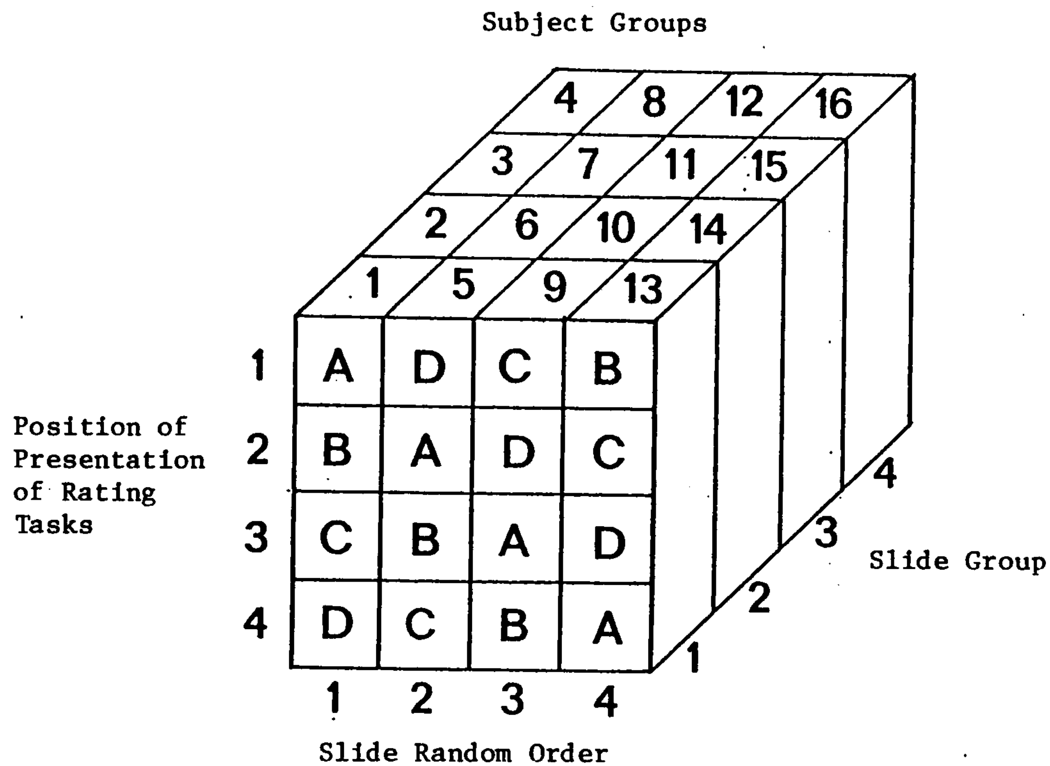
sd=.91); Group 3(X=3.54, sd=.92); Group 4(X=3.54, sd=.91). The scenic quality ratings were made on 7-point scales.



<u>**FIGURE 2**</u>

GRAPHIC REPRESENTATION OF RESEARCH DESIGN

Each of four near equivalent slide groups (n = 15 slides each) were rated in four different random orders of (slide) presentation. Each random order was also accompanied by a different order of presentation of the four rating task sections: A - Activity Satisfaction Ratings; B - Familiarity Ratings; C - Utility Ratings, and D - Environmental Attribute Ratings. Thus, 16 total (indepdendent) groups of subjects were involved (average n per group = 22; total N = 354).

> support certain activities better than others. We'll also ask you to make some judgements about certain features of the environment as well. In all cases, the judgements you will be making are straightforward and involve no deception. You should answer them as truthfully as possible and to the best of your knowledge.

After signing a form of informed consent (see Appendix A), the subjects proceeded to work their way through the specific questions and tasks contained in the questionnaire/ rating scale packet. Subjects completed each of four sections of the packet in unison; the researcher waited until everyone had completed section A before proceeding further.

Three of the sections required ratings relative to accompanying slides. At the start of each new section, the experimenter would read instructions for that particular rating task and answer any questions subjects asked. Slides were presented for approximately 40 seconds each during the familiarity rating task, 90 seconds each for the utility ratings section, and 90 seconds each for the environmental characteristic rating questions. The researcher waited until all subjects had made appropriate ratings before proceding to the next slide. Subjects marked their responses directly on computer opscan sheets. In order to avoid confusion in marking these responses, at the presentation of each new slide, announcements were made regarding which specific numbers subjects should be filling out on their sheets at that time. Subjects were given a short 5-10 minute break, usually following completion of the third section, before completing the fourth.

The specific instructions for each section of the questionnaire in one of the orders of presentation were as follows:

Section A: Ratings of 10 Outdoor Activities

The following list represents a series of activities that one might be able to participate in, in an outdoor recreational setting:

1--Backpacking/Hiking	6--Horseback Riding
2--Camping	7--Motorcycle (Trail) Riding
3--Canoeing/Kayaking	8--Photography
4--Hunting	9--Bird Watching/Nature Study
5--Fishing	10--Mountain Climbing

You may or may not have participated in such activities before, but in either case we would like you to estimate for each activity in turn, how much you might value participating in them.

Use the scale provided here to make your estimates of how much expected satisfaction or dissatisfaction you would derive from participating in each of these activities, given an ideal setting and conditions. Mark your ratings on the opscan sheet provided. The experimenter will instruct you as to which rows on the opscan should be used for these ratings. Are there any questions?

I-----Dissatisfaction-----I I-------Satisfaction------I

1______2______3______4______5______6______7______8______9

High — Moderate — Don't Know or Neutral — Moderate — High

When you have completed making your ratings, please wait for further instructions from the experimenter before proceeding.

Section B: Familiarity Ratings

You will soon be viewing a series of slides representing different types of environments. We would like to get an idea of how familiar or knowledgeable you are with each of these sample environments. Since this can be conceived in several ways, for each slide shown, we would like you to answer the following three questions related to familiarity:

1) I have lived in or near to this type of environment.

1______2______3______4______5______6______7
Never — A Fair Amount of My Life — All of My Life

2) I have visited or have made trips to this type of environment.

1______2______3______4______5______6______7
Never — A Few Times — Quite Often

3) I have knowledge of this type of environment through my reading of books or magazines, watching films or television, or through friends and/or relatives.

1______2______3______4______5______6______7
No Knowledge — Some Knowledge — Very Knowledgeable

For each slide, make your ratings in the order that these questions have been presented, on the opscan sheet provided. The experimenter will announce to you which rows on the opscan should correspond to ratings for each presented slide. Are there any questions?

Section C: Utility Ratings

You will soon be shown a set of slides representing different types of environments. For each slide presented, we would like you to rate how much you feel that the specific environment shown would allow or support participation in each of 10 different activities that one might engage in, in an outdoor recreational setting.

Use the scale provided below in making these ten ratings for each slide presented. Remember, this has nothing to do with whether you would like to participate or not. Rather, it is a judgement based on whatever knowledge you might have, as to how well you would expect the environment to support that activity (or how successful one might be able to engage in the activity in that particular environment).

How suitable and/or supportive would this environment be for [activity]?

Activities:

1--Backpacking/Hiking
2--Camping
3--Canoeing/Kayaking
4--Hunting
5--Fishing
6--Horseback Riding
7--Motorcycle (Trail) Riding
8--Photography
9--Bird Watching/Nature Study
10--Mountain Climbing

1	2	3	4	5	6	7
Not at All Suitable			Moderately Suitable			Extremely Suitable

Please mark your opscan sheets in the order in which these 10 activities are listed above. The experimenter will announce to you which opscan numbers you should be marking for each slide presented. Are there any questions?

Section D: Environmental Ratings

You will shortly be viewing a series of slides that represent different types of environments. We would like from you, some ratings that reflect various characteristics of these environmental scenes. In doing this we will use some concepts that stem from fields related to landscape architecture and forest management. For each slide presented we would like you to rate the scene on the following characteristics: Scenic Quality, Complexity, Congruity, Mystery, Novelty, Spatial Enclosure, and Preference.

Some of these measures are more subjective than others, (e.g., preference) and are meant to be so; others may seem to be somewhat confusing or subjective, but past research has shown that they can be quite reliable and useful given that they are derived from enough subjects.

For the purposes of this study you should use the following definitions when making your ratings:

Scenic Quality--The overall aesthetic quality of the scene; its general beauty.

Complexity--The diversity of the scene in terms of the number of perceptually distinct elements present. The greater the number and more varied the elements in the scene, the greater its complexity.

Congruity--The degree of harmony, fittingness, and compatability evident in the interrelation of the scene's elements. The more a scene's elements seem to interrelate, go together, or form a comprehensible pattern, the greater the scene's congruity.

Mystery--The degree of alluring uncertainty projected by the scene, as if more information could be obtained from deeper exploration of it. Is everything contained in the landscape evident from one's current perspective, or could one better comprehend it by "walking into it" for further exploration? The more a scene promises additional information as a result of such exploration, the greater the mystery of the scene.

Novelty--The degree to which the scene or its elements are novel, unexpected, or surprising. The greater a scene's uniqueness, the greater its novelty.

Spatial Enclosure--The extent of surrounding enclosure found in a scene. The more enclosed one's view (due to vertical topographic and vegetative elements), the greater a scene's spatial enclosure. Conversely, the more open a scene is; the less covered, encompassed, or obstructed one's view, the lesser the spatial enclosure of the scene.

Preference--The degree to which you like or are attracted to the scene; your general preference towards it.

In general, there are no explicit standards for making these ratings. You must use your own judgement. For each scene shown, rate it on each of these seven characteristics, using the following 7-point scales, in the order in which they are presented here. Record your ratings on the computer opscan rating sheet provided. The experimenter will instruct you as to which numbers on the sheet should correspond to the ratings for the current slide being viewed.

Rate each slide on the following scales:

1______2______3______4______5______6______7

Very Low Scenic Quality — Moderate Scenic Quality — Very High Scenic Quality

1______2______3______4______5______6______7

Very Low Complexity — Moderate Complexity — Very High Complexity

1______2______3______4______5______6______7

Very Low Congruity — Moderate Congruity — Very High Congruity

1______2______3______4______5______6______7

Very Low Mystery — Moderate Mystery — Very High Mystery

1______2______3______4______5______6______7

Very Low Novelty — Moderate Novelty — Very High Novelty

1______2______3______4______5______6______7

Very Low Spacial Enclosure (High Openness) — Moderate Spacial Enclosure — Very High Spacial Enclosure

1______2______3______4______5______6______7

Very Low Preference — Moderate Preference — Very High Preference

You will be given as much time as necessary to complete these ratings. Are there any questions? Does anyone need some redefinition as to what these terms mean?

Measurement of Physical Features of Slides

In order to obtain objective measurements of the various physical characteristics featured within each slide, a category scheme was first developed describing several landscape features. Fifteen such features were identified. These included the areas of: exposed rock, soil and/or gravel, water, man-made modifications, trees, grass, scrub brush, shrubs, mixed scrub brush and grass, sky, clouds, flat topography, hilly topography, mountainous topography, and finally, "other" (unidentifiable) vegetative features. Specific definitions of these features can be found in Appendix B.

A simplified linear representation of each slide was next obtained by projecting the slide onto a wall and tracing the boundaries of each of these features onto a large 18 by 24 inch sheet of paper. Features were traced using different color coded pencils such that one could easily distinguish overlapping features, like topographies, from rock, water, and/or vegetation areas. Each specific area was also immediately coded with a numerical identification.

Later, the area that each one of these features held was measured with the aid of a numonics digitizer. With such, a stylus on an electronic sliding arm was used to trace the outlines of the respective landscape features for each slide's linear representation, recording plotted points in space as the tracing was made. The digitizer used these points as the basis for calculating an output measure in units of total square inches of the area traced.

For those areas' features that were located in numerous spots on a photograph, total areas were added together within each photograph. Since all of the photographs had been projected and traced in the same size, relative measures of total square inches of a particular landscape feature across different slides was directly comparable.

RESULTS

Data Orgаnaization: Raw subject data were collapsed by obtaining the mean value for each variable rated, for each of the 60 slides in the study. In this manner, each data point for variables whose value had been obtained from subject ratings was based on an average of 88.5 individual ratings across all 60 slides. Hence, "true" score values of each scene's relative complexity, spatial enclosure, familiarity, utility for camping, utility for hunting, etc. were obtained.

To this data for each slide was added numbers representing the relative amount of area of the slide that was classified as belonging to any of the 15 physical variable categories. Most of the subsequent analyses examined used this data set as opposed to the raw subject data. Hence, the n for most analyses equaled 60, and there were 35 variables per observation (slide).

The following results are organized under the headings of those "hypotheses" previously presented spanning pages 61-64.

Hypothesis 1 --Degree of Correspondence between Aesthetic Criteria

As hypothesized, the two aesthetic criteria measured were highly correlated. Average subject scenic quality ratings and preference ratings were nearly identical across the 60 slides ($r=.98$).

Hypothesis 2 --Proposed Differences between Aesthetic Criteria via Descriptive Statistics

Although the aesthetic measures appear nearly identical, subtle differences exist between the two. For instance, a paired comparison t-test indicated that scenic quality (SQ) ratings are on average higher than those corresponding preference ratings for scenes ($t=10.31$, $p < .001$).

In addition, as hypothesized, the preference ratings were more variable than the SQ ratings. The variances of the average preference ratings across slides were higher than were the variances for the average SQ ratings ($t=7.80$, $p < .001$).

Hypotheses 3 & 4 --Differences in Aesthetic Criteria via Differential Correspondence to Outside Variables

Another means of distinguishing between variables, especially if they are to be used as concept criteria, is to note how they differentially relate to other theoretically important variables. When the average SQ and preference scores were correlated with the scenes' physical characteristics, average transactional variable, familiarity, and utility ratings, very similar coefficients were obtained between SQ ratings, preference ratings and the respective third variables (see Table 1).

Two approaches were taken to examine the extent of their relationship further. First, multivariate regression models were developed where SQ and preference scores were two dependent variables, regressed on each of the single 33 predictors in turn. Tests of significance (using Wilk's Lambda) were run to examine whether the dependent variables SQ and Preference could be fit to these same regressors.

Table 2 lists the multivariate test statistic results. A quick glance at the F values here indicates that even though the two criteria are highly correlated themselves, and appear to correlate similarly with most of this study's predictors, statistically significant differences exist between the degree to which the two criteria relate to most of the predictors. This is not surprising.

TABLE 1

CORRELATIONS OF 33 STUDY PREDICTORS WITH
TWO AESTHETIC QUALITY CRITERIA: SCENIC QUALITY & PREFERENCE

	Scenic Quality	Preference
Physical Features:		
Rock	.27*	.27*
Soil	-.39**	-.39**
Water	.30*	.30*
Man-Modifications	-.17	-.16
Sky	-.07	-.15
Clouds	.08	.08
Trees	.54**	.57**
Grass	-.22	-.24
Shrubs	-.17	-.11
Scrub Brush	-.44**	-.48**
Mixed Scrub/Grass	-.24	-.26*
Flat Topography	-.09	-.02
Hilly Topography	-.07	-.10
Mtn. Topography	.26*	.25
"Other" Vegetation	.00	.08
Transactional Variables:		
Complexity	.79**	.78**
Congruity	.67**	.74**
Mystery	.73**	.80**
Novelty	.81**	.82**
Spatial Enclosure	.47**	.55**

	Scenic Quality	Preference
Familiarity:		
Residential	.44**	.52**
Travel	.60**	.66**
Indirect	.67**	.72**
"Composite"	.58**	.65**
Environmental Utility (Suitability for Activity):		
Hiking	.70**	.73**
Camping	.84**	.85**
Canoeing/Kayaking	.49**	.51**
Hunting	.73**	.77**
Fishing	.49**	.52**
Horseback Riding	.06	.05
Motorcycle (Trail) Riding	-.50**	-.51**
Photography	.95**	.93**
Bird Watching/ Nature Study	.76**	.78**
Mountain Climbing	.53**	.46**

*p < .05
**p < .01

TABLE 2

MULTIVARIATE TEST RESULTS COMPARING PREDICTOR PARAMETER VALUES OF TWO CRITERIA EQUATIONS: SCENIC QUALITY & PREFERENCE

Equation Tested	Wilk's Lambda Value	F	Prob. > F
Physical Feature Models:			
Rock	.9907	.544	.464
Soil	.9753	1.469	.230
Water	.9755	1.455	.233
Man-Modifications	.9997	.015	.904
Sky	.8382	11.193	.001*
Clouds	.9963	.213	.646
Trees	.8652	9.034	.004*
Grass	.9644	2.139	.149
Shrubs	.9646	2.130	.150
Scrub Brush	.8430	10.799	.001*
Mixed Scrub/Grass	.9461	3.306	.074
Flat Topography	.9032	6.216	.016*
Hilly Topography	.9676	1.941	.169
Mountainous Topography	.9979	.122	.728
"Other" Vegetation	.8518	10.090	.002*
Transactional Variable Models:			
Complexity	.9151	5.384	.024*
Congruity	.6213	35.350	.001*
Mystery	.6075	37.473	.001*
Novelty	.8480	10.397	.002*
Spatial Enclosure	.6202	35.515	.001*
Familiarity Models:			
Residential	.6847	26.704	.001*
Travel	.6995	24.921	.001*
Indirect	.6837	26.828	.001*
Environmental Utility Models:			
Hiking	.8026	14.267	.001*
Camping	.8225	12.517	.001*
Canoeing/Kayaking	.9047	6.111	.016*
Hunting	.7268	21.803	.001*
Fishing	.8919	7.027	.010*
Horseback Riding	1.0000	.0003	.987
Motorcycle Riding	.9370	3.901	.053
Photography	.8882	7.299	.009*
Bird Watching/Nature Study	.7941	15.040	.001*
Mountain Climbing	.9881	.701	.406

*p < .05

What is perhaps more surprising is that for one category of predictors--the physical characteristics of the setting, statistically significant differences beteen the criteria were often not noted. In fact, 10 of the 15 physical variable predictors behaved similarly to preference and SQ. In contrast, other types of predictors may differentially relate to these two environmental aesthetic criteria. For the most part, significant differences were noted between predictor/criterion relationships when the predictors were familiarity, utility, or transactional variable ratings.

Of interest besides the fact that there were differences is to note the direction of difference; that is, which predictors were more highly related to preference, and which were more highly related to to scenic quality ratings. With the physical predictors, for the most part, significant differences in correlations did not exist between the two criteria. With the transactional, familiarity, and utility variables however, significant differences occured in 15 out of 18 cases, and in all of these instances except one (environmental utility for photography), it was the preference related correlation that was stronger, as hypothesized.

A second approach was also taken in examining the apparent differences between respective predictive correlates. In this case an effort was made to determine to what extent the overall "pattern" between correlates of SQ and prefernce were similar. Rank orders of the correlation coefficients were established from those of the highest positive value down to zero and continuing up through those of the highest negative value. This was done for all correlation coefficients involving SQ and the 33 predictors, and for all the coefficients between preference and the 33 predictors. A Spearman rho correlation was then calculated between these two sets of rankings, indicating how similar the correlate patterns between each criterion and the whole set of predictors were. The resulting correlation of .99 indicates a nearly identical correlate pattern exists between the criteria.

<u>Hypothesis 5</u> --Relationship of Scenic Quality to Proposed Predictors

Table 1 lists the correlations between the two criteria of aesthetic quality and all 33 predictor variables. Most of these are highly related to scenic quality, indicating selection of a potentially very useful set of predictors. (Tables 3 and 4 contain intercorrelation matrices of these predictor variables.)

TABLE 3

CORRELATION MATRIX OF PHYSICAL FEATURE PREDICTORS AGAINST TRANSACTIONAL, FAMILIARITY, AND UTILITY VARIABLE PREDICTORS

	Complexity	Congruity	Mystery	Novelty	Spatial Enclosure	Residential Familiarity	Travel Familiarity	Indirect Familiarity	Hiking	Camping	Canoeing/ Kayaking	Hunting	Fishing	Horseback Riding	Motorcycle (Trail) Riding	Photography	Bird Watching/ Nature Study	Mountain Climbing
Rock	.37**	.11	.26*	.43**	.20	-.07	.02	-.02	.18	.15	.29*	.07	.27*	-.14	-.22	.27*	.10	.21
Soil	-.37**	-.32**	-.35**	-.21	-.34**	-.41**	-.49**	-.46**	-.45**	-.50**	-.22	-.57**	-.24	-.16	.31*	-.44**	-.57**	-.17
Water	.17	.23	.23	.24	.11	.18	.29*	.28*	-.03	.14	.82**	.20	.79**	-.41**	-.46**	.23	.12	-.14
Man-Modifications	-.04	-.20	-.10	-.13	.00	.14	.11	.08	.02	.00	-.09	-.01	-.09	.11	.10	-.17	-.05	-.15
Sky	-.24	-.30*	-.37**	-.23	-.58**	-.37**	-.33**	-.26*	-.34**	-.21	-.29*	-.29*	-.29*	.17	.20	-.11	-.29*	.21
Clouds	-.03	.09	.00	.01	-.13	-.17	-.12	-.08	-.09	-.02	.00	-.03	-.02	-.01	-.03	.01	-.06	.14
Trees	.58**	.47**	.63**	.46**	.69**	.60**	.64**	.64**	.74**	.65**	.08	.73**	.11	-.08	-.40**	.59**	.75**	.33**
Grass	-.42**	-.11	-.47**	-.51**	-.40**	-.04	-.07	-.10	-.22	-.09	-.22	-.04	-.18	.41**	.19	-.28*	-.14	-.31**
Shrubs	.05	-.05	.22	.00	.27*	.13	.11	.04	.14	-.03	.07	.13	.05	-.02	.00	-.04	.17	-.09
Scrub Brush	-.17	-.38**	-.40**	-.24	-.34**	-.50**	-.56**	-.54**	-.41**	-.42**	-.21	-.54**	-.24	-.02	.35**	-.39**	-.47**	-.12
Mixed Scrub/Grass	-.30*	-.10	-.26*	-.15	-.24	-.36**	-.42**	-.40**	-.36**	-.36**	-.17	-.44**	-.18	-.06	.21	-.28*	-.42**	.04
Flat Topography	-.15	.11	-.05	-.13	.03	.26*	.13	.17	-.19	-.01	.28*	.03	.30*	.19	.14	-.14	-.07	-.64**
Hilly Topography	.13	-.10	.02	.02	.12	.02	.08	-.01	.24	.03	-.04	.07	-.06	-.14	-.09	-.01	.09	.18
Mtn. Topography	.21	.18	.28*	.31*	.19	-.14	-.07	-.06	.19	.11	-.15	.07	-.16	-.21	-.22	.28*	.17	.54**
"Other" Vegetation	.02	.17	.23	.15	.29*	.19	.09	.13	.14	.01	-.09	-.06	-.11	.11	.16	.04	.02	-.08

*p < .05
**p < .01

TABLE 4

INTER-CORRELATION MATRIX: TRANSACTIONAL, FAMILIARITY, AND UTILITY VARIABLE PREDICTORS

	Complexity	Congruity	Mystery	Novelty	Spatial Enclosure	Residential Familiarity	Travel Familiarity	Indirect Familiarity	Hiking	Camping	Canoeing/ Kayaking	Hunting	Fishing	Horseback Riding	Motorcycle (Trail) Riding	Photography	Bird Watching/ Nature Study	Mountain Climbing
Complexity	1.00																	
Congruity	.36	1.00																
Mystery	.78	.59	1.00															
Novelty	.87	.41	.84	1.00														
Spatial Enclosure	.63	.46	.88	.62	1.00													
Residential	.36	.59	.59	.26	.66	1.00												
Travel	.53	.62	.69	.41	.70	.94	1.00											
Indirect	.54	.67	.68	.43	.66	.91	.97	1.00										
Hiking	.82	.48	.80	.68	.80	.63	.74	.72	1.00									
Camping	.80	.57	.74	.68	.63	.63	.76	.78	.89	1.00								
Canoeing/Kayaking	.34	.42	.40	.42	.24	.29	.40	.41	.16	.35	1.00							
Hunting	.69	.61	.78	.58	.73	.77	.87	.85	.83	.89	.44	1.00						
Fishing	.35	.44	.41	.43	.27	.34	.44	.45	.18	.39	.98	.49	1.00					
Horseback Riding	.02	.03	-.12	-.13	-.14	.06	.04	.08	.16	.30	-.33	.06	-.31	1.00				
Motorcycle Riding	-.41	-.34	-.52	-.49	-.44	-.38	-.47	-.43	-.37	-.36	-.54	-.55	-.54	.68	1.00			
Photography	.83	.62	.80	.81	.57	.49	.63	.68	.78	.86	.43	.77	.45	.05	-.52	1.00		
Bird Watching	.75	.59	.83	.65	.77	.73	.82	.80	.88	.87	.34	.95	.38	.03	-.57	.85	1.00	
Mountain Climbing	.59	.06	.40	.57	.24	-.18	.02	.05	.50	.42	-.11	.24	-.14	-.08	-.28	.57	.36	1.00

Note: $p < .05$ if $\geq .26$

$p < .01$ if $\geq .32$

Contrary to what was hypothesized, the physical characteristics of the environment were, by themselves, least related to scenic quality. Only 6 out of 15 of these correlations were significantly different from zero ($p < .05$). Specifically, SQ was positively related to the presence of water, bare rock formations, trees, and mountainous topography ($r=.30$, $r=.27$, $r=.54$, $r=.26$, respectively). Bare ground cover (i.e., soil) and scrub brush vegetation were significantly negatively related to perceived SQ ($r=-.39$, & $r=-.44$, respectively).

All five transactional variables were highly related to SQ ($p < .001$). The relative spacial enclosure of a setting was least predictive ($r=.47$) followed by a setting's congruity ($r=.67$). Mystery ($r=.73$), complexity ($r=.79$), and environmental novelty ($r=.81$) were more highly correlated.

The familiarity of the setting to those viewing was also significantly related ($p < .001$) to perceived scenic beauty. The three individual familiarity ratings had correlations with SQ ranging from .44 to .67. A linear composite measure of these three yielded a correlation of .58.

Finally, environmental utility was also highly correlated with rated sceinic quality. Utility was defined here as the degree to which a setting could support participating in a specific kind of outdoor recreational activity. All but one of these utility ratings yielded significant correlations with SQ ($p < .001$). The lowest of these were environmental canoeing and environmental fishing suitabilities, both with r's=.49. The most highly related was environmental suitabiltiy for photography (r=.95) which is intuitively pleasing. One would assume a setting's suitability for or support of such an activity would be dependent in large part upon how aesthetically pleasing the setting was. Other utility ratings corresponding to environmental suitability for hiking, camping, hunting, bird watching, and mountain climbing were also highly correlated with scenic quality and displayed correlations ranging from .53 to .84. Only one activity's environmental suitability was negatively related to scenic quality--motorcycle (trail) riding (r=-.50).

In addition to examining bivariate correlation coefficients, an attempt was made to develop several regression equations that would both enhance the variance accounted for in the criterion--scenic quality, beyond that which would be obtained from use of single variables alone, and also aid in describing what characteristics of the environment itself were important in determining the aesthetic response. The first objective merely relates to predictive ability without any regard for examining the individual terms which make up the equation itself. The second however, involves examination of these terms in an attempt to explain how they, as a group, affect the scenic quality response.

Since detailed explanation of any single regression equation as the definitve answer to what predictors are important in determining the criterion is risky, especially when one is dealing with numerous potential variables for inclusion into the "final" equation, no single equations are presented here. Rather, a "family" of equations are presented that represent various solutions to the problem of yielding models with the highest R-Squares, that have the most stable beta weights, and overall highest predicted R-Squares. With a number of different variables available, one may also uncover equally predictive models containing different conceptual sets of variables. Considering a number of models is thus theoretically more compatible with the exporatory/explanatory approach of this research, especially given no predetermined theoretical reason for choosing one model over another if they are equally predictive.

A several stage process was utilized in searching for the "best" predictive and descriptive models for aesthetic response from the data. First, an all possible regressions strategy was initiated in order to generate potential models to be examined for further investigation. Each generated model was then examined on the basis of R-Square values, Mallow's Cp statistic, and the number of predictors (p) it contained.

Models that generally had R-Squares > .50, a (Cp - p) value close to 1 (10 to -5), and 5 or fewer predictors, were designated for more detailed analysis. Mallow's Cp statistic is a tool that can aid in selection of a "best" possible subset of variables to be used in a regression equation given a theoretically based "full" model. The closer the Cp - p values are to 1; the better a particular subset model (i.e., a model with fewer predictors than are contained in the full model) represents the full model in predictive ability. Also, the less likely biased are the model estimates.

Obviously, different Cp values indicating a potential "good" equation will differ depending upon what one's specified full model is. Hence, some theoretical guidelines must be used in designating the full model. For the purposes of this research, six different full models were initially specified based upon conceptual distinctions among the various predictors. Thus, an attempt was made to look for the best predictive equations describing SQ in terms of 1) physical characteristics of the environment alone (15 variable full model); 2) transactional variables alone (5 variable full model); 3) environmental familiarity alone (3 variable full model); and 4) environmental utility alone (10 variable full model). In addition, several composite variable full models were designated for: 5) all of those variables requiring human ratings (18 variable and 7 variable full models) and 6) all possible predictors measured for this research (a 33 variable full model).

In the instances where many possible subset models met the requirements for further investigation, a limit of approximately 10 of the best were selected per full model, based on highest R-Square, (Cp - p)'s closest to 1, and intuitive judgements of those models containing variables that appeared important in smaller p subset equations. In this manner, a total 37 specific regression models were selected for more detailed examination.

At this stage additional diagnostic information was gathered and examined for each equation, including the equation's overall F value, R-Square, predicted R-Square (R^2p--a derivative from each observation's PRESS*), individual significance levels for each term (predictor) in the equation, term VIF's (Variance Inflation Factor)--a measure of relative predictor multicolinearity, Studentized residuals, h-hat statistics (an indicator of individual observation's leverage of the equation), and partial regression residual plots for each predictor.

Equations with high VIF's (indicating multicolinearity of the predictors, and likely biased estimates), or non-significant individual terms ($p > .10$), were dropped. Examination of the studentized residuals and h statistics indicated no individual observations (slides) that were both exhibiting extreme leverage on the final equations ($h > 2p/n$) and were doing so as outlyers (studentized residual > 2.5).

The most parsimonious solutions to this quest were favored, i.e., models with fewer predictors were selected for final reporting over those with a greater

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*The PRESS (prediction error sum of squares) statistic is the cummulative residual total based on eliminating a particular model N times and can be used for predictive validation of regression models. Predicted R-Square= 1-(PRESS/SStot) (Montgomery & Peck, 1982).

number. Those with more predictors were only included if the increase in R-Square or predicted R-Square value was statisticaly significant ($p < .05$).

A family of 4 models describing perceived environmental scenic quality as a function of physical characteristics were ultimately selected for presentation here (see Table 5). These four models are:

1) SQ= f(Soil, Grass, Shrubs, Scrub)
2) SQ= f(Rock, Water, Sky, Trees)
3) SQ= f(Soil, Grass, Shrubs, Scrub, Man Modifications)
4) SQ= f(Rock, Water, Sky, Trees, Other Vegetation)

In general, the predicted R-Squares were fairly high for all 4 models, accounting for approximately 50% of the variance. All 18 individual regressor coefficients were satistically significant ($p < .001$) and corresponding VIF's very low--indicants of models with stable parameters. One notes the importance of utilizing a family approach of all multiple regressions in generating the models, in that two equally predictive and stable base models were located, neither of which contained any identical terms. These two models apparently tap two distinct types of relationships between perceived SQ and an environment's

TABLE 5

REGRESSION MODELS PREDICTING SQ RATINGS: PHYSICAL FEATURE PREDICTOR MODELS

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
1	.57	18.291	78.914	3.68	40.524	.49	Intercept	4.8825	.001		
		(p < .001)					Soil	-.0104	.001	-.4390	1.169
							Grass	-.0084	.001	-.5092	1.162
							Shrubs	-.0106	.001	-.3900	1.096
							Scrub	-.0146	.001	-.4997	1.164
2	.55	16.913	78.914	6.28	41.650	.47	Intercept	1.6387	.001		
		(p < .001)					Rock	.0113	.001	.3519	1.137
							Water	.0090	.001	.3628	1.069
							Sky	.0082	.001	.3635	1.362
							Trees	.0091	.001	.6906	1.186
3	.62	17.601	78.914	-1.89	37.843	.52	Intercept	4.9521	.001		
		(p < .001)					Soil	-.0108	.001	-.4551	1.174
							Grass	-.0086	.001	-.5218	1.165
							Shrubs	-.0100	.001	-.3685	1.105
							Scrub	-.0150	.001	-.5117	1.167
							Man-Modifications	-.0252	.01	-.2238	1.025
4	.61	17.178	78.914	-1.11	36.005	.54	Intercept	1.1017	.01		
		(p < .001)					Rock	.0129	.001	.4020	1.177
							Water	.0103	.001	.4155	1.113
							Sky	.0109	.001	.4828	1.590
							Trees	.0101	.001	.7669	1.279
							"Other" Vegetation	.0095	.01	.2738	1.202

physical characteristics. Model 1 contains regressor coefficients that are all negative, while Model 2 contains all positive coefficients.

In general, scenic quality decreases as a scene contains progressively more bare soil, grass, scrub brush, and shrubs. Model 3 indicates that the presence of man-made modifications (e.g., fences, gravel roads, buildings) may also decrease perceived scenic quality. Conversely, the presence of more bare rock outcroppings, water, trees, and visible sky increased perceived SQ.

Two models were selected representing SQ as a function of the transactional variable predictors (see Table 6). They are:

5) SQ= f(Complexity, Congruity, Novelty, Spatial Enclosure)
6) SQ= f(Complexity, Congruity, Mystery, Spatial Enclosure)

Very high predicted R-Squares were achieved for both models--accounting for over 80% of the variance in SQ. All eight regressor coefficients were individually significant ($p < .001$), although VIF's were slightly larger than those linked with the physical variable predictors.

In general, landscape scenes are perceived as more aesthetically pleasing given a scene that is more

TABLE 6

REGRESSION MODELS PREDICTING SQ RATINGS: TRANSACTIONAL VARIABLE AND UTILITY VARIABLE PREDICTOR MODELS

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
5	.87	91.748 (p < .001)	78.914	1.16	12.371	.84	Intercept	-3.0321	.001		
							Complexity	.5150	.001	.4397	4.365
							Congruity	1.0296	.001	.4689	1.313
							Novelty	.6672	.001	.4174	4.422
							Spatial Enclosure	-.2976	.001	-.2851	1.881
6	.86	83.602 (p < .001)	78.914	5.78	13.504	.83	Intercept	-2.4473	.001		
							Complexity	.6786	.001	.5795	2.885
							Congruity	.8734	.001	.3978	1.670
							Mystery	.6483	.002	.5274	9.760
							Spatial Enclosure	-.5693	.001	-.5453	5.013
7	.82	83.776 (p < .001)	78.914	6.12	16.381	.79	Intercept	1.2367	.001		
							Camping	.5202	.001	.5901	1.505
							Canoeing	.2062	.001	.3169	1.259
							Mountain Climbing	.2153	.001	.3200	1.336
8	.81	79.911 (p < .001)	78.914	8.52	17.078	.78	Intercept	1.2390	.001		
							Camping	.5038	.001	.5715	1.618
							Fishing	.1967	.001	.3145	1.362
							Mountain Climbing	.2259	.001	.3358	1.395

complex, and novel or mysterious. A unity or balance of the scene's elements (higher congruity) and less spatially enclosed view also correspond to higher SQ.

Two models are presented that relate an environment's scenic quality to its perceived utility for specific activities (see Table 6). They are:

7) SQ= f(Camping, Canoeing, Mt.Climbing)

8) SQ= f(Camping, Fishing, Mt.Climbing)

Again, the predicted R-Square values were very high (R^2p =.79, R^2p =.78 respectively). All regressor coefficients were individually significant ($p < .001$) and corresponding VIF's low.

Here, increased scenic quality is shown to relate to certain environmental suitabilities for activitiy--notably camping, canoeing or fishing, and mountain climbing. As the canoeing and fishing terms themselves are highly correlated (r=.98), these models are conceptually nearly identical.

One model was located that ideally described perceived SQ as a function of environmental familiarity (see Table 7). The model:

9) SQ= f(Residential Familiarity, Indirect Familiarity)

TABLE 7

REGRESSION MODELS PREDICTING SQ RATINGS: FAMILIARITY VARIABLE AND COMPOSITE PREDICTOR VARIABLE MODELS

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
9	.62	47.202 (p < .001)	78.914	0.30	32.332	.59	Intercept	-2.6161	.001		
							Residential Familiarity	-1.5039	.001	-1.0494	6.142
							Indirect Familiarity	2.5371	.001	1.6267	6.142
10	.92	132.536 (p < .001)	78.914	-0.20	7.322	.91	Intercept	-2.2211	.001		
							Congruity	.5246	.001	.2389	1.849
							Novelty	.9518	.001	.5954	3.416
							Spatial Enclosure	-.4261	.001	-.4081	2.840
							Composite Familiarity	.0892	.005	.2111	3.775
							Composite Utility	.0592	.001	.3967	4.430

had a fairly high predicted R-Square (.59), individually significant terms ($p < .001$) and respectable VIF's.

It indicates that perceived scenic quality is in part related to familiarity with the environmental type. However, this relationship is complex, as the residential familiarity term was negatively weighted; conversely, familiartity due to non-first hand knowledge was positively related to SQ.

Finally, one combined predictor model was located that described scenic quality response (see Table 7). As hypothesized, such a model was able to account for a higher degree of variance than any of the other conceptual group models developed. The model:

10) SQ= f(Congruity, Novelty, Spatial Enclosure, Familiarity, Utility)

had a predicted R-Square of .91. All regressor coefficients were significant ($p < .001$) and VIF's generally low.

Again, three transactional variables previously noted as important in predicting SQ were included here, with congruity and novelty linked to positive coefficients; spacial enclosure to a negative one. Familiarity and utility represent composite variables formed by the linear addition of values from each of the separate 3 familiarity and 10 utility variables, respectively. They were both positivly related to SQ in the model.

Model 10 represents the best solution subset model located when utilizing a 7 variable full model (Model 10's terms plus complexity and mystery). Other composite subset models were examined using different full models as the basis from which to calculate Cp, yet given the self imposed restriction of considering no model with more than 5 variables (in order to avoid overfitting the regression due to a limited degrees of freedom (n=60)), no other composite models yielded acceptible Cp - p values (less than 10). However, interesting patterns were yielded when examining the all possible regressions strategy up to this point. In all cases, whether designating the full model as all possible predictors (33 variables), or as all predictors except the physical characteristics (18 variables) the same "best" 5 variable model yielded was a close derivative of Model 10:

11) SQ= f(Congruity, Novelty, Spacial Enclosure, Indirect Familiarity, Photography)

Examination of the various equation diagnostics indicated a strong model (R^2p =.95, all regressor coefficients significant at $p < .001$, highest predictor VIF=6.00)--other than the high (Cp - p) values of 27.70 (33 variable full model) or 19.72 (18 variable model). The point to note here is not whether the model reached standards sufficient enough to be considered useful as a predictive tool. Rather, one should note the apparent pattern in the relationship of the predictor variables overall, in that near identical 5 variable models were found using a variety of full models. Of special note is that physical predictors, although important in themselves, did not add to equations' effectiveness when using other types of predictors like the transactional, familiarity, and utility variables noted here.

Hypothesis 6 --Distinctive Conceptual Definition of Transactional, Utility, & Familiarity Variables via Regression Modeling

Besides attempting to adequately predict aesthetic response through development of a number of conceptually distinct models, further analyses of many of the variables utilized in these predictive models were conducted. One potential drawback to describing SQ as a function of terms like complexity or congruity is the lack of control resource managers have over changing or selecting settings on the basis of these concepts. Part of this problem, however, may be linked to a lack of knowledge as to what these concepts mean in terms of other managable factors, like setting physical characteristics. Thus, one focus of this research was to reach beyond mere comparison of alternative concepts that might be used in SQ prediction; and aid researchers and managers in understanding the relationships existing between these concepts.

To this end, further analyses were carried out in an attempt to describe the 5 tranactional, 10 utility, and 3 familiarity variables in terms of the 15 distinct environmental physical characteristics.

An all possible regression strategy was used identical to the one described previously (on pgs. 92,93). Here, the full predictor model was the same in all cases--15 physical characteristic variables. A variety of different criteria were used however--each transactional, familiarity, and utility variable in turn. Thus, a subset of best possible models were sought for 18 different criteria, utilizing the same potential set of predictors. No more than 15 of the "best" subset models were chosen for further analysis on the basis of R-Square, (Cp - p) values, and the total number of predictors in the equation. In this manner, a total 129 models were selected for further analysis.

Detailed diagnostics were next obtained for these selected models, and a final "family" of models was chosen for presentation here for each criterion. The final selection was based upon total model F value, individual predictor significance ($p < .10$), R-Square and Predicted R-Square (R^2p, obtained from PRESS value) statistics, predictor VIF's, examination of observation (slide) studentized residuals, h-hat statistics, and inspection of partial regression residual plots for each predictor.

The standards used as "cut-offs" for final selection were generally the same as those mentioned for earlier similar analyses (see pg. 94). Smaller variable models were favored over those with more terms. However, larger models that were derivatives of smaller "base" models were reported if the R-Square value was significantly greater ($p < .05$) than the corresponding base models.

Prediction/Description: Transactional Variables

A family of five models describing environmental complexity were selected for presentation (see Table 8). These models are:

TABLE 8

REGRESSION MODELS PREDICTING ENVIRONMENTAL COMPLEXITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
12	.48	26.213 (p < .001)	57.541	7.56	33.074	.43	Intercept	2.5163	.001		
							Rock	.0104	.001	.3795	1.000
							Trees	.0066	.001	.5844	1.000
13	.51	19.291 (p < .001)	57.541	5.01	33.504	.42	Intercept	3.5139	.001		
							Soil	-.0076	.001	-.3776	1.372
							Trees	.0037	.004	.3275	1.376
							Grass	-.0061	.001	-.4310	1.325
14	.52	20.175 (p < .001)	57.541	3.64	32.869	.43	Intercept	4.1133	.001		
							Soil	-.0103	.001	-.5116	1.089
							Grass	-.0082	.001	-.5794	1.088
							Mixed Scrub	-.0110	.002	-.2993	1.005
15	.56	17.336 (p < .001)	57.541	-0.03	31.110	.46	Intercept	3.1717	.001		
							Rock	.0068	.02	.2463	1.226
							Soil	-.0057	.01	-.2824	1.555
							Trees	.0044	.001	.3949	1.468
							Grass	-.0045	.01	-.3210	1.570
16	.60	16.244 (p < .001)	57.541	-4.27	29.183	.49	Intercept	3.3898	.001		
							Rock	.0065	.02	.2378	1.228
							Soil	-.0064	.01	-.3154	1.580
							Trees	.0034	.01	.3029	1.665
							Grass	-.0052	.001	-.3710	1.629
							Mixed Scrub	-.0081	.02	-.2216	1.143

12) Complexity= f(Rock, Trees)

13) Complexity= f(Soil, Trees, Grass)

14) Complexity= f(Soil, Grass, Mixed)

15) Complexity= f(Rock, Soil, Trees, Grass)

16) Complexity= f(Rock, Soil, Trees, Grass, Mixed Scrub)

Close examination of the models' diagnostics indicates predicted R-Square values that were slightly less than what standards have been used here previously in presenting a model. The simplest (Model 12) only predicts slightly over 40% of the variance in complexity, while Model 16 approaches the 50% mark. Individual terms in all five models were significant ($p < .02$) and VIF's fairly low.

In general, the models indicate that much of environmental complexity can be explained as a function of increased numbers of trees and rock outcroppings present in a scene (Model 12). Other physical features may decrease complexity, like bare soil, grass, and mixed scrub brush and grass (Models 13-16).

One interesting point involving these models was that the base model (Model 12) was as effective in predicted R-Square as the more complex models (Models 15, 16). That is, there was no significant increase in R^2p between them. This fact, coupled with the relative level of R^2p found in the models as a group, may indicate that the relationship between physical predictors and complexity, though limited ($R^2p = .43$, Model 12), is very basic (the simplest model is just as good as the more complex ones). And given a base model that contains only two terms, this relationship is likely quite stable and strong.

Two models were selected that described environmental novelty in terms of physical characteristics (see Table 9). These models are:

17) Novelty= f(Rock, Soil, Grass, Scrub)

18) Novelty= f(Rock, Trees, Grass, Scrub)

Both models had fairly high predicted R-Squares (.44 and .48, respectively). In addition, all model terms were significant ($p < .03$) and have low VIF's.

In general, environmental novelty is in part explained by increased numbers of bare rock formations and trees, but less bare soil, expanses of grass, and/or scrub brush vegetation.

Three models were selected to describe the spatial enclosure of a setting in terms of its physical characteristics (see Table 10). These models are:

19) Enclosure= f(Sky, Trees, Shrubs, Other Vegetation)

20) Enclosure= f(Rock, Trees, Shrubs, Other Vegetation)

21) Enclosure= f(Water, Sky, Trees, Shrubs, Other Vegetation)

TABLE 9

REGRESSION MODELS PREDICTING ENVIRONMENTAL NOVELTY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
17	.54	16.147 (p < .001)	30.883	1.62	17.220	.44	Intercept	3.3239	.001		
							Rock	.0060	.004	.2967	1.180
							Soil	-.0032	.04	-.2173	1.261
							Grass	-.0058	.001	-.5635	1.223
							Scrub	-.0062	.001	-.3402	1.143
18	.55	16.582 (p < .001)	30.883	0.82	16.120	.48	Intercept	2.9257	.001		
							Rock	.0075	.001	.3717	1.085
							Trees	.0020	.02	.2471	1.387
							Grass	-.0041	.001	-.4002	1.329
							Scrub	-.0052	.01	-.2871	1.331

TABLE 10

REGRESSION MODELS PREDICTING ENVIRONMENTAL SPATIAL ENCLOSURE

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
19	.74	38.504 ($p < .001$)	72.416	3.96	26.627	.63	Intercept	2.1732	.001		
							Sky	-.0051	.004	-.2379	1.303
							Trees	.0083	.001	.6577	1.228
							Shrubs	.0067	.001	.2574	1.069
							"Other" Vegetation	.0088	.001	.2671	1.120
20	.76	42.844 ($p < .001$)	72.416	-0.49	28.397	.61	Intercept	1.3047	.001		
							Rock	.0078	.001	.2532	1.007
							Trees	.0096	.001	.7596	1.020
							Shrubs	.0081	.001	.3112	1.033
							"Other" Vegetation	.0022	.001	.3434	1.037
21	.76	33.366 ($p < .001$)	72.416	0.86	24.480	.66	Intercept	1.9529	.001		
							Water	.0034	.05	.1445	1.122
							Sky	-.0040	.02	-.1877	1.438
							Trees	.0087	.001	.6864	1.273
							Shrubs	.0070	.001	.2701	1.077
							"Other" Vegetation	.0098	.001	.2961	1.165

The predicted R-Squares of all three models were high, all accounting for over 60% of the spatial enclosure variance. Individual model terms were all significant ($p < .05$) and corresponding VIF's low.

A setting's relative enclosure is thus related to numerous physical factors including increased numbers of trees, shrubs, and rock outcroppings. More water and "other" vegetation also related to perceived enclosure. Conversely, the more visible sky a scene possessed, the less enclosed (i.e., more open) it was perceived.

Overall, the relationship of spatial enclosure to specific physical characteristics was fairly high ($R^2p = .63$, Model 19) yet somewhat complex (requiring 4 or 5 term predictive models).

Two models were ultimately selected describing environmental mystery as a function of physical features (see Table 11). These models:

22) Mystery= f(Soil, Man Modifications, Trees, Grass, Scrub)
23) Mystery= f(Soil, Man Modifications, Sky, Grass, Scrub)

had predicted R-Squares of .62 and .66, respectively. All individual model terms were significant ($p < .02$) and VIF's low. Thus, as was the case for spacial enclosure, mystery was another

TABLE 11

REGRESSION MODELS PREDICTING ENVIRONMENTAL MYSTERY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
22	.70	25.621 ($p < .001$)	52.214	9.42	19.678	.62	Intercept	3.867	.001		
							Soil	-.0069	.001	-.3592	1.385
							Man-Modifications	-.0177	.01	-.1935	1.018
							Trees	.0023	.03	.2177	1.647
							Grass	-.0079	.001	-.5897	1.482
							Scrub	-.0085	.001	-.3595	1.339
23	.72	28.097 ($p < .001$)	52.214	5.45	17.713	.66	Intercept	4.5965	.001		
							Soil	-.0077	.001	-.4019	1.191
							Man-Modifications	-.0180	.01	-.1960	1.017
							Sky	-.0042	.003	-.2274	1.085
							Grass	-.0085	.001	-.6316	1.193
							Scrub	-.0108	.001	-.4532	1.123

transactional variable that relates strongly to specific physical characteristics (high predicted R-Squares) yet in a complex way (requiring larger models).

In general, environmental mystery was related to more trees and less bare soil, expanses of grass, scrub brush vegetation, and visible sky. Man-made modifications in the setting (e.g., roads, buildings, fences) also tended to decrease perceived mystery.

No final models that could meet this research's criteria for presentation were located for the congruity transactional variable. As its written definition would imply, this concept is probably more related to relationships between various physical features composing an environment instead of the simple presence of physical characteristics themselves. As such, the best models located, although possessing individually significant terms ($p < .10$) and low VIF's could only account for 30% of the variance (predicted R-Square estimates).

While such a level was too low to endorse as a good predictive model, the three best models located are outlined here in light of what "exploratory insight" they might yield concerning congruity, through noting those physical terms included. The three models:

24) Congruity= f(Trees, Man Modifications, Scrub, Other Vegetation)

25) Congruity= f(Trees, Scrub, Water, Other Vegetation)

26) Congruity= f(Trees, Man Modifications, Water, Other Vegetation)

all had R-Squares approximating .38, and predicted R-Squares approximating .31. Other model diagnostics achieved levels comparable to past presented models. In all models, the Scrub and Man Modification terms were negatively related to congruity; the Other Vegetation, Trees, and Water terms were positively related to congruity. Some interpretation of these relationships is undertaken in the discussion section.

<u>Prediction/Description</u>: <u>Utility Variables</u>

Models that attempted to predict and describe an environment's suitability for a specific type of outdoor recreation activity as a function of its physical features were also explored. Good predictive models were located for 8 of the 10 outdoor activities examined in the research.

As was the case with the congruity variable cited in the previous section, the "best" models located for those two activity types that did not yield good models, failed to meet acceptable predicted R-Square levels. Other equation diagnostics, like term significance, and VIF's were within acceptable standards. For the purposes of conceptual insight, a few best models are outlined for these activities, none of which however, are considered good predictive models.

Suitability for horseback riding was best described as:

27) Horseback Riding= f(Water, Mt.Topography)

The predicted R-Square was only .14 for this model. Both terms had negative coefficients. Thus, environments were more suitable for horseback riding, the less mountainous or water-laden they were. Although conceptually sound, such says little about the myriad of other environmental possibilities that exist even when these two are absent. A low R-Square is not altogether surprising.

In a similar manner, the environment's suitability for motorcycle (trail) riding was not predicted well by an environment's physical characteristics alone. The best models located had predicted R-Squares ranging from .26 to .33. Several of these are as follows, and are presented for purposes of conceptual insight:

28) Motorcycle Riding= f(Water, Scrub, Flat Topography)

29) Motorcycle Riding= f(Water, Scrub, Mt.Topography)

30) Motorcycle Riding= f(Water, Trees, Mt.Topography)

The Water, Trees, and Mt.Topography terms had negative coefficients; the Flat Topography and Scrub terms, positive ones. These equations indicate that subjects perceived wet, mountainous, and/or densely vegetated land as unsuitable for motorcycle riding, while flat, low (scrub) vegetation landscapes were more suitable.

Predictive equations accounting for at least 50% of an activity's suitability variance were located for the remaining 8 outdoor behaviors examined. An environment's suitability for Camping was best described by the following equation:

31) Camping= f(Soil, Trees)

Thus, a fairly simple, yet powerful, relationship exists between physical characteristics and environments' ability to support camping activities. Diagnostics indicated a potentially very stable model (see Table 12), where both terms were individually significant ($p < .01$) and corresponding VIF's were quite low. More complex models were generated, but they normally possessed terms that did not remain significant, and had predicted R-Square values identical to the simpler two term model ($R^2p = .47$). One such model was:

TABLE 12

REGRESSION MODELS PREDICTING ENVIRONMENTAL CAMPING SUITABILITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
31	.51	29.936 ($p < .001$)	101.549	-0.03	53.941	.47	Intercept	2.5522	.001		
							Soil	-.0086	.002	-.3220	1.128
							Trees	.0081	.001	.5398	1.128

32) Camping= f(Rock, Soil, Trees, Scrub, Mt.Topography)

Model components that held positive values were Trees, Rock, and (in other related models) Water. Negative value terms included Soil, Scrub, and Mt.Topography. However, accepting the most parsimonious description of physical requirements for camping, Model 30 suggests the landscape requires simply more trees, and less bare soil.

A family of four equally predictive models were selected in describing an environment's suitability for mountain climbing. predicted R-Squares ranged from .50 to .52 (see Table 13). These models are:

33) Mt.Climbing= f(Rock, Trees,
Flat Topography, Hilly Topography)

34) Mt.Climbing= f(Trees, Grass,
Flat Topography, Hilly Topography)

35) Mt.Climbing= f(Soil, Grass,
Flat Topography, Hilly Topography)

36) Mt.Climbing= f(Soil, Grass,
Shrubs, Flat Topography)

All models possessed terms with low VIF's and acceptable individual significance levels (highest $p < .10$).

TABLE 13

REGRESSION MODELS PREDICTING ENVIRONMENTAL MOUNTAIN CLIMBING SUITABILITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
33	.58	19.297	174.346	4.40	86.518	.50	Intercept	4.7108	.001		
		(p < .001)					Rock	.0070	.10	.1461	1.014
							Trees	.0056	.002	.2878	1.012
							Flat Topography	-.0128	.001	-.8222	1.683
							Hilly Topography	-.0064	.002	-.3602	1.670
34	.59	19.421	174.346	4.18	85.891	.51	Intercept	5.2046	.001		
		(p < .001)					Trees	.0047	.01	.2415	1.095
							Grass	-.0039	.09	-.1586	1.112
							Flat Topography	-.0129	.001	.8251	1.676
							Hilly Topography	-.0068	.001	-.3787	1.660
35	.59	19.556	174.346	3.95	83.106	.52	Intercept	5.9059	.001		
		(p < .001)					Soil	-.0086	.01	-.2459	1.101
							Grass	-.0072	.002	-.2948	1.114
							Flat Topography	-.0126	.001	-.8080	1.685
							Hilly Topography	-.0060	.004	-.3342	1.679
36	.60	20.204	174.346	2.84	85.599	.51	Intercept	5.4283	.001		
		(p < .001)					Soil	-.0114	.001	-.3237	1.117
							Grass	-.0084	.001	-.3411	1.142
							Shrubs	-.0114	.002	-.2826	1.074
							Flat Topography	-.0100	.001	-.6422	1.052

In general, a land's suitability for mountain climbing was positively related to more rock outcroppings and trees. However, most model terms emphasized negative relationships--that is, an absence of flat topography or hilly topography, and less shrubs, grass, or bare soil.

Three models were located describing the relationship between photographic suitability and physical characteristics (see Table 14). These models are:

37) Photography= f(Soil, Man Modifications, Trees, Grass, Scrub)

38) Photography= f(Soil, Man Modifications, Shrubs, Grass, Scrub)

39) Photography= f(Rock, Water, Sky, Trees, Other Vegetation)

All models showed fairly high predictive ability (predicted R-Squares ranged .51 to .54). Individual term VIF's were all low, and individually significant ($p < .03$). In general, Models 37 and 38 describe the relationship in negative terms. The more bare soil, scrub brush, expanses of grass, shrubs, or man-made modifications (e.g., buildings, roads, fences) present in a scene, the less suitable it was deemed for

TABLE 14

REGRESSION MODELS PREDICTING ENVIRONMENTAL PHOTOGRAPHIC SUITABILITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
37	.59	15.491	44.396	3.23	21.769	.51	Intercept	4.5703	.001		
		(p < .001)					Soil	-.0072	.001	-.4037	1.385
							Man-Modifications	-.0215	.01	-.2547	1.018
							Trees	.0024	.03	.2435	1.647
							Grass	-.0050	.001	-.3992	1.482
							Scrub	-.0064	.01	-.2902	1.339
38	.60	16.349	44.396	1.45	21.723	.51	Intercept	5.1002	.001		
		(p < .001)					Soil	-.0092	.001	-.5187	1.174
							Man-Modifications	-.0204	.01	-.2418	1.025
							Grass	-.0070	.001	-.5629	1.165
							Shrubs	-.0048	.01	-.2326	1.105
							Scrub	-.0094	.001	-.4278	1.167
39	.62	17.395	44.396	-0.57	20.356	.54	Intercept	2.310	.001		
		(p < .001)					Rock	.0095	.001	.3941	1.177
							Water	.0063	.001	.3400	1.113
							Sky	.0074	.001	.4396	1.590
							Trees	.0079	.001	.8003	1.279
							"Other" Vegetation	.0078	.002	.3007	1.202

photography. Model 39 presents a relationship stated in positive terms. The more trees, water, rock outcroppings, visible sky, and "other" vegetation present, the more suitable a landscape was deemed for photography.

Envrionmental hiking suitability was quite well described by physical characteristics. Three models were located with high predicted R-Squares ranging from .64 to .68 (see Table 15). These models are:

40) Hiking= f(Soil, Trees,
Hilly Topography, Other Vegetation)

41) Hiking= f(Soil, Trees, Mixed,
Hilly Topography, Other Vegetation)

42) Hiking= f(Rock, Soil, Trees,
Hilly Topography, Other Vegetation)

All model terms had low VIF's and were individually significant ($p < .03$). In general, an environment was considered more suitable for hiking when it had more trees, less bare soil, more "other" vegetation, and was hilly in topography type. Models 41 and 42 indicate scrub brush and grass may detract from an envrionment's support of hiking activity, while rock outcroppings may conversely enhance it.

TABLE 15

REGRESSION MODELS PREDICTING ENVIRONMENTAL HIKING SUITABILITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
40	.71	34.373 ($p < .001$)	104.900	4.19	37.361	.64	Intercept	2.3870	.001		
							Soil	-.0076	.001	-.2793	1.161
							Trees	.0100	.001	.6536	1.157
							Hilly Topography	.0037	.001	.2699	1.079
							"Other" Vegetation	.0113	.001	.2852	1.058
41	.74	30.476 ($p < .001$)	104.900	0.29	33.162	.68	Intercept	2.5259	.001		
							Soil	-.0078	.001	-.2865	1.163
							Trees	.0092	.001	.6023	1.266
							Mixed Scrub	-.0081	.03	-.1628	1.101
							Hilly Topography	.0037	.001	.2700	1.079
							"Other" Vegetation	.0113	.001	.2832	1.058
42	.74	31.194 ($p < .001$)	104.900	-0.63	36.136	.66	Intercept	2.2104	.001		
							Rock	.0064	.02	.1722	1.039
							Soil	-.0067	.002	-.2459	1.200
							Trees	.0102	.001	.6687	1.165
							Hilly Topography	.0037	.001	.2684	1.079
							"Other" Vegetation	.0118	.001	.2955	1.062

The presence of the Other Vegetation term is somewhat confusing, yet less so when defined by specific slides on which it was present. In general, scenes with high Other Vegetation were those where panoramic views were present; and the vegetation in the extreme background was out of focus or otherwise unidentifiable. More of such vegetation is often present in moderately open (versus highly spacially enclosed) environments; where a panoramic view is available--often with mountains or rolling hills in the background. Further analyses and the implications of this term's inclusion in these models, as well as for the Photography models presented earlier, are covered in the discussion section.

Very similar models were located describing an environment's suitability for canoeing and fishing activities. Five models were located describing canoeing/kayaking suitability in terms of physical characteristics (see Table 16). These models are:

43) Canoeing= f(Rock, Water)

44) Canoeing= f(Rock, Water, Mt.Topography)

45) Canoeing= f(Rock, Water, Scrub)

46) Canoeing= f(Rock, Water, Scrub, Mt.Topography)

47) Canoeing= f(Rock, Water, Trees, Mt.Topography)

TABLE 16

REGRESSION MODELS PREDICTING ENVIRONMENTAL CANOEING/KAYAKING SUITABILITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
43	.71	69.129	186.353	5.20	64.560	.65	Intercept	.3935	.01		
		(p < .001)					Rock	.0095	.01	.1911	1.016
							Water	.0303	.001	.7960	1.016
44	.72	49.299	186.353	2.58	62.376	.67	Intercept	.4741	.003		
		(p < .001)					Rock	.0120	.002	.2421	1.167
							Water	.0294	.001	.7724	1.048
							Mtn. Topography	-.0033	.07	-.1419	1.165
45	.73	50.835	186.353	1.30	60.448	.68	Intercept	.5039	.002		
		(p < .001)					Rock	.0106	.004	.2153	1.041
							Water	.0295	.001	.7751	1.035
							Scrub	-.0070	.03	-.1557	1.038
46	.75	41.393	186.353	-1.73	57.571	.69	Intercept	.5937	.001		
		(p < .001)					Rock	.0134	.001	.2702	1.198
							Water	.0285	.001	.7493	1.069
							Scrub	-.0073	.02	-.1623	1.041
							Mtn. Topography	-.0035	.04	-.1499	1.168
47	.75	41.733	186.353	-2.05	56.525	.70	Intercept	.1842	.33		
		(p < .001)					Rock	.0130	.001	.2621	1.181
							Water	.0294	.001	.7714	1.048
							Trees	.0035	.02	.1707	1.086
							Mtn. Topography	-.0045	.02	-.1930	1.263

All five of these models had individually significant terms ($p < .06$) and corresponding low VIF's. The predicted R-Squares were quite high. The base model ($R^2p = .65$) indicates an environment with more water and bare rock outcroppings is generally considered more suited for canoeing and kayaking. The presence of such rock outcroppings probably corresponds to river-type water bodies in part, rather than to flat lake and swamp-like types. Models 44 and 45 indicate extreme (mountainous) topogrphy (with sheer elevation drops) detracts from canoeing suitability; scrub brush vegetation is also negatively related to suitability. Model 46 is merely a combination of all 4 terms found in the earlier models and Model 47 ($R^2p = .70$) contains a positively weighted Tree term.

Very similar models representing environmental fishing suitability were located (see Table 17). These are:

48) Fishing= f(Rock, Water)

49) Fishing= f(Rock, Water, Mt.Topography)

50) Fishing= f(Rock, Water, Scrub)

51) Fishing= f(Rock, Water, Scrub, Mt.Topography)

52) Fishing= f(Rock, Water, Trees, Mt.Topography)

TABLE 17

REGRESSION MODELS PREDICTING ENVIRONMENTAL FISHING SUITABILITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
48	.65	52.284	201.654	5.36	84.551	.58	Intercept	.5491	.002		
		($p < .001$)					Rock	.0091	.03	.1771	1.016
							Water	.0302	.001	.7629	1.016
49	.67	37.375	201.654	2.93	82.118	.59	Intercept	.6386	.001		
		($p < .001$)					Rock	.0119	.01	.2316	1.167
							Water	.0292	.001	.7378	1.048
							Mtn. Topography	-.0036	.07	-.1515	1.165
50	.68	39.587	201.654	0.73	78.153	.61	Intercept	.6843	.001		
		($p < .001$)					Rock	.0106	.01	.2056	1.041
							Water	.0292	.001	.7383	1.035
							Scrub	-.0086	.02	-.1883	1.038
51	.70	32.350	201.654	-2.13	74.805	.63	Intercept	.7846	.001		
		($p < .001$)					Rock	.0136	.002	.2645	1.198
							Water	.0281	.001	.7107	1.069
							Scrub	-.0089	.01	-.1904	1.041
							Mtn. Topography	-.0039	.05	-.1609	1.168
52	.71	32.918	201.654	-2.76	73.343	.64	Intercept	.2776	.20		
		($p < .001$)					Rock	.0131	.002	.2556	1.181
							Water	.0292	.001	.7365	1.048
							Trees	.0043	.01	.2043	1.086
							Mtn. Topography	-.0051	.01	-.2128	1.263

Interestingly, these five models are identical (in terms of predictors) to the five just presented describing canoeing/kayaking suitability; however, some differences exist between these sets.

First, actually only models 48 and 50 met the normal standards for selection here, as Models 49, 51, and 52 did not produce a significant increase in R-Square over the previously selected base models. This fact alone indicates a slight difference between the two activities. Apparently, fishing is not as restricted by topography and vegetative covering conditions as is canoeing. (These three normally unacceptible models are presented for comparative purposes only, and all future discussion concerns only Models 48 and 50.)

Second, although the two models are acceptable by all selection standards (terms with low VIF's, and all individually significant ($p < .03$)), they are less predictive for fishing suitability (R^2p = .58 and .61, respectively) than are the similar Models 43 and 45 for canoeing/kayaking suitability (R^2p = .65 and .68, respectively).

Two models were located describing an environment's suitability for nature study and birdwatching (see Table 18). They are:

TABLE 18

REGRESSION MODELS PREDICTING ENVIRONMENTAL BIRD WATCHING/NATURE STUDY SUITABILITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
53	.73	37.710	80.228	3.75	24.150	.70	Intercept	3.2711	.001		
		(p < .001)					Soil	-.0089	.001	-.3735	1.137
							Trees	.0074	.001	.5582	1.237
							Mixed Scrub	-.0101	.002	-.2339	1.104
							Man-Modifications	-.0140	.08	-.1233	1.010
54	.74	39.324	80.228	1.99	25.126	.69	Intercept	3.0776	.001		
		(p < .001)					Soil	-.0080	.001	-.3358	1.165
							Trees	.0079	.001	.5922	1.288
							Mixed Scrub	-.0085	.01	-.1953	1.143
							Shrubs	.0043	.03	.1579	1.076

53) Bird Watching= f(Soil, Trees,
Mixed Scrub, Man Modifications)

54) Bird Watching= f(Soil, Trees,
Mixed Scrub, Shrubs)

Both models had high predicted R-Squares (R^2p = .70 and .69, respectively), and terms that were individually significant ($p < .08$). All predictor VIF's were low.

In general, the more trees and shrubs an environment held, the more suitable it was considered for bird watching and nature study. Conversely, the more bare soil, mixed scrub brush and grass, and man-made modifications present, the less suitable.

Finally, four models were located describing hunting suitability as a function of physical features (see Table 19). They are:

55) Hunting= f(Soil, Trees, Water, Scrub)

56) Hunting= f(Soil, Trees, Water, Mixed Scrub)

57) Hunting= f(Soil, Trees, Scrub, Mixed Scrub)

58) Hunting= f(Soil, Trees, Water, Scrub, Mixed Scrub)

The models were all highly predictive (predictive R-Squares ranged .68 to .72), had individually significant models terms ($p < .05$), and low VIF's. Bare soil, scrub brush vegetation, and mixed scrub

TABLE 19

REGRESSION MODELS PREDICTING ENVIRONMENTAL HUNTING SUITABILITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
55	.73	36.461	93.690	2.71	29.922	.68	Intercept	2.4348	.001		
		($p < .001$)					Soil	-.0076	.001	-.2946	1.194
							Trees	.0079	.001	.5492	1.262
							Water	.0043	.03	.1591	1.045
							Scrub	-.0075	.004	-.2342	1.214
56	.73	37.140	93.690	1.95	30.422	.69	Intercept	2.4244	.001		
		($p < .001$)					Soil	-.0090	.001	-.3491	1.166
							Trees	.0079	.001	.5467	1.260
							Water	.0041	.04	.1532	1.050
							Mixed Scrub	-.0109	.003	-.2340	1.121
57	.75	40.406	93.690	-1.43	27.871	.70	Intercept	2.7072	.001		
		($p < .001$)					Soil	-.0087	.001	-.3360	1.175
							Trees	.0067	.001	.4674	1.320
							Scrub	-.0069	.005	-.2178	1.227
							Mixed Scrub	-.0104	.003	-.2232	1.127
58	.76	34.844	93.690	-4.01	26.644	.72	Intercept	2.5898	.001		
		($p < .001$)					Soil	-.0081	.001	-.3136	1.204
							Trees	.0071	.001	.4911	1.352
							Water	.0037	.05	.1353	1.060
							Scrub	-.0065	.01	-.2039	1.238
							Mixed Scrub	-.0097	.005	-.2064	1.144

brush and grass terms all had negative coefficient weights. Trees and water were, conversely, positivly related to a land's hunting suitability.

Prediction/Description: Familiarity Variables

Finally, the three familiarity measures were examined as a function of specific physical characteristics. Good predictive models would be indicative of how homogeneous the sample of subjects was in terms of familiarity. In locating the models, the same procedures and diagnostic standards used for all previous analyses were also applied here. At least one acceptible model was located for each of the three familiarity variables.

Environmental familiarity as a function of where subjects have lived (see Table 20) was best described as:

59) Residential Familiarity= f(Soil, Trees, Scrub, Flat Topography, Hilly Topography)

The model had a fairly high predicted R-Square (.57) and all model terms were individually significant ($p < .05$). Corresponding term VIF's were low.

Overall, subjects had lived in (and were familiar with) environments that were moderate in topography

TABLE 20

REGRESSION MODELS PREDICTING ENVIRONMENTAL FAMILIARITY

Model	R^2	Overall F	SS Total	Cp-p	PRESS	Predicted R^2	Variable	Coefficient	p > /t/	Standard Beta	VIF
59	.63	18.605	38.422	3.87	16.680	.57	Intercept	.1651	.43		
		($p < .001$)					Soil	-.0030	.05	-.1801	1.206
							Trees	.0041	.001	.4495	1.254
							Scrub	-.0062	.001	-.3064	1.217
							Flat Topography	.0037	.001	.5094	1.663
							Hilly Topography	.0024	.01	.2823	1.701
60	.68	23.147	90.052	6.83	33.579	.63	Intercept	2.1873	.001		
		($p < .001$)					Soil	-.0059	.01	-.2323	1.205
							Water	.0060	.01	.2271	1.057
							Trees	.0075	.001	.5319	1.345
							Scrub	-.0082	.003	-.2614	1.237
							Mtn. Topography	-.0033	.02	-.2027	1.112
61	.64	24.804	32.440	6.56	15.844	.51	Intercept	2.6854	.001		
		($p < .001$)					Water	.0048	.001	.2995	1.038
							Trees	.0048	.001	.5699	1.188
							Scrub	-.0056	.001	-.3003	1.184
							"Other" Vegetation	.0050	.01	.2277	1.030
62	.67	21.916	32.440	3.06	14.718	.55	Intercept	2.7022	.001		
		($p < .001$)					Water	.0045	.001	.2838	1.047
							Trees	.0053	.001	.6217	1.289
							Scrub	-.0052	.002	-.2785	1.202
							"Other" Vegetation	.0051	.01	.2289	1.030
							Mtn. Topography	-.0017	.04	-.1710	1.102
63	.67	22.085	32.440	2.77	14.613	.55	Intercept	2.7750	.001		
		($p < .001$)					Water	.0044	.001	.2750	1.195
							Trees	.0044	.001	.5188	1.059
							Scrub	-.0050	.003	-.2692	1.280
							"Other" Vegetation	.0051	.005	.2319	1.219
							Soil	-.0028	.04	-.1837	1.031

(flat or hilly, but not mountainous) and contained trees. Environments with scrub brush vegetation or bare soil were not familiar.

Familiarity with a setting as a function of travel and visits (see Table 20) was best described as:

60) Travel Familiarity= f(Soil, Water, Trees, Scrub, Mt.Topography)

The model was highly predictive ($R^2p = .63$). All model terms were individually significant ($p < .02$), and had corresponding low VIF's.

Overall, subjects felt familiar with environmental settings that contained trees and bodies of water (e.g., lakes, rivers, streams). They were not familiar with those that had extreme (mountainous) topographies, or that contained much bare soil or scrub brush.

Finally, perceived familiarity with a setting as a function of any third hand knowledge (i.e., books, films, acquaintances) (see Table 20) was described by three related models:

61) Indirect Familiarity= f(Water, Trees, Scrub, Other Vegetation)

62) Indirect Familiarity= f(Water, Trees, Scrub, Other Vegetation, Mt.Topography)

63) Indirect Familiarity= f(Water, Trees, Scrub, Other Vegetation, Soil)

All model terms had low VIF's and were individually significant ($p < .04$). The models were moderately predictive (R^2p = .51 to .55).

Again, familiarity was negatively related to landscapes containing scrub brush. Scenes with more water, trees, and other vegetation were considered more familiar. Bare soil and mountainous topography were indicative of less familiarity in some models.

Overall, subjects appeared familiar with those settings that were typical of the eastern regional United States. That is, settings that contained more trees and were moderate in topography. Those settings that were more typical of western regions--dryer (with more soil and scrub brush) or more mountainous, were considered less familiar.

Hypothesis 7 --Comparison of Aesthetic Quality Predictors within an Expectancy Theory Framework

The utility variable predictors included in analyses to this point were originally conceived as merely one component in an expectancy theory approach to prediction. Under such an approach, a model composed of a) individual subject expectations as to how suitable specific settings were for certain outdoor recreation activities, coupled with b) individual ratings of how much expected satisfaction would be received from participating in such activities, were to be combined into c) composite scores representing an overall motivational force towards a setting. Such force should predict, in part, one's preference for a setting.

In the analyses previously reported, the environmental suitabilities for each of 10 different outdoor activities have been used as predictors of scenic quality (SQ). These suitability ratings were conceived as rough measures of environmental utility, in that they indicated, in part, how an environment could be <u>used</u>, relative to recreation opportunities. Under the framework of an expectancy theory approach, however, these same 10 ratings correspond to the expectancy (E) term in the model; that is, they represent a subjective expectation as to how likely a setting can support participation in a given activity. Another term utilized is a valence (V) term. These were ratings asking subjects to indicate how much expected satisfaction (or dissatisfaction) they would receive from participating in each of these 10 activities.

A between subjects approach to analyses was utilized.* That is, average E values and V values were

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*Although Vroom (1964) originally conceived the model as a within subjects model of choice, such an approach calculated for each slide across subjects. Thus, there were 20 such values for each slide (corresponding to the 10 outdoor activities rated in this research). Each slide had an average rating of its suitability for each of 10 different outdoor activities, and each of these activities had an average subject rating of how valued they were (specifically, how much expected satisfaction they would yield). Tests of the model's effectivenenss were then made across slides (n=60) via correlation coefficients with the criteria: the average preference and average SQ rating for each slide.

Comparisons between slightly different composite variable models were also made. Specifically, the following "models" were used as predictors of the criteria: ΣE (the sum of the 10 expectancy (activity

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was not deemed necessary here for three reasons. First, due to the research design, individual subject correlations from a within subjects approach would have been based on relatively few cases (n=15 slides rated per subject). Second, initial analyses indicated high predictive power from the between subjects approach, such that increased effectiveness of the model, given a different approach, would likely have been minimal due to ceiling effects. Third, such a between subjects approach is consistent with the analyses approaches represented by the other variable types examined in this research. Finally, a between subjects approach is the most efficient and the method that would be used from a managerial perspective--where environmental "true scores" based upon subject averages are ideally sought. If such an approach yields highly effective results (point 2), there is no need, from a pragmatic standpoint, to proceed further with additional analyses--in this case, a within subjects approach.

suitability) ratings); ΣV (the sum of the 10 valence (activity satisfaction) ratings); Fa, the additive model (a sum of each respective expectancy and valence ratings' sums: $\Sigma(E + V)$); and Fm, the original (Vroom, 1964) multiplicative force model (a sum of each respective expectancy and valence ratings' products: $\Sigma(E * V)$).

In addition, two more sets of composite variables were tested. The first set included: $\Sigma V+/-$, Fa+/-($\Sigma(E + V+/-)$), and Fm+/- ($\Sigma(E * V+/-)$). With one exception, these models were identical to those previously listed. The valence (V) term was scaled so as to include both positive and negative score values, a distinction stressed as important in Vroom's original conception of the model.*

The second set included: $\Sigma E3$, $\Sigma E5$, $\Sigma V3$, $\Sigma V5$, $\Sigma(E + V)3$, $\Sigma(E + V)5$, $\Sigma(E * V)3$, $\Sigma(E * V)5$. These models represented the four main ones tested, with the exception of the number of terms used in the summing operations. All previous models included the values of all 10 E and/or V terms. Within this last set, only the highest valued E, V, or additive or multiplicative

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*The positive and negative scores were scaled -4 (high dissatisfaction) through +4 (high satisfaction), with a zero indicating a neutral response. The alternative valence scores used simply represented a 0 through 8 scale (0 indicative of high dissatisfaction and 8, high satisfaction).

combinations of terms were utilized. For those models subscripted "3", only the highest three valued terms or term combinations were used. Those models subscripted "5" utilized the best five terms or term combinations.

Table 21 lists the correlation coefficients between overall motivational force towards a setting (Fm or Fa) with the settings' SQ and preference ratings. Also included are correlations of these two criteria with individual model components and the variations of the model described above, using different component combination and/or scale value schemes.

At first glance, an expectancy theory approach receives considerable support. Conceiving force scores as average subject perceived utility of the settings, one notes a strong relationship between these and actual preference (attractiveness or probable choice) for the setting (r= .88), as the theory would predict. However, other expectancy model parameters proposed by Vroom were not supported.

First, although the valence component (ΣV) was not related to preference (r= .01) as should theoretically be the case, the expectancy component (ΣE) was as good at prediction alone as it was in conjunction with the valence terms (e.g., as Fm or Fa).

TABLE 21

PEARSON R CORRELATION COEFFICIENTS BETWEEN AESTHETIC QUALITY CRITERIA AND A VARIETY OF EXPECTANCY THEORY VARIABLES

	Scenic Quality	Preference
ΣV	-.03	.01
ΣE	.88	.88
Fa or $\Sigma(V + E)$	.87	.88
Fm or $\Sigma(V * E)$	.87	.88
$\Sigma V^{+/-}$	-.03	.01
$\Sigma (V^{+/-} + E)$	.87	.88
$\Sigma (V^{+/-} * E)$	.82	.82
ΣV_3	-.06	-.03
ΣE_3	.87	.89
$\Sigma (V + E)_3$	.86	.88
$\Sigma (V * E)_3$	.88	.89
ΣV_5	-.05	-.03
ΣE_5	.88	.89
$\Sigma (V + E)_5$	.87	.88
$\Sigma (V * E)_5$	.89	.90

NOTE: All coefficients are significantly different from zero ($p < .001$) except those 8 involving just a valence (V) term.

This was not predicted. All three of these models' correlations with preference were .88. Second, the supposed superiority of a multiplicative model over an additive one was not demonstrated. Both models yielded correlations with preference of .88.

One also notes that the accuracy of the model did not require a large number of separate expectancy and/or valence values. Use of an environment's best three or five average E or V values, as opposed to all ten that were collected, yielded nearly identical correlations with preference and SQ to those models that used all ten values.

Finally, the necessity of utilizing a valence component that incorporates both positive and negative scale values is also placed in question, as none of the models using such values outperformed those using all positive scores. However, as will be covered in more detail in the discussion section, this result may stem from an inadequate testing of this condition, due to properties of the particular data set used. Specifically, very few activities had negative average valence ratings, and those that did were only slightly so, such that these models were, in reality, nearly identical to the positively scaled models.

Overall, the correlations were high for all component and full model derivatives, excluding the valence components alone. Correlations with preference and correlations with SQ values were virtually identical, again indicating the near one to one correspondence these two criteria of aesthetic quality demonstrate empirically.

Hypothesis 8 --Environmental Familiarity as a Moderator of the Utility/Preference Relationship

It was suggested in the introduction that familiarity with a setting might relate to aesthetic perception and preference via links with utility associations held regarding that setting. That is, people more familiar with a setting should be aware of what the setting can offer (i.e., what activities it can support well) and hence, display higher environmental suitability expectations than those less familiar. With higher expectations, the attractiveness (or preference) of the environment increases. Likewise, familiarity should not relate to valence ratings of the activities, since these do not depend upon any specific setting being examined.

A second point was also proposed. In addition to being more aware of environmental potential (in terms of numbers of activities possible, or overall expectations of suitability for activity), those more familiar should collectively be more accurate in such assessments. Although no "true score" measures of suitability were available here, one means of implying accuracy in the measures is to compare the variances of such suitability ratings given to environmental settings for specific activites. Those higher in familiarity should display lower collective variances in scores, indicating more agreement among one another on the "true" value the setting ought to receive. Those less familiar should yield higher variance ratings, as they are not collectively as sure of such ratings, and thus would display a wider range of scores.

Several analyses were performed to address these assertions. First, the slide sample was sorted on the basis of the overall familiarity of the slides to the subjects. A composite familiarity score (the sum of the three specific familiarity measures) was used as the basis of this sort.

Separate correlation coefficients were then calculated between the two aesthetic criteria and a number of the expectancy theory models (e.g., ΣE, ΣV, Fm) using just the 20 most familiar and 20 least familiar slides in these analyses. If familiarity with the environment had a moderating effect on the expectancy/preference relationship noted thus far, one would expect a resulting set of diverging correlation coefficients between these two groups. Specifically, the relationship would be attenuated given less familiar environments. In these cases, decreased familiarity could lead to less accurate expectancy (suitability) predictions and weaker expectancy/preference relationships overall. Conversely, highly familiar environments should yield more accurate expectancy estimates, and with less random error present in the measurements, a "disattenuated" (higher) correlation might even result.

Such reasoning was supported by the results (see Table 22). Pearson r correlation coefficients between model variables and the criteria were all greatly reduced when calculated using only those low familiarity slides. Compared to the coefficients found using all 60 slides, the relationship of ΣE to preference dropped from .88 to .61, a result indicative of most of the other models' changes as well. The only exception to this general trend was that, within the low familiarity group, the valence variable (e.g., ΣV) correlations actually increased. For instance, ΣV with preference grew to -.17, compared to .01 when calculated using the total group.

TABLE 22

PEARSON R CORRELATION COEFFICIENTS BETWEEN AESTHETIC QUALITY CRITERIA AND SEVERAL EXPECTANCY THEORY VARIABLES FOR EACH OF THREE DIFFERENT SLIDE (ENVIRONMENTAL SETTING) GROUPS

	Total Slides (n = 60)		Lowest Familiarity Slides (n = 20)		Highest Familiarity Slides (n = 20)	
	Scenic Quality	Preference	Scenic Quality	Preference	Scenic Quality	Preference
Σ V	-.03	.01	-.33	-.17	-.15	-.17
Σ E	.88	.88	.64	.61	.89	.91
Σ (V + E)	.87	.88	.60	.60	.87	.90
Σ (V * E)	.87	.88	.64	.62	.88	.90
$\Sigma V^{+/-}$	-.03	.01	-.33	-.17	-.15	-.16
$\Sigma (V^{+/-} + E)$	.87	.88	.60	.60	.87	.90
$\Sigma (V^{+/-} * E)$	.82	.82	.59	.59	.78	.79

NOTE: All coefficients are significantly different from zero ($p < .001$) except those 12 involving just a valance (V) term.

Table 23 lists the Spearman rho coefficients for these respective relationships. In these analyses, apparent discrepancies between groups are heightened even further, with expectancy (ΣE) relationships dropping to r= .32 and valence (ΣV) relationships increasing to r= -.31.

Conversely, Tables 22 and 23 show that there were virtually no differences between correlations of model variables and the criteria when comparing high familiarity slide, and total slide groups. The expectancy (ΣE) variable correlations with preference were nearly identical (r's= .91 and .88, respectively), as were most other variable correlations. The one exception again appeared with the ΣV variable, where correlations rose from .01 to -.17. However, this relationship is tempered (.00 to -.06) if one considers the Spearman coefficients (Table 23).

Hypothesis 8b proposed that familiarity may mediate a preference or aesthetic response via its relationship to environmental utiliy. As utility is positivly related to SQ and preference, to the extent that familiarity can alter one's utility ratings, it also is (more indirectly) related to these criteria. Aside from noting that familiarity affects the degree of the utility/preference relationship, other analyses

TABLE 23

SPEARMAN RHO CORRELATION COEFFICIENTS BETWEEN AESTHETIC QUALITY CRITERIA AND SEVERAL EXPECTANCY THEORY VARIABLES FOR EACH OF THREE DIFFERENT SLIDE (ENVIRONMENTAL SETTING) GROUPS

	Total Slides (n = 60)		Lowest Familiarity Slides (n = 20)		Highest Familiarity Slides (n = 20)	
	Scenic Quality	Preference	Scenic Quality	Preference	Scenic Quality	Preference
ΣV	-.03	.00	-.39	-.31	-.18	-.06
ΣE	.89*	.88*	.39	.32	.89*	.87*
$\Sigma (V + E)$	.88*	.87*	.28	.23	.89*	.89*
$\Sigma (V * E)$	.88*	.87*	.33	.28	.91*	.89*
$\Sigma V^{+/-}$	-.03	.00	-.39	-.31	-.18	-.06
$\Sigma (V^{+/-} + E)$	.87*	.87*	.28	.29	.89*	.89*
$\Sigma (V^{+/-} * E)$	.84*	.83*	.29	.25	.79*	.82*

*p < .001

attempted to investigate whether this might be due to a positive familiarity-expectancy link. That is, increased familiarity with a setting leads to more knowledge about what potential opportunities for action the setting has to offer. This would correspond to high correlations between familiarity and expectancy terms in this research, while correlations between valences and familiarity should be negligible.

Table 24 lists the correlation coefficients between familiarity and the various models incorporated in the expectancy theory aspects of this research. In general, the relationship is high. Familiarity and ΣE correlate .70 ($p < .001$) indicating that those more familiar environments were also recognized as having overall higher utilities; specifically, these settings were perceived as being more suitable for more total recreation opportunities than was the case with low familiarity environments. Likewise, familiarity and ΣV did not correlate significantly ($r = .17$) as one would predict.

Additional analyses were carried out in an attempt to further examine this issue. High and low familiarity groups composed of 20 slides each were constructed and the mean values of many of the expectancy model variables compared via t-tests. Table 25 lists results of these analyses.

TABLE 24

PEARSON R CORRELATION COEFFICIENTS BETWEEN ENVIRONMENTAL FAMILIARITY AND A VARIETY OF EXPECTANCY THEORY (ENVIRONMENTAL UTILITY) VARIABLES

	Composite Familiarity	Residential Familiarity	Travel Familiarity	Indirect Familiarity
ΣV	.17	.08	.21	.18
ΣE	.70*	.56*	.72*	.75*
$\Sigma (V + E)$	.71*	.56*	.74*	.76*
$\Sigma (V * E)$	.67*	.53*	.70*	.73*
$\Sigma V^{+/-}$	.17	.08	.21	.18
$\Sigma (V^{+/-} + E)$	.71*	.56*	.74*	.76*
$\Sigma (V^{+/-} * E)$	.56*	.39**	.60*	.63*
ΣV_3	-.03	-.06	.04	-.06
ΣE_3	.73*	.59*	.75*	.78*
$\Sigma (V + E)_3$	.74*	.60*	.77*	.79*
$\Sigma (V * E)_3$	.72*	.57*	.75*	.78*
ΣV_5	.00	-.06	.06	-.04
ΣE_5	.75*	.62*	.78*	.79*
$\Sigma (V + E)_5$	.67*	.53*	.71*	.73*
$\Sigma (V * E)_5$	.68*	.54*	.72*	.74*

NOTE: Composite Familiarity is a linear composite of the three specific familiarity measures: residential, travel, and indirect familiarity.

*$p < .001$
**$p < .01$

TABLE 25

T-TEST RESULTS COMPARING THE MEAN VALUE OF A VARIETY OF EXPECTANCY THEORY (ENVIRONMENTAL UTILITY) VARIABLES BETWEEN GROUPS (SCENES) HIGH VERSUS LOW IN ENVIROMENTAL FAMILIARITY

Variable	Familiarity Group	N	Mean	Standard Deviation	T	df	Prob > /T/
Composite Familiarity	Low	20	3.63	0.84	18.20	38	.001*
	High	20	9.82	1.26			
Residential Familiarity	Low	20	0.27	0.20	15.77	38	.001*
	High	20	2.07	0.47			
Travel Familiarity	Low	20	1.09	0.48	17.39	38	.001*
	High	20	3.84	0.52			
Indirect Familiarity	Low	20	2.27	0.23	17.34	38	.001*
	High	20	3.91	0.35			
Total Valence (Σ V)	Low	20	51.50	0.82	1.29	38	.21
	High	20	51.83	0.80			
Total Expectancy (Utility) (ΣE)	Low	20	20.46	4.55	7.39	38	.001*
	High	20	32.25	4.84			
Additive Force (Σ [V + E])	Low	20	71.96	4.44	8.30	38	.001*
	High	20	84.08	4.79			
Multiplicative Force (Σ [V * E])	Low	20	104.76	23.37	7.52	38	.001*
	High	20	163.03	25.56			
Total Valence ($\Sigma V^{+/-}$)	Low	20	11.50	0.82	1.30	38	.20
	High	20	11.83	0.80			
Additive Force ($\Sigma [V^{+/-} + E]$)	Low	20	31.95	4.43	8.31	38	.001*
	High	20	44.08	4.79			
Multiplicative Force ($\Sigma [V^{+/-} * E]$)	Low	20	22.92	5.46	5.68	38	.001*
	High	20	34.04	6.84			

TABLE 25 (Continued)

Variable	Familiarity Group	N	Mean	Standard Deviation	T	df	Prob > /T/
Hiking Valence (V)	Low	20	5.93	0.11	1.16	38	.25
	High	20	5.98	0.12			
Camping Valence (V)	Low	20	6.29	0.06	1.70	38	.10
	High	20	6.32	0.06			
Canoeing Valence (V)	Low	20	6.37	0.05	0.46	38	.65
	High	20	6.38	0.06			
Hunting Valence (V)	Low	20	3.08	0.35	1.47	38	.15
	High	20	3.24	0.36			
Fishing Valence (V)	Low	20	4.98	0.27	0.95	38	.35
	High	20	5.07	0.31			
Horseback Riding Valence (V)	Low	20	5.83	0.47	0.96	38	.34
	High	20	5.71	0.36			
Motorcycle Riding Valence (V)	Low	20	5.02	0.29	1.30	38	.20
	High	20	5.13	0.25			
Photography Valence (V)	Low	20	5.44	0.19	0.18	38	.86
	High	20	5.45	0.25			
Bird Watching Valence (V)	Low	20	3.13	0.13	0.28	38	.78
	High	20	3.14	0.14			
Mountain Climbing Valence (V)	Low	20	5.42	0.16	0.35	38	.73
	High	20	5.40	0.16			
Hiking Expectancy (Suitability) (E)	Low	20	2.16	0.81	7.35	38	.001*
	High	20	4.27	1.00			
Camping Expectancy (Suitability) (E)	Low	20	1.74	0.75	9.00	38	.001*
	High	20	3.96	0.81			
Canoeing Expectancy (Suitability) (E)	Low	20	0.13	0.10	3.02	38	.01*
	High	20	1.40	1.86			
Hunting Expectancy (Suitability) (E)	Low	20	1.46	0.70	12.22	38	.001*
	High	20	3.93	0.57			

TABLE 25 (Continued)

Variable	Familiarity Group	N	Mean	Standard Deviation	T	df	Prob > /T/
Fishing Expectancy (Suitability) (E)	Low	20	0.17	0.12	3.36	38	.01*
	High	20	1.70	2.03			
Horseback Riding Expectancy (Suitability) (E)	Low	20	3.06	0.68	0.92	38	.36
	High	20	3.36	1.28			
Motorcycle Riding Expectancy (Suitability) (E)	Low	20	3.53	0.91	3.53	38	.001*
	High	20	2.41	1.09			
Photography Expectancy (Suitability) (E)	Low	20	3.41	0.62	5.55	38	.001*
	High	20	4.55	0.68			
Bird Watching Expectancy (Suitability) (E)	Low	20	2.36	0.78	9.44	38	.001*
	High	20	4.47	0.62			
Mountain Climbing Expectancy (Suitability) (E)	Low	20	2.43	1.28	0.50	38	.62
	High	20	2.20	1.67			

Overall, 13 out of 15 variables that either are or contain an expectancy (suitability) term have mean values that are higher for the predicted (high familiarity) group. The degree of difference is statistically significant ($p < .01$) in 12 out of 13 of these cases. Conversely, in only 1 of the 2 cases where the low familiarity group held a higher mean value, was the difference significant. No significant differences were noted for any variables that represented valence values alone. This held for 12 out of 12 cases. Such results strongly indicate that the relationship between familiarity and utility variables is through the expectancy linked terms and not the valences.

Finally, hypothesis 8c proposed that high familiarity should also lead to more reliable expectancy ratings for a setting being evaluated. To this end, an examination of the variances of the expectancy values given for high versus low familiarity environments was carried out. Again, high and low familiarity groups were selected and the mean variance scores of the expectancy (E) terms were compared via t-tests. It was hypothesized that the mean variances of the high familiarity group would be significantly lower than those of the low familiarity group.

TABLE 26

T-TEST RESULTS COMPARING THE MEAN VARIANCE VALUES OF ENVIRONMENTAL SUITABILITY FOR ACTIVITY (EXPECTANCY SCORES) BETWEEN GROUPS (SCENES) HIGH VERSUS LOW IN ENVIRONMENTAL FAMILIARITY

Variable	Familiarity Group	N	Mean Variance	Standard Deviation of the Variances	T	df	Prob > /T/
Hiking	Low	20	2.89	0.64	1.90	38	.07*
	High	20	2.40	0.97			
Camping	Low	20	2.44	0.67	1.46	38	.15
	High	20	2.78	0.76			
Canoeing	Low	20	0.30	0.27	4.42	38	.001*
	High	20	1.45	1.13			
Hunting	Low	20	1.82	0.58	4.98	38	.001*
	High	20	2.71	0.55			
Fishing	Low	20	0.46	0.38	7.16	38	.001*
	High	20	1.63	0.62			
Horseback Riding	Low	20	3.08	0.47	0.94	38	.35
	High	20	2.85	0.98			
Motorcycle Riding	Low	20	3.12	0.69	0.45	38	.65
	High	20	3.01	0.80			
Photography	Low	20	2.68	0.33	5.90	38	.001*
	High	20	1.72	0.65			
Bird Watching	Low	20	2.58	0.42	3.09	38	.01*
	High	20	1.97	0.77			
Mtn. Climbing	Low	20	3.11	0.94	2.04	38	.05*
	High	20	2.44	1.11			

Results of the t-tests are presented in Table 26. Overall, the results neither confirm nor dispute the hypothesis. Average variances of the high familiarity group expectancy scores were lower in only 6 out of 10 possible cases. Only 4 out of 6 of these were at a statistically significant level ($p < .10$, two-tailed). Of the 4 cases where the low familiarity group held lower variances, 3 of these were statistically significant between groups. In two cases, however, the expectancy values concerned two activities that necessarily required water (i.e., canoeing and fishing), and the specific manner in which expectancy (suitability) ratings were given for these two activities may shed light on these results--as possible special cases. A detailed explanation of this possibility is undertaken in the discussion section.

DISCUSSION

As this project involves investigation of several related yet individually important themes, the discussion is organized under three major sections. These correspond to the three major research emphases outlined on pages 35-40. Each section additionally corresponds to several of the research hypotheses listed on pages 61-64. Specifically, Theme 1, which involves examination of the similarity between two commonly utilized asthetic quality criteria, houses Hypotheses 1-4. Theme 2, which addresses the predictive ability and comparison of variables stemming from three different conceptual paradigms, houses Hypotheses 5a-6. Finally, Theme 3, which involves comparison of a between and within subjects approach to prediction; and specifically the use of an expectancy model in prediction of aesthetic response, houses Hypotheses 7-8c.

Theme 1--Examination of Correspondence Between and Conceptual Distinctions of Aesthetic Criteria: Scenic Quality Ratings versus Preference Ratings

Proper conceptual understanding and empirical distinction of the criterion are basic to any research effort. Unfortunately, resarchers in aesthetic perception of natural landscapes have paid less attention to what they are measuring in favor of the variables used to predict it. Yet, when the question of what "it" is has been neglected, there is little assurance that one is measuring what he purports to be, or that different researchers are measuring the same concept, especially when they utilize different operationalizations. Unfortunately, this has been the case in this field, and such is not altogether surprising given the approaches and philosophies brought to address both independent and dependent variable conception from fields as varied as forestry, geography, psychology and landscape architecture.

A concern voiced earlier in this paper was whether varied research efforts could be directly compared given the different operationalizations of aesthetic response used. Spcifically, it was questioned whether research involving measures of "scenic quality" (SQ), would yield results similar to research utilizing measures of "preference", especially as these two criteria seemed to differ on a conceptual basis. Would not measures of preference be open to numerous associations with the landscape itself rather than just being involved with its aesthetic qualities? And although no measures would be capable of eliminating such associations, would not measures of scenic quality conceptually reduce the chance of such intrusions entering into one's measures?

Empirical evidence addresssing this issue has been limited to date, although sveral efforts suggest that the two conceptual types of measures are highly related (e.g., Daniel & Boster, 1976; Zube, Pitt, & Anderson, 1975). The results from this research strongly confirm these earlier efforts, as the two criteria correlated very highly (r= .98). Thus, from a conceptual perspective, it can be said that subjects' perceived scenic (aesthetic) quality of natural settings is in large part related to the preference they have for said settings. (Conversely, subjects' preferences for specific landscapes ar highly related to the settings' perceived SQ.)

Thus, even though these two measures appear to have quite distinct conceptual definitions, when applied to this case they are virtually empirically identical; i.e., they are measures of the same thing. This finding should have much practical significance for those interested in uniting the prior research stemming from diffrent disciplines. It appears that direct comparison of results is feasible, even if the research criteria used have differed.

Several points related to this general conclusion are warrented, however. First, some may be skeptical regarding the degree of the relationship. Is it not possible that much of this apparent similarity is due to common correlated error variance in the measures? Since the ratings were made by the same subjects at a point separated by only five items in the research design, the concern is warrented. In fact, this point was brought up earlier as a reason to be cautious in interpreting Zube et. al.'s results, where the same subjects were also used in making both sets of ratings.

However, pilot research done prior to the current project (Greene & Feimer, 1985) suggests any inflation of the correlation due to shared error variance is minimal. As a part of that research, 100 slides of a variety of outdoor landsapes were shown to subjects in small groups (n=20-25). Separate groups of subjects were asked to rate the slides in terms of scenic quality <u>or</u> preference. Average slide ratings on both the measures correlated .95 across the 100 slides. Since such ratings were made by independent groups of subjects who were not aware of other groups making different types of ratings, no chance of the correlated error variance mentioned above existed. The results of that study merely provide one more case supporting the contention that these two concepts are highly related and in many respects identical when applied to natural landscape assessments. Thus, Hypothesis 1, predicting a high corrspondence between these two, is confirmed.

A second point related to the practical implications of such a conclusion involves further digging for what should be conceptual distinctions between the measures--even though they are nearly identical. Investigation of the actual relationship they have to other significant variables should be addressed, as this is a major means by which conceptual validity and distinctiveness are determined.

Hypothesis 2 was also confirmed. The individual subject preference scores used in generating mean preference ratings for the scenes were more variable than those corresponding scenic quality (SQ) ratings used to calculate mean SQ ratings. This was expected as the preference type measures should have conceptually been more open to differential subject associations, and hence larger discrepancies in the individual subject preferences. The practical implications for such a finding hint towards more favorable reliability ratings achieved with the less associationally laden SQ measures, especially in cases where few subjects are used in generating ratings. In cases where large numbers are used, the differences would be practically insignificant.

Do the two measures behave differently when compared to other important variables? The results of the multivariate regression tests suggest they do so, in a specified manner.

Significant differences between regression coefficients of models predicting preference and SQ were not found when applied to two-thirds of the physical variables utilized in this research. Hence, whatever conceptual distinctiveness these two have, it is apparently not related to how they correspond to an environment's physical characteristics. That is, an environment's physical features affect its perceived SQ and preference nearly identically.

This finding has major significance for those in the field who have been utilizing differing criteria yet a common assortment of physical type predictors. Although other physical measures may yield different results from those reported here, the available evidence suggests that as a "conceptual family" physical features correspond to these two criteria very similarly. Thus, results across studies utilizing the different operationalizations are likely dirctly comparable.

More caution must be extended to research involving other conceptual types of predictors, however. For instance, significant differences in regression coefficients were noted between the two when testing transactional variable, familiarity, and utility predictors.

An examination of the overall pattern of multivariate test results confirms what one would expect given the supposed conceptual distinctions of these two criteria. Differences are found between SQ and preference when the two's correlations with other variables (that are open to differential individual associations) are compared. A preference measure is open to influences beyond what one would consider purely aesthetic. It is more linked to individual differences in the subject rater and should thus react differently towards predictors that are also less objective, directly tied to the environment, or more subject to individual differences, than would a SQ measure.

Such was the case when comparing average environmental familiarity and transactional variables like novelty, mystery, and congruity. Significant differences existed between predictors' coefficients in 8 out of 8 cases ($p < .02$).

However, when more objective or less personally influenced measures were examined, the degree to which differences were noted decreased. Thus, the conceptual family of utility variables showed differences between the two criteria in only 8 out of 10 cases ($p < .05$). Whether this was due to a clearer idea across subjects as to what they meant or was due to the means by which utility was operationalized--as suitability of the environment for specific activity (which should logically be related to specific environmental features) is undetermimable.

Finally, the pattern continued for those variables where the most objectivity existed--with actual physical chaaracteristics of the environemnt. Here, SQ and preference behave almost identically. In these cases, no opportunity for individual interpretation entered, and the two criteria differed on only 5 out of 15 possible cases.

An additional point to note is that the direction of these differences was that which was posited in Hypothesis 4. Specifically, the relationships (correlations) between those variables open to individual interpretation (tranactional, familiarity, and utility) corresponded more highly with the preference measure (which is also subject to such influences); rather than to the more "sterile" SQ.

Why was this hypothesized? Scenic quality measures conceptually limit ratings to aesthetic attractiveness, while preferences involve more general attractiveness. Aesthetic quality, as conceived by conservative definition, should relate mainly to environments' visual elements and not other associational factors. However, such associational factors would likely be inherent in preference ratings, where no effort to restrict individual reasons (various associations) for general attractiveness exists.

The results confirmed this association, as in all cases where the correlations (standarized coefficients) between the two criteria and predictors were significantly different, the correlation with the preference measure was the stronger one.

Thus, for instance, how suitable the environment was for activity did strongly relate to both preferences and SQ, but more stongly to preferences. This relationship held for 7 out of the 8 utility variables that had significantly different coefficients. The one exception involved environmental suitability for photography, where the SQ correlation was higher. This is not surprising, however, as such suitability would probably relate more to the aesthetic qualities of the landscape (i.e., SQ), rather than on one's general preference.

Similar relationships exist for environmental familiarity as well; it is more strongly related to preferences than to "pure" aesthetic quality. A similar pattern found among the criteria and transactional variables is less conceptually easy to explain, other than to posit that such variables are open to individual subject interpretation and are not strictly objective measures of visual elements. What is mysterious, novel, or congruous to one person may not be so for the next. Complexity, a measure more clearly linked with specific elemental features in its definition, was more highly correlated with SQ. For the most part, significant differences did not exist between the respective correlations involving physical predictors--those variables not open to individual interpretation and most closely related to specific visual elements.

A general conclusion offered is that the slight bit of unrelated variance that exists between the two criteria takes on greater importance when dealing with predictors that capitalize upon their conceptual differences--a more objective SQ measure versus an associationally laden, individually-determined preference. It is an apparent fact that the two are empirically close; people's preferences happen to mirror "objective" SQ nearly identically ($r = .98$). Further, when using objective predictors like physical characteristics, that do not capitalize on or correlate with any conceptual differences, research using either term will likely yield similar results. However, as more individually influenced, less objective (inherent in the land) predictors are used, more differences in study results using one or the other will likely result as one capitalizes more and more upon the small unshared variance between the two.

What effects do these findings have in practical terms? On one level, it would seem prudent to excercise caution in equating results using the two different criteria when the research involves less traditional predictors (i.e., familiarity, utility, etc. as oppossed to physical variables). It is along such dimensions that the current results suggest that the two aesthetic crteria themselves may diverge; and hence, not yield identical findings. Research involving more objective predictors (i.e., physical features), like most of what has been done in the past, is less likely to yield differences dependent upon the chosen criterion.

On a more global level however, even research utilizing a variety of predictors may yield similar results irrespective of the criterion. Significant differences between the regressor coefficients of the two criteria were noted in multivariate analyses, but the differences were not random. For the most part, the preference rating correlations were stronger than observed SQ correlations; however, the pattern of relative strength between all 33 predictors used in the research, as evidenced by correlating the rank orders of the respective coefficients' strengths (preference with SQ) was .99!

This finding further suggests that the practical implications for noted differences--even in the cases involving less traditional predictor variables (like familiarity and utility) suggest very little worry in use of either of the criteria. Rather, decisions should be based upon that conceptual definition that best applies to one's situation. If the research is really concerned with aesthetic quality and preservation of such a natural resource alone, use of a SQ measure is warranted. If however, the research frame involves landscape beauty in terms of people's potential use, and overall attractiveness, a preference measure would yield the closest conceptual match of research problem to criterion. As this project is concerned mainly with the former, the remainder of the analyses involved only the SQ criterion.

Theme 2--Examination of Predictive Ability of Distinct Types of Independent Variables: Physical Characteristics, Transactional Variables, Familiarity, and Environmental Utility

Perhaps the strongest finding this research yields is that aesthetic perception can be accurately predicted by a wide variety of variables. In total, over 70% of the predictors selected at the outset of the study were significantly correlated with SQ ($p < .05$). Furthermore, predictors derived from three major paradigms of scenic quality research all performed well, indicating all approaches have empirical merit.

Interestingly, the predictors that were least valuable, purely in terms of r and R values, were those representing various physical features of the environment, contrary to what was expected (Hypothesis 5a). Several points are presented here, relative to this apparent discrepancy.

First, as was the case with all the specific variables selected representing each major paradigm (Psychophysical, Cognitive and Experiential), there is no definitive way to assess how well they represented that "paradigm" or how well (or poorly) they might have performed given a different environmental context. The specific slide set utilitzed in this research was one representing a variety of biome types--from eastern hardwoods to western deserts. An attempt was made to select a set that would yield highly generalizable results; yet this very sought generalizability directly affects the nature of one's results.

With the wide variety of settings used (specifically selected on the basis of providing a wide range of SQ values), a corresponding wide range of values for most of the transactional variables resulted. Such variables, as general concepts that should be applicable across a wide variety of settings, were tested in just such a situation. Perhaps it was an absence of a restricted range of values that enhanced their effect in this research.

Conversely, although fairly general physical feature predictors were utilized, the best physical characteristic models developed in the course of prior research involve fairly specific measurements applied to a fairly specific biome type. The best predictors are not expected to be identical, given a different task (biome). Rather, the specific physical components that best describe the new setting are sought. And while such models may be best for specific cases, they may lack power given vastly different settings.

The issue here, then, ultimately involves one's purpose. For describing SQ perception in general, the abstract concepts are quite applicable; however, when predicting response among a specific set of sites within one setting type, these concepts should fall short--the environment not offering a broad enough range of values to witness their effective operation. In these cases, specific physical predictors may be quite effective, yet would be less so given a wide range of settings. Thus, it is important to remember that this reseach deals with a general (aesthetic) response over a wide variety of settings. All findings should be interpreted within this context.

SQ Prediction: Physical Characteristics

Although having just noted that physical features may have the least potential given the broad environmental context, this is not to say they are not highly predictive. Models 1-4, which describe SQ as a function of physical correlates, all account for approximately 50% of its variance--a highly acceptible figure given the general nature of the predictors, the ease with which they were measured, and the broad range of settings to which they were applied.

Detailed interpretation of the models will be avoided for two reasons. First, location of a definitive interpretive model is first dependent upon specification of a definitive set of potential predictors. Given the exploratory approach of this project, some rather general ones were chosen, and there is no guarantee that other important ones were not overlooked.

Second, the purpose of generating specific predictive models was not so much to explain the aesthetic response, as it was to demonstrate that certain types of predictors could be useful, and to compare the relationships between predictor types. Since location of good predictive models in this research coincides with an all possible regressions approach and models that have stable coefficients, interpretation of individual terms is possible, but interpretation will remain general.

The importance of adopting a "family" approach to modeling was especially evident given the four models generated for SQ as a function of physical features. Two equally good models located (Models 1 and 2) contain none of the same predictors, a result that would have been impossible to obtain using stepwise procedures. Model 1 stresses SQ in terms of inverse relationships. The less bare soil, open expanses of grass, scrub brush, or shrubs present, the higher the SQ. Basically, subjects do not like dry, barren landscapes (ones often covered by scrub brush); similarly, more boring flat landscapes (evidenced by large grass fields or bare soil) are less aesthetically pleasing. Further insight into these relationships, as is evidenced by how the physical variables relate to specific transactional ones, is addressed in a later section.

Model 2 describes SQ in positive terms. Environments that are more complex, variable, or interesting seem to be those more aesthetically preferred. Specifically, settings with more trees, bare rock outcroppings, bodies of water, and visible sky have higher SQ. Again, these relationships can be explained in part by noting correspondence to certain transactional variables. Rock outcroppings interspersed with trees are typically part of more mountainous topographic settings--ones more interesting and complex. Such variety also has apparent links to increased novelty. The inclusion of the sky predictor probably indicates some visible view (i.e., lower spatial enclosure) aids in increasing perceived SQ. Again, more specifc interpretations involving physical features as they relate to transactional variable predictors will be examined subsequently.

Finally, a few notes concerning Models 3 and 4 are warrented. It is not surprising that man-made modifications have a negative effect upon perceived scenic beauty. Such features are likely related to the congrutiy concept, which decreases as the number of modifications increase. These features may appear "out-of place" or obtrusive in the scene, thereby reducing its total cohesiveness.

Although this variable is not strongly related to SQ here, had its range in the scenes been increased, its effects might have been much more evident. As this study was examining natural landscape perception, scenes were selected for the study purposefully avoiding "intrusive" man-made elements. But such elements likely have quite an effect. For instance, when correlations between man-made modifications and SQ were calculated using only those scenes in which at least some modifications were present (i.e., eliminating scenes completely devoid of any man-made elements) the bivariate correlation jumped from -.17 to -.55.

"Other" vegetation is a difficult variable to deal with since its meaning is unclear. Specifically, scenes high in "other" vegetation were those where vegetation in the distant background (usually on a hill or mountainside) was out of focus or not readily distinguishable. Sometimes it referred to vegetative forms that were rare (e.g., vines, cacti). However, more often than not, it was probably trees located on a distant mountainside, thereby implying a panoramic view, as opposed to an immediate viewing perspective for the observer. "Other" vegetation was positively related to SQ.

SQ Prediction: Transactional Variables

All five transactional variables tested in this research were highly effective in predicting the aesthetic response, thus supporting the contention that a psychological/cognitive paradigm approach has merit. In fact, in the broad based environmental context examined here, this conceptual family of variables was the most effective in predictive ability. Both Models 5 and 6, utilizing simply four variables apiece, predict over 80% of the SQ variance.

Obviously, the belief that such variables may be useful for such a task cannot be contested. The fact that they performed "better" than those from the "physical" family may attest to their usefulness in the general case of prediction across a wide variety of settings. To assist the reader in interpreting these concepts, some desriptions are given here by example of what types of scenes used in the research corresponded to low and high values of these variables.

Taken in unison, all the variables have a positive effect upon SQ except for spatial enclosure, which when used in combination with the others, is negatively related to the aesthetic quality of a scene. Care must accompany this interpretation, for spatial enclosure is by itself positively related to SQ. Thus, scenes that are completly open and flat (no enclosure due to topographic elements) are less preferred. However, the negative coefficient enclosure attains when used in conjunction with the other transactional variables probably attests to a decreasing SQ when too much enclosure occurs, e.g., when one is deep in the middle of a woods or facing a sheer vertical cliff. Hence, a degree of visibility beyond the immediate foreground apparently enhances SQ, while completly open, flat land ultimately detracts from it.

Complexity in a scene, which increases as the number and variety of distinct elements increase, enhances SQ. Thus, flat fields of grass, where no break in texture exists, would be quite low in complexity and SQ. Mountainous landscapes with a variety of trees and shrubs, perhaps a grassy field, and several rock outcroppings, would conversely be quite textured, highly complex, and higher in SQ.

Yet the sheer numbers and variety of elements alone do not increase SQ. The interpretive integrity of their arrangement, such that the pattern they create "makes sense", and the fact that all elements seem to belong, is what congruity measures. Quite interestingly, as will be detailed subsequently, when an analysis of this variable was performed using physical variables as predictors, no "acceptible" predictive models were located. Obviously, the concept truly dealt with arrangement and form of elements rather than just simpler present/absent type relationships that could be conceived via linear regression.

When examining the specific scenes used in this research for high and low congruity, the following aspects appeared. An apparent environmental texture element was present. Scenes were rated low in congruity if they displayed mosaic patterns of vegetation (e.g., scrub brush mixed with grass) or rock/soil and vegetation (e.g., sparse trees through which one could view bare ground). This was especially so if such a pattern existed in only part of the scene.

Scenes high in congruity consisted of often complex scenes, but those lacking the mosaic pattern. These scenes were often from a panoramic perspective, and always contained some obvious "artistic" focal point--whether this happened to be an obvious pathway through a woods, a river or waterfall, or even an obvious gap between mountain ridges. In essence, such scenes were viewed from a perspective such that a typically picturesque scene was before the observer--the kind one would expect painted by a landscape artist.

Scenes moderate in congruity had even textures--solid grass fields bordered by a solid woodland, for instance, but no obvious focal points.

Novelty and mystery were both positively related to SQ. Interpretation of novelty is interesting, for subjects did not conceive it as a conceptual opposite to familiarity. Rather, the term seems in many ways closely related to complexity. Scenes that were novel were interesting--less uniform in texture and topography (form), color, and element shape. Scenes low in novelty were flat, monochromatic, and repetitious in landscape element type. Overall, the term seemed to relate to a scene's stimulus arousal potential, and hence, increased attractiveness.

Mystery's verbal definition implied an "alluring uncertainty present in the scene, such that if one could 'enter and explore', a good deal more information would be available", i.e., everything contained in the scene is not obvious from one's current perspective. Thus, a flat landscape with low vegetation (grass or scrub brush) was low in mystery. Land covered with trees was more mysterious, as some aspect of the landscape could be considered hidden. Scenes containing trees interspersed with rock outcroppings or a river would rate even higher, for here is some obvious textural change "peeking through" that indicates a different land form type present. Roads winding around a mountainside or winding rivers are classic examples used to convey mystery.

Just as complexity and novelty correlated highly ($r = .87$) so did mystery and spatial enclosure ($r = .88$). Apparently, subjects perceived highly enclosed scenes as mysterious. Perhaps such landscapes sensitized one to specific differences in a view given the immediate perspective. With a panoramic view it might have been easier to dismiss a forest as a uniform pattern, rather than when one is in it and faced with a variety of brush, ground cover, fallen trees, smaller rocks, etc that indicate much more can be gained about the landscape if one explores. Obviously, scenes low in spatial enclosure allow open viewing and usually contain few elements that would arouse mystery. Everything to know about the scene is visible from one's current perspective.

To conclude, the obvious practical value (i.e., predictive power) of such variables makes them valuable. Such is probably most evident when they are used in a broad biome type context as was done here. Finally, although useful as is, they might be made more so if they could be empiricaly defined through specific manageable physical features. Such an examination would also further conceptual understanding, as it would force the definitions to correspond to something concrete rather than rely upon design terminology. Discussion of such a procedure is taken up in a later section of this report.

SQ Prediction: Familiarity

One other predictor type that has been linked to cognitive paradigm studies are individual difference variables. For the purposes of this research, environmental familiarity was selected to represent such a variable type. As with the other predictors, it was quite effective in describing SQ. Also of some note is that the way in which it is defined is directly related to this relationship. Specific definitions utilized correlated highly with one another yet differentially with SQ. Thus, given the wide manner in which this variable has been used in prior research efforts, it is no surprise that outcomes have differed indicating both positive and no relationships to aesthetic response.

Further, using more than one type added significantly to a multiple regression solution. Model 9 indicates that use of two types of familiarity, i.e., residence in the biome type and indirect knowledge (through books, films, etc.) can account for approximately 60% of the SQ response.

No specific conceptual explanations are offered as to why the specific forms of familiarity in Model 9 were selected for final model inclusion. Empirically, however, these two types were the least correlated of the three types measured. With less similar variance, greater unique variance was available for joint modeling. Apparently, residential familiarity also acted as a suppressor, indicating that familarity relationships are not entirely straightforward.

SQ Prediction: Utility Variables

The inclusion of utility variables as another means of predicting SQ was originally conceived from the perspective of the experiential/phenomenological paradigm. However, at this stage of analysis, utility was simply conceived as one more cognitive paradigm variable. In essence, it is a transactional type, because it requires human evaluation of the setting's characteristics given specific criteria to make a composite judgement.

In the case of the five transactional variables utilized, physical features were being examined to yield composite summaries of the relationship between the actual elements (e.g., complexity is a measure of the number and variety of elements, spacial enclosure is a measure of element size and position relative to the viewer, mystery is a measure of entire element viewing availability given the current viewer position).

With utility variables, those same physical features are examined but are the basis of a summary judgement which focuses on suitability of the element combinations for a specific activity. Logically, certain activities would require specific elements to be carried out sucessfully, (e.g., water is required to canoe or fish, mountains (and rock outcroppings) are required to mountain climb). The only difference in making these judgements is that the rater is called upon to compare the features not to just themselves, but to a set of behaviors making up the specific activity.

Overall, the utility variables did amazingly well in predicting SQ. The initial relationship was hypothesized through the linkage that aesthetic quality had to general environmental preferences. People should generally prefer those settings that allow them to participate in valued activities. Such a hypothesis is based in basic theories of motivation and reinforcement; that is, people will generally behave in ways that allow them to acheive valued goals. In this case, that behavior is conceived as a general gravitation towards (preference for) specific settings that allow them to acheive valued goals (here, specifically, participate in valued activites).

In actuality, since differential subject value levels are not measured here (they are addressed under Theme 3), the analyses essentially equates these values across all subjects and assumes that the more favorable an environment is for any activity, or for several, the more preferred it will be. As preference is itself a strong component to SQ, such a relationship will similarly exist for SQ.

Defining the activities in terms of outdoor recreation opportunites was done for two reasons: 1) It was felt most subjects would be somewhat familiar with them--hence, could respond knowledgeably and 2) Addressing such activities relative to an outdoor setting, made conceptual sense--more so than it would have been to address other more specific (or general) activities.

As was the case for all of the other predictors selected in this research, these specific utilities were merely selected to represent a test for the potential that such activity suitability measures might have in predicting SQ. The specific activities chosen have no theoretical significance, but the fact that as a group they were highly successful in prediction does.

Specifically, two equally good regression models were located that predicted SQ as a function of activities the environment could support. The models account for nearly 80% of the SQ variance. The astute observer will note the lack of a photographic suitability term in either of these models, a variable that correlated with SQ quite highly by itself ($r=.95$). This absence is not incidental, but due to the peculiarities of regression modeling and one's set of potential predictors. Although a series of equations were examined that included photographic suitability as one of its terms (e.g., a three term model of photography, bird watching, and hunting, $R^2p = .93$), these models exhibited unacceptable levels of multicolinearity. Examination of several equation diagnostics across these models suggested that the photography term was having an adverse undue effect upon the total modeling scheme.

Hence, Models 7 and 8 were developed from a full utility predictor set of only nine variables (i.e., excluding photographic suitability). Entirely different terms are revealed in these models, a fact clearly demonstrating the dependancy with which any regression modeling technique has for the initial set of predictors selected. Thus, camping, mountain climbing, and canoeing or fishing activities should not be interpreted as the most related to SQ, but rather as the best set given the nine originally examined. Considering the models each only contain three terms, predicted R-Squares are very high. There can be little doubt remaining as to the effectiveness of utility variables (or more specifically one's related to activity utility) in predicting and describing environmmental attractiveness.

Future efforts will be required, however, to more fully diagnose the extent of this relationship. Does it apply equally well, for instance, to other activity types, or for that matter, utility perceived in terms of more abstract goals rather than as activities?

<u>SQ Prediction</u>: <u>All Predictor Types</u>

Given that the predictors selected for inclusion in this research stemmed from a variety of philosophical paradigms, it was hypothesized that enough unshared variance would exist between them (that would also be uniquely related to SQ) that when combining predictors from several paradigms into one model, substantial increases in predictive ability would result.

Hypotheis 5b, this very contention, was supported as is evidenced by Model 10. Here, a five variable model containing three transactional variables, a composite familiarity, and composite utility variable predicts 90% of the SQ variance. This is nearly ten percentage points more than the next best model reported in this research. One should note that technically, this model is a derivative of just a 7 variable full model that includes the two composite variables and five transactional variables (i.e., all variables requiring observer ratings).

In addition, quite a few full models involving a variety of physical, transactional, utility, and familiarity variables were tested. Unfortunately, no model was located that satisfied all of the selection criteria set forth in this research. No subset models containing 5 or fewer terms yielded low enough Cp - p values to warrent further diagnostics. This was the case for full models tested containing 12, 17, 18, and 33 variables.

However, although no predictive model is officially presented, Model 11 represents the best possible model available (given the 33 variable full model) that is limited to 5 predictors. Interestingly, the outcomes when utilizing all the other full models tested (12, 17, and 18 variable) were conceptually identical. The same five variables yielded from the 33 variable analysis turned up in these best possible 5 term subset solutions. As these same three transactional variables, a familiarity term, and a utility term constantly belong to the best 5 variable solution, the importance of each of these variables is supported.

Also of interest is that in no cases did any physical characteristic variables show up in these model subsets. Obviously, such specific features did not contribute enough unique variance to a total solution to warrent inclusion. This finding supports the notion that certain cognitive paradigm variables, (like the transactional ones) in combination, are measuring much of the same SQ variance as the more specific physical predictors. In fact they appear to encompass more unique shared variance with SQ in the broad context, as they were the most important variables noted in the regression subset located.

To the extent that much of this variance is shared (between transactional and physical predictors), the transactional variables should be strongly related to the physical variables in their own right. Discussion of analyses involving just this point follow in the next section. Their importance has two bases. First, such analyses will conceptually aid researchers in better grasping the meaning of these variables in concrete terms. Second, if they are ever to be used as the basis for general prediction, resource managers would be aided by empirical ties linking these more general terms to specific manageable (physical) features, through which transactional variables themselves can be predicted and managed.

Transactional Variable Prediction/Description

Hypothesis 6 posits that the conceptual differences between the five transactional variables will be confirmed empirically. That is, as each is actually measuring a unique aspect of the way environmental elements are arranged, the concepts should lend themselves to empirical description via regression models using physical predictors. In addition, the "best" limitied variable models should differ among concepts, thereby demonstrating conceptual distinctiveness. In general, hypothesis 6 was confirmed.

Adequate regression models describing the concepts were located for four out of the five variables. The physical features that were most important in describing each of the variables differed as a function of the variable examined.

Complexity-- A family of five models describing complexity were located. The most important physical features related to this concept were trees and rock. It is likely these terms are tapping the "variety" component of complexity, as greater numbers of rock outcroppings interspersed with more trees tend to create a more variable texture pattern. In additon, rocks and trees reflected in the slide set used tended to be large enough to be interpreted as distinct elements, thereby increasing complexity by nature of number alone.

Conversely, those kinds of features that did not lend themselves to such individuality, but were rather more likely perceived as a perceptual whole, like bare soil and grass fields (Models 13-16), were negatively related to complexity. Such physical features are also typical of specific biome types (desert or grasslands) where fewer other elements break the pattern, and the landscapes are often flat--conditions leading to lower conceived complexity. Conversely, trees and rock are more often accompanied by less flat topographies. Mixed scrub brush and grass landscapes, also typical of the more dry, western regions, were similarly negatively related to complexity.

For the most part, such relationships logically coincide with complexity definitions; overall, physical features are good predictors of environmental complexity. However, this conclusion requires a footnote. In terms of a basic relationship to specific physical features--they do well. The two term Model 12 accounted for over 40% of the complexity variance. Apparently, a very stable, simple relationship exists.

However, the best five variable model located could only account for 49% of the variance, leaving quite a bit unexplained. This is no doubt due to the fact that complexity is due to more than just specific features, but in part, to a total pattern. Thus, even terms like grass and soil could, in limited amounts, increase complexity of a scene by making it more diverse in element type and pattern. In this way, a mountain scene encompassing a grassy field should be more complex than one covered with just trees. But such a relationship was not captured in the models located, no doubt due in part to the fact that grass was not often noted in such limited quantities in the natural settings surveyed, and hence carried instead a negative coefficient value.

Perhaps it is for reasons such as these that the tranactional variables were better predictors of SQ across a wide variety of settings. They apparently tap patterns of arrangement of features which are difficult to capture through physical feature models alone.

Novelty-- The extent to which environmental novelty could be explained by physical features was also limited. Model 18 accounts for 48% of predicted novelty variance, which, though respectable, is not extensive.

Given that the novelty and complexity variables were themselves highly correlated, it is not surprising that many of the same features important in the prediction of the former are also so for the latter. As was reported previously, novelty appeared to coincide with general "interestingness" of a scene, rather than as an opposite to familiarity. Hence, rock outcroppings and trees corresponded to higher novelty (as was the case with complexity), as well as does less bare soil and grass. In addition, scrub brush vegetation was negatively related to novelty.

The overall relationship of physical variables to novelty, as seen in Models 17 and 18, probably mirrors the general landtype as well--where more barren, flat, and dry landscapes (evidenced by more bare soil, scrub brush, or grass) were less novel or interesting. Apparently, scenes low in novelty (high grass and scrub brush content, low rock outcropping and tree content) were viewed less "unique, unexpected, or surprising"--words used in defining the concept to subjects. Uniform grass or scrub brush is not unique, and such a scene offers little surprise to subjects. However, scenes with more rock and tree content offer potentially unique, unexpected boulder formations, interspersed among a background of trees--certainly more surprising, novel, or as has been interpreted here--interesting.

As was the case with complexity however, over 50% of novelty variance can not be accounted for by physical features alone. Thus, several of the scenes rated highest in novelty involved mountain and hilly landscape scenes, that in addition to being composed mainly of trees and interesting rock formations, included segments of grassy fields. Likewise, a barren scene, featuring several hills of rocky soil and a few scrub bushes was rated moderately novel--predictions the models could not accurtately make.

<u>Spatial Enclosure--</u> The enclosure of the environment relative to one's position was much better represented by regression models, than were the previous two concepts. Models 19-21 had predicted R-Squares ranging from .61 to .66. Predcitors that were common to all three models included trees, shrubs, and "other" vegetation. Such terms' inclusions are logical, as trees and shrubs are the two vegetation types that would be taller than the human observer, and as such would increase the enclosure, especially from an immediate viewing perspective. As the other vegetation term usually corresponds to trees that are out of focus in the distance, often on hills or

mountains, the term is probably indicative of a topographic factor, i.e., landscapes with mountains correspond to more enclosure.

Two other positively related terms included in one model each were rock and water. Inclusion of a rock term is not surprising, as bare rock outcroppings more often than not, correspond to mountainous topograpies or sheer cliff faces. The water term is more difficult to explain, as one might expect a negative relationship--a flat expanse of water related to a more open view. However, inspection of the specific scenes that contained a water component indicate that the lake, river, etc. present was either surrounded by trees (if the observer perspective was immediate), or part of a somewhat hilly or mountainous topography, (if panoramic). Such situations are often the case in natural settings, where the natural course of a river is to cut its own gorge. The term's inclusion is not surprising given the slide set used in this research; however, caution need be taken when contemplating just how general an effect this would be using a different set of water landscape scenes.

Finally, the amount of sky present was negatively related to enclosure in Models 19 and 21. Obviously, this term corresponds to a lack of enclosing vegetative or topographic elements (i.e., trees or mountains), that from an immediate perspective, would greatly restrict view and visible sky.

Mystery-- Environmental mystery was adequately described by two physical characteristic models (R^2p = .62 and .66). Four predictors were common to both--soil, grass, scrub, and man-made modifications. All four were inversely related to mystery. The presence of more bare soil, scrub brush and/or grass should logically decrease mystery, as these forms of ground cover lack any height with which to obscure one's view and "hide" other potentially present features. Conversely, trees (Model 22) are positively related to mystery, probably for exactly the opposite reason.

The negative influence of man-made modifications stems from a detracting influence they have on the whole natural setting. Buildings, fences, and paved roads apparently remove some of a scene's "alluring uncertainty". These are recognizable features for most people. However, as was alluded to earlier (on page 47), the exact nature of the effects of such features are not addequately addressed in this research, as natural scenes were selected with a conscious attempt to avoid greatly intrusive man-made elements.

Finally, a sky element is included in Model 23. The more visible sky, the less mystery a scene has. This relationship is explainable along two lines of reasoning. First, the obvious reason is that the more open sky visible, the less land visible in one's view.

Second, as was noted earlier, mystery and spacial enclosure are highly related such that more enclosed scenes are also more mysterious. There, it was suggested that with a more immediate viewing perspective (as would be the case when one stands "in" a forest, as opposed to looking at its border or down on top of it), one is less likely to perceive the trees as a blanket element. They are more distinct and individualized. One is sensitized to peculiarities and enhanced potential for more knowledge should he explore, than if they view a "blanket green of trees" from afar. Visible sky likely indicates less enclosed, immediate perspectives which enhance mystery.

Congruity-- No "good" predictive models were located describing congruity. Models 24-26 only accounted for slightly over 30% of the predicted congruity variance. This lack of good fit between straight physical predictors and congruity is probably due to its concentration upon the overall pattern that a scene's elements compose, rather than the nature of specific elements themselves. Its definition calls for a "harmony, fittingness, or compatibility" of elements, which does not logically preclude the inclusion or omission of any elements in general, but rather their arrangement and grouping.

However, how should that variance accounted for be explained? One notes the presence of a man-made modification term in two of the models. Such features probably lack in compatibility within the context of the natural settings sampled.

Other features may be perceived as more or less compatible or comprehensible, in general, no matter what they are paired with. Could such be the case with trees and water, and inversely with scrub brush? It was noted earlier that low congruity scenes displayed a characteristic mosaic pattern (typical of scrub brush landscapes) which most tree landscapes lack. Conversely, the presence of an obvious pathway leading to a focal point is characteristic of scenes with high congruity. Many of the scenes containing water were of rivers, which would satisfy this condition.

<u>Transactional Variable Prediction</u>: <u>Conclusion</u>

Overall, four of the five transactional variables could be adequately described ($R^2p \geq .50$) as a function of specific landscape physical characteristics. The limits to which this could be done probably lie both in: 1) the nature of the definition of the transactional variables, and 2) the minimally complex physical predictors utilized here.

Concerning the first point, transactional variables involve, by definition, more than just attention to physical charateristics present, but to the arrangements of these features as well. As such, they conceptually transcend mere linear combinations of physical variables. Composition should be important. Not surprisingly, congruity, which most closely involves the patterning of elements, was the least best described in the regression models. Conversely, spatial enclosure, which concerns the relative viewer distance from and presence or absence of elements, was the best described variable in the modeling.

Concerning the second point, the general nature of the physical features used may have reduced predictive potential. More specific physical variables would likely allow more complex description. For instance, by definition, one should be able to contruct a measure of complexity solely through use of physical factors. More specific measures of the features would be required--like actual counts of the number of trees, or listings of species. Although the practicality of doing such would probably be limited to the extent that such information is already available, the point is, increasing specificity could in part yield higher degrees of correspondence between physical characteristics and various transactional variables.

Utility Variable Prediction/Description

A greater understanding of the transactional variables was generated by noting how they related to an environment's physical characteristics. Similar insight concerning the utility variables, results in doing the same for them. Logically, such variables, as operationalized here, should directly relate to physical characteristics. The suitability of a setting for specific outdoor recreation will depend upon the physical features required to successfully engage in that activity.

By noting different patterns of predictors among the different activities examined, one empirically verifies their conceptual distinctiveness. Further inspection of these relationships may also shed light upon why specific activity combinations are the best predictors of SQ.

Of the ten activities measured, adequate descriptive regression models were located for all but the horseback and motorcycle riding activities (R^2p = .14 and .33, respectively). For the most part, interpretation of the models is straightforward. Total R-Square values may in part reflect how dependent specific activities are upon physical features of the environment, although different outcomes could result with a different set of predictors.

These analyses do strongly support the reasoning used to select outdoor recreation activity as a potential SQ predictor in the first place. Specific physical features of an environment which have most consistently been used to explain SQ response in the past, are stongly related to setting suitability for specific activities as well. Given this logical (and now empirical) link, plus the added generality these concepts have (to cover variance to preference/SQ related to <u>motives</u> for attractiveness), their usefulness is both theoretically and empirically secure. Some brief summaries of these relationships follow.

Camping suitability (Models 31 and 32, Table 12, R^2p = .47) was a function of less bare soil and scrub brush, and more trees and rock. In general, land that provides more natural shelter (trees), is less open and dry (soil, scrub brush), and is not extremely steep (lack of mountainous topography) is most suitable.

Mountain climbing (Models 33-36, Table 13, R^2p = .50 to .52) was related to rock and trees; and inversely to soil, grass, shrubs, and flat and hilly topographies. Obviously, it requires mountainous topography and rock outcroppings. Soil, grass, and hilly and/or flat topographies all are indicative of non-mountainous landtypes.

Photographic suitability (Models 37-39, Table 14, R^2p = .51 to .54) was related to less soil, man-made modifications, grass, scrub brush, and shrubs. It was positively related to trees, rock, water, sky, and "other" vegetation.

Interestingly, it was these same ten features that composed the four models presented that predicted SQ. This is not surprising; landscapes most suitable for photography are those that are highly aesthetically pleasing. Photographic suitability and SQ were highly correlated (r = .95). Thus, landscapes with more trees, rock outcroppings, water and sky, are more picturesque. (Some sky insures the view will not be too enclosed.) Such features (trees, rock, and other vegetation) are also associated with more extreme topographies. Landscapes with more soil, grass, scrub brush, shrubs or man-made modifications are less picturesque. Many of these features (scrub, soil, and grass) are also associated with more barren, dry, flat landscapes.

Hiking suitability (Models 40-42, Table 15, R^2p = .64 to .68) was a function of moderate topographies (hilly), some ground cover (trees), and interesting rock formations. Dryer landscapes (mixed scrub and grass) were deemed less suitable.

Landscapes suitable for canoeing and kayaking (Models 43-47, Table 16, R^2p = .65 to .70) were those with water, trees, and rock outcroppings. The presence of the rock term could correspond to the favorability of river type waterways (which are often bordered by or pass around rock formations) to open lakes for canoeing. Mountain topographies were inversely related to canoeing suitability, indicating extreme drops in elevation were not desirable. Likewise, scrub brush vegetation (indicative of more desert like biomes) indicated less suitability.

Fishing suitability mirrored most of the relationships noted for canoeing (Models 48 and 50, Table 17, R^2p = .58 to .61). Specifically, environments required water and some rock, and an absence of scrub brush vegetation. However, less importance of specific topographies was evident, and overall, fishing suitability was less well represented by physical characteristics than was canoeing suitability.

An environment's suitability for bird watching and general nature study (Models 53 and 54, Table 18, R^2p = .69 to .70) was enhanced by more trees and shrubs but less scrub brush and bare soil. Thus, the more lush, less arid biomes were perceived as more favorable. In addition, the presence of man-made modifications decreased such suitability.

Finally, suitability for hunting (Models 55-58, Table 19, R^2p = .69 to .72) required trees and water, but an absence of bare soil, scrub brush, or mixed grass and scrub. Thus, those elements that correspond to lush habitats (trees and water), as opposed to grass and scrub brush environments, were specified here.

Environmental Utility: Conclusions

Overall, these results point strongly to the allegation that the suitability for specific recreation activities can be reliably and differentially linked to specific environmental features. This point, coupled with the links established earlier between outdoor recreation activities and SQ have interesting implications.

In an era where more and more emphasis is given towards managing our natural resources with multiple uses in mind, research similar to this would prove very useful. To date, research has been carried out that examines what effects different silvicultural, mining, and energy production practices have on natural landscapes' scenic beauty. Solutions to problems that offer both the best cultivation of natural resouces and preservation of the scenic quality are desirable. However, just as the preservation of SQ has been deemed an important consideration in management of these resources, so has the importance of preserving and using public lands for recreation purposes. This research indicates strong links can be established between recreational use suitability and enhanced SQ congruently; such a finding should be a welcome fact to those landscape administrators who wish to manage lands with as many compatible uses as possible, in order to maximize the land's output.

Subsequent research in this area could concentrate on providing empirical evidence for what sets of activities are the most compatible in terms of both required physical features and overall perceived attractiveness for entire regions. Initial studies could concentrate on actually establishing empirical links between aesthetic quality and recreation activity opportunity enhancement through management of the same physical features in a setting.

Familiarity Variable Prediction/Description

Finally, a greater understanding of the familiarity measures employed was sought. To this end, regression models predicting subject environmental familiarity as a function of specific physical characteristics were developed. If highly predictive models were found, a rather homogeneous set of subject raters would be indicated. Such was the case. Models 59-61 had predicted R-Squares ranging from .51 to .63. Obviously, the subjects employed in this research were fairly homogeneous in terms of familiarity.

It should be noted that this was the case for all three familiarity types, thus adding merit to the general conclusion. In addition, the fact that these three familiarity ratings yielded different "best" predicitve equations supports the contention that this variable can be measured on several dimensions.

Specifically, subjects had lived in (and hence were familiar) with settings that contained tree vegetation, and was of moderate (flat or hilly) topography. They had not lived in (western) environments typical of high scrub brush vegetation.

Apparently, in terms of familiarity as a result of travel, subjects were still not familiar with the more western United States regions. Those settings with more bare soil, scrub brush, or extreme (mountainous) topographies were considered unfamiliar. However, landscapes containing large bodies of water were. Thus, although not typically living near rivers, lakes, etc., the subjects had visited such settings frequently enough to feel familiar with such features.

Finally, familiarity due to indirect knowledge (i.e., books, films, word of mouth) was very similar to that due to actual travel and visits. It should be noted however, the subjects considered themselves slightly more familiar with grasslands than with desert and western scrub landscapes. Several models not specifically reported in the results contained positive valued coefficients for grass and negatively valued coefficients for mixed (grass and scrub) predictors. These results again confirm the (expected) regional bias of the sample in terms of familiarity. Are there any important implications given this conclusion?

One point to be considered is how much effect familiarity per se has upon SQ prediction. Were the strong relationships noted previously due to differential aquaintance the subjects held with specific settings and their features; or was this effect noted primarily because the subject group happened to be familiar with eastern settings and those features most typical of such? Such feature types might naturally be perceived as more aesthetically pleasing than those uniquely typical of western settings (e.g., more scrub brush and less vegetative ground covering).

A definitive answer to that question is impossible, as this research failed to question a heterogeneous sample in terms of familiarity. However, examination of several past studies may shed light on the issue and suggest possible follow-up. Wellman & Buhyoff (1980) have suggested that no regional familiarity effect exists, and therefore generic landscape preference models are viable. Their design incorporated an equal mix of Rocky Mountain and Appalachian region slides, and groups of subjects from Utah and Virginia. Subjects from both regions ranked a series of slides on preference nearly identically ($r = .90$). However, other analyses indicated no inherent preference for either the eastern or western landscape slides. This last fact may, of course, be related to the specific sample used--which did not contain scenes particularly devoid of vegetation or with a preponderance of scrub, as was the case with the current study.

Other studies have suggested a familiarity effect (Herzog, Kaplan, & Kaplan, 1976; Lyons, 1983; Pederson, 1978; Penning-Rowsell, 1979), although the relationships are quite complex. It is quite likely that the effect is dependent upon the level of analysis one uses. For instance, Herzog et. al. noted differential preference correlations depending upon which of several groups (dimensions) of slides were examined. Positive correlations between the two were noted for (urban) scenes that were the least familiar and preferred overall; but negative correlations were found with scenes that were most familiar and preferred. Pederson noted a significant correlation between familiarity and aesthetic appeal for only certain scene types, i.e., a strong relationship between the two with beach scenes, yet not with desert or forest scenes.

Lyons examined persons' general preferences for scenes from radically different biomes (desert, savannah, coniferous, deciduous, and rain forests) as a function of their own residential area. Ratings of preference for desert scenes from those residing in a desrt biome were significantly higher than ratings from those residing in northern coniferous forests. However, these same residents preferred many coniferous forest scenes over desert scenes as well.

Thus, conclusions in the past likely vary depending upon one's level of analysis--both within the experimental design (i.e., is one looking for significant differences between specific levels of familiarity and specific environmental types, or looking for familiarity across all subjects and environmental types), and in terms of the generality of one's slide set. Familiarity effects may not be noted for highly familiar or preferred areas or for specific environmental types, yet if more general relationships are sought, and a broader set of slides utilized, effects may develop. Such a reason may have been why Wellman and Buhyoff failed to note differences between groups in their study. Within the biomes they were testing, there may be little effect. Yet with a wider range (as with Lyon's work) effects may surface.

Specifically turning attention to this research's results, all one can conclude is that some form of familiarity effect exists. This research approaches the concept from a broader level of analysis, or generality of environment, than has been attempted in some past efforts that have questioned the effect. And although some of its degree may correspond to a similarity between specific features of the environment that are generally considered more preferable (i.e., trees and water, as opposed to bare soil and scrub), which also coincide with this sample's regional similarity, the fact that a familiarity predictor is included in all generations of the full variable prediction equations tested, indicates variance unique to it alone exists--aside from any it holds in common with specific physical features, arrangements of such, or knowledge relative to environmental utility.

Familiarity's relationships with SQ perception are obviously complex. However, this complexity should not lead to deliberate ignoring of its potential value and its continued investigation.

Theme 3--Examination of Environmental Utility and Familiarity as Predictors of Aesthetic Response within an Expectancy Theory Framework

Quite a large portion of the introduction was devoted towards the proposal that a phenomenologically based variable, one that might capture some aspect of environmental meaning to the individual, could greatly enhance prediction of aesthetic response, and in turn shed light on its processes. For the purposes of this research, such meaning was defined in terms of environmental utility, where several distinct concepts could be combined under the framework of an expectancy model, yielding one composite predictor. Such an approach also allowed individual assessment of model components and examination of various ways in which they might be combined.

The model, as tested here, was composed of two types of variables. First, ratings of how suitable a particular setting would be for 10 designated outdoor recreation activities (outcomes) were collected. Earlier analyses and discussion (see pg. 181) referred to these as utility or environmental suitability ratings, and indicated that they were, by themselves, highly predictive of aesthetic response. Within the framework of an expectancy model however, they were referred to as expectancy (E) ratings, since they represented expectancies subjects had as to how likely a specific setting would support engagement in a specific activity, i.e., an environmental suitability for the activity.

A second variable consisted of ratings of how much satisfaction individuals would expect to receive from participating in each of the 10 activities. These valence (V) ratings, when combined with corresponding activity's expectancy scores and then summed for a specific setting, gave a total motivational force (F) score or "pull" towards the environment. In general, it was hypothesized that such force scores should correspond highly to aesthetic response, especially in terms of environmental preferences.

Overall, the results strongly support this contention. Interpretation, however, can fall at several conceptual levels. On a broad scale (and ignoring the specific intracacies involved with the expectancy analyses results), the fact that calculated motivational force correlated highly to scenes' preference and SQ scores, empirically supports the general contentions of numerous environmental theorists mentioned earlier (e.g., Ittelson, 1978; Stokols, 1976, 1978; Wapner, Kaplan, & Cohen, 1973) who claim environmental perception necessarily requires attention to meaningful interpretation relative to persons' needs, goals, and expectations regarding future activity.

Specifically, the general success with which such F scores and the individual E scores (environmental utility/suitability) predict SQ and preference is solid evidence that attraction towards a setting is strongly linked to one's expectations held of that setting regarding, at a broad level, potential behavioral outcomes, opportunities for action, and most likely, chances to achieve various goals.

This research happened to measure merely one aspect of meaningful interpretation relative to the individual, i.e., environmental suitability for engaging in (valued) activities. However, the success this measure of environmental utility acheived sets precedents both: a) for the importance of taking more personal (i.e., phenomenologically based) measures into consideration when addressing environmental perception generally (and aesthetic perception specifically), and b) for showing that such variables can be easily operationalized, measured, and utilized, as was done here.

Once again, results were nearly identical when comparing SQ and preference ratings, thereby supporting the contention that even if not conceptually identical themselves, they must empirically relate to some concept representing aesthetic response in general.

Thus, although the force felt towards one setting over another was initially hypothesized in terms of a preference for that environment, the fact that preferences (a general attraction) towards settings are empirically the same as perceived aesthetic (SQ) reactions, leads to interesting inferences regarding the role of meaningful (and possibly individual) interpretation in aesthetic assessment.

One must conclude that aesthetic perception is strongly linked to the individual through one's experiences, in terms of expected environmental potential for (in this case) action. Therefore, attractiveness is in part related to the meaning that the stimulus has to the person, or as operationalized here, environmental utility. Aesthetic perception thus, reaches beyond general principles of design, or mere physical feature patterns of a setting alone. It is not something based strictly upon universal principles.

Such a view is obviously contrary to that proposed by authors like Laurie (1975) or Daniel and Vining (1983) who, as mentioned earlier, specifically state that landscape quality assessment should not involve aspects like opportunities for recreation activities (Daniel & Vining, 1983, p. 41), and should actually avoid references to preference measures, as such likely contain "utility preference elements" (associations of the land with use or activities) (Laurie, 1975, p. 106). Obviously, the strong relationships of these to pure SQ ratings noted in this research speak otherwise.

Of course, to say that meaningful interpretation, perhaps even a utilitarian interpretation, is a likely component of aesthetic perception, is not to say that more traditional factors do not play an important role. The current research has also noted fairly strong relationships between SQ and basic physical features, and even a variety of complex transactional variables, which represent the combination of such features into meaningful patterns. These meanings (not related to utility type assessments) probably mirror many common design concepts most often used to describe aesthetic experience. Such features themselves have even been shown to directly relate to similar aesthetic evaluations of landscape scenes (Patsfall, 1984). Thus, the emphasis here is not to denigrate the value of one type of predictor over another, but merely to emphasise that one should not deny the existence of a more utilitarian aspect of aesthetic response. Neither pure design elements, physical characteristics, transactional variables, nor utilitarian predictors alone can account for all of the variance in SQ. Rather, all in some ways likely blend in creating a final aesthetic assessment.

Second, it is important to note that although the origins of such utility predictors are based within a phenomenologiacl perspective to aesthetic response, this need not mean use of such cannot be streamlined to fit an "average value inherent in the land" perspective, compatible with other assessment philosophies, like the psychophysical and psychological ones. This was done in the current project, showing that from a management perspective, it is not impossible, costly, or inconvenient. The current effort also proved that such transformation does not necessarily lead to a reduced effectiveness in prediction. The between subjects analysis scheme used in evaluating the predictability of the utility variables was quite effective.

Before addressing the issues relevant to specific aspects of the expectancy model utilized in these analyses, two final asides regarding the above general conclusions are warranted:

1) The fact that a utilitarian factor of aesthetic assessment was strongly evident may in part stem from the nature of the aesthetic ratings themselves. These

ratings were made by the general public (i.e., students) and not design experts; perhaps such a public would have been more susceptible to such a factor, as opposed to professionals, who would be trained to base opinions on more traditional design elements. Research does show that landscape assessments between groups of these types does differ (Buhyoff, Wellman, Harvey, & Fraser, 1978). Perhaps utility effects would be moderated had a more "knowledgeable" subject pool been used in making the ratings. On the other hand, if one takes the view that public lands ought best to be evaluated and managed with the public's interpretation of scenic quality in mind, the above point becomes irrelevant.

2) Finally, although the above findings hold interesting implications for aesthetic perception in general, for the moment they are only considered relevant for aesthetic perception towards a fairly specific stimulus type--natural landscape settings. Such outdoor settings may be inherently more susceptible to utilitarian influences, especially as they apply to specific activities, since most all perception of landscapes, by necessity, is made within the very context of activity. As explained by Unwin (1975) earlier (pg. 33, Introduction), landscapes

cannot be perceived passively; they surround a person, and are always interpreted within the context of some activity or purpose. It should not be surprising, therefore, to find that even their aesthetic assessment is somehow linked to associated activities.

Examination of Individual Components and Variations of the Expectancy Model

Full Model versus Component Predictability: Although the overall effectiveness of an expectancy (utility) approach was clearly demonstrated, questions regarding the theoretical integrity of basic model proposals arise. The most obvious is probably why full model predictors that combined valence and expectancy variables (e.g., Fa and Fm) did no better in predicting the criteria than did the individual expectancy values (ΣE) alone. The fact that the valence (ΣV) component alone was not predictive of aesthetic response was expected, as such values are logically independent of the environments to which they are applied. The people who supplied ratings to a full range of aesthetically attractive and unattractive settings all had the same V values for the 10 activites used in the research.

However, the average E ratings representing how suitable a setting was for activities overall, were highly predictive of environmental SQ and general preference--as much so as when combined with the valence scores, which was contrary to what expectancy theory would predict (hypothesis 7a). Why? As the mathematical difference between E scores alone and the F scores merely involves the addition of the V component, an examination of the actual V scores sheds light on this issue.

One suggestion is that differences were noted because most all of the recreation activities examined were fairly well liked. With such a restriction in range of score variance, little difference would be noted when combined with the wide range of values gathered relative to environmental suitabilities (E's) for activity. This would be especially evident in the case of an additive force model (Fa), where such additional scores would amount to little more than adding a constant value to all the E scores, and hence, near identical correlations.

A second thought simply centers upon the effectiveness of the ΣE scores themselves. As they proved so highly correlated with SQ and preference to begin with, improvement in any case would have been difficult. In essence, a ceiling effect may have been operating.

Positive versus Negative Range Valence Scores: A second important proposition of Vroom's expectancy theory, the importance of positively and negatively valued valence scores, was tested. Three models using this "full range" scaling were compared to the models reported thus far, which simply used all positive scale values. Hypothesis 7b proposed that the full range scaling would lead to better prediction. Such was not the case. Again, the specific nature of the valence values used in this research point towards an explanation.

The fact that many of the activities rated were well liked in general also corresponds to the fact that the range of scores itself was nearly all positive. Simply put, all activities, on average, were expected to bring satisfaction to the subjects. Only two--hunting and bird watching/nature study--received slight average dissatisfaction ratings. Thus, what was supposed to be a test of a full range of scores, which would capitalize upon positive versus negative scaling, turned out to be a rehash of the same data merely scaled down 4 points (i.e., instead of a scale of 0 to 8, a scale of -4 to +4). Unfortunately, the two activities whose range now dropped below zero did so only very slightly (the average negative value was

-.85), so that this supposed test of scaling differences was an inadequate one, due simply to a restriction of range (and few corresponding negative score values). Therefore, judgement as to the necessity of full range scaling as proposed by the theory must be suspended here.

Full (10) Term Models vesus Partial (Best 3 or 5) Term Models: Other tests were conducted investigating the extent to which a reduction in the number of outcomes (activities) used in the modeling would reduce predictive efficiency. Again, no differences were noted between predictor-criterion correlations utilizing only the best (highest valued three or five) E terms, V values, or E/V additive or multiplicative combinations versus those using all ten terms. This is not very surprising, as past research confirms the innecessity of including a large number of outcomes in one's equations (e.g., Shiflett & Cohen, 1980; Wanous, Keon, & Latack, 1983).

Also, the very effectiveness of the best three or five environmental suitability (E) terms in predicting aesthetic response alone (see Table 1), coupled with a general common variance held among many of the activities (see Table 3), would indicate that models only utilizing these "best" predictors should not be much less effective in prediction than the full 10 term models. After a point, adding one more similar predictor to a composite score would not likely yield much unique individual variance to the new score values thereby enhancing prediction. The results seem to confirm this. The best 3 and 5 term models tested were just as effective as the ones using all 10 terms' (activities') scores.

The Additive Force versus Multiplicative Force Models: Comparison of the two most commonly used means of combining V and E scores into composite variables indicated no differences in predictive efficiency between the two. This is contrary to what Vroom (1964) had initially proposed (i.e., the necessity of a multiplicative combination) but not contrary to other research results that suggest that an additive model may, in some cases, prove as effective as a multiplicative one, or that individual differences in cognitive processing lead people to use one over another (e.g., Fusilier, Ganster, & Middlemist, 1984; Stahl & Harrell, 1981).

In the case of the current research, the issue is again somewhat clouded by the nature of the valence scores collected. Multiplicative models would mathematically show biggest differences compared to additive ones where 1) score ranges were highly variable and 2) both positive and negative valence values were utilized. Unfortunately, neither of these conditions was particularly heightened here, at least regarding the valence terms. Thus, inadequate conditions existed by which a true comparative test between models could be conducted. At best, one can merely conclude that neither form appeared superior in the current effort.

Conclusions: Expectancy Model Parameters given the Aesthetic Quality/Environmental Utility Prediction Case

Thus far, discussion in this section has been limited to implications of the results relevant to expectancy theory propositions themselves. Unfortunately, due to the nature of the data, few solid conclusions have been offered.

However, more definite conclusions can be made in regards to how this approach applies to the case at hand--aesthetic quality assessment via specific utility predictors framed under an expectancy model. Obviously, the approach is highly effective from a predictive standpoint. From a practical one, it seems advantageous too. Not only was the information easy to gather, but the data regarding environmental suitabilities might prove useful to managers interested in multiple (and compatible) uses of land tracts.

The importance of including information relative to activities' valences appears less necessary, as most recreation activities appear to be generally liked and such measurements, at least in this research, did not improve prediction. Managers need not likely be concerned with including a large number of activity assessments either, for use of only those few most liked or thought to be best suited for a particular landscape were as good at prediction as use of a whole list of activities.

This is not to say no room exists for follow-up research along these lines. Besides the testing and refinement of different systems similar to that utilized here (especially if being applied to a specific region, as opposed to a set of general settings, as with this research), the importance of considering other types of "outcomes" in expectancy models would be valuable. Depending upon the type selected, one might also find that valence terms and full range (+/-) scaling again become useful.

For instance, if outcomes tested were for more specific aspects of a setting, corresponding to conditions related to specific activities, one might find the valence component more important. Aspects related to hiking/backpacking, for example, might include: probability of spotting snakes, having to cross rough terrain, ease of finding dry and level areas, availability of water, presence of bears, opportunity for scenic vistas, etc. The valance component might take on added value here for two reasons.

First, some of these factors would certainly hold negative valences for people. Hence, the range and importance of dissatisfying events would be evident (as was not really the case in the tests of general activites, done here). Second, the effectiveness of a negatively valued outcome affecting overall assessment of preference in the current research was questionable in its own right, for even though a negatively valued activitiy might be associated with an area, that does not mean that a person rating would have to participate. Its suitability for them would probably be irrelevant, unless they were concerned with the likelihood of meeting others who were doing this (which might apply to some activities like hunting). In general, however, people should most likely be concerned only with those positively valued activites, how suitable, and how many would be suitable for a given setting, as these measures directly relate to opportunities for action.

On the other hand, with specific features related to given activities, identified negative aspects would not be avoidable (while one chooses not to engage in hunting and it is therefore irrelevant, one simply cannot count on avoiding snakes, rough terrain, bears, etc.) hence, negative features would be relevant to practically all making the assessments.

Obviously, much room for further exploration on such issues is available. How such specific features would relate to preferences would have both practical and theoretical significance.

Familiarity as a Mediating Variable in Aesthetic Preference/Utility Relationships

The notion that familiarity relates to aesthetic perception of natural landscapes has been supported by numerous research efforts (e.g., Herzog, Kaplan, and Kaplan, 1970; Lyons, 1983; Pederson, 1978; Penning-Rowsell, 1979) and although by now a fairly established phenomenon, it has been left relatively unexplained. In response, one series of hypotheses examined here proposed that familiarity's effects might, in part, be explained through a relationship to persons' perceptions of environmental utility, which in turn relate to aesthetic reactions more directly.

Logically, familiarity could be positively linked to utility via the expectancy (environmental suitability) component. If more familiar with a setting, people should also be more aware of the various opportunities for activity. Within the current framework, this could correspond to being more aware of what kinds of activity could be engaged in, and overall higher environmental suitability rankings for the setting by those more familiar with it. Such a link has been indirectly referred to by others, most notably Lawler (1973) who notes that familiarity, i.e., past experiences with similar situations, could greatly effect one's estimates of expectancies given a current case. Those better informed would better be able to estimate the so called "true expectancies" offered by the environment.

Valences, on the other hand, have no logical relationship to environmental familiarity, as they are made independent of the settings themselves. Hence, although potentially important in a utility assessment, they should not be influenced by differential environmental familiarity.

Overall, the results of the familiarity analyses support the contention that familiarity may relate to aesthetic assessment through its relationship to environmental utility perception. In turn, such utility assessments are likely the more direct link to aesthetic reactions as they correlate more highly with them than does familiarity (e.g., .88 and .58, respectively). At the least, familiarity certainly moderates the normal environmental utility/attractiveness relationship. Correlations between preference (or SQ) and various expectancy theory models were greatly reduced when only low familiarity environments were utilized to calculate coefficients.

Additional analyses also support hypotheses 8a and 8b, which proposed the linkage was through the enhanced awareness of environmental opportunities overall. This would be evidenced by higher expectancy (environmental suitability) scores, and higher total expectancy (ΣE) and motivational force (Fa and Fm) values for high familiarity groups. No such relationships were hypothesized between familiarity level and valence values.

T-tests comparing high and low familiarity settings indicated that individual E (environmental suitability) values, total setting expectancies (ΣE), and total motivational force (Fa and Fm) were significantly higher in the high familiarity settings. Valence values of the activites were not statistically significant between groups. As additional evidence, familiarity and such expectancy predictors correlated quite highly (.67 to .74) while familiarity and valence scores were not significantly different from zero (-.03 to .17). Thus, the linkage appears to be through the E component, where it is most likely a result of higher expectancies (or more, in the case of summed variables) found with settings that are more familiar.

Hypothesis 8c suggested one alternative means by which the expectancy familiarity linkage might exist, via a more accurate assessment of the E scores for individuals who were more familiar with a setting. Hence, while the previous linkage was framed in terms of improved validity of the E scores as a result of higher familiarity, this linkage suggests familiarity may enhance reliability of the scores. With less resulting error variance in the measures, an improved chance for more accurate prediction occurs.

This question was somewhat indirectly addressed in the current effort by comparing the variances of the E scores between high and low familiarity groups.

Hypothesis 8c proposed that variances of individual expectancy (environmental suitability) terms of those in a high familiarity group would be significantly lower than those variances displayed in a low familiarity group. Results were inconclusive. Although 6 out of 10 of the variances noted for the activity suitability ratings were in the predicted direction, only 4 of these were statistically significant. Also, 3 of the 4 that were in the non-predicted direction were significant, although two of these, involving the variances of environmental suitability ratings for canoeing and fishing, probably represented a special case.

When the ratings were actually collected, the experimenter noted on several occasions that some raters appeared uncertain as to how to judge environmental suitabilities for these two activities. Did the slide showing a scene have to show water in order for the scene to be rated at all suitable? Or could the rater make slight inferences relative to the general landscape type, and base a rating upon what they felt was probable suitability given the landscape vegetation, topography, or a small section of water in the bottom corner of the scene? As one student put it: "I don't technically see any water in that scene, but

I've done a lot of canoeing, and that landscape looks extremely similar to the type I'd see on either side of a river gorge.".

As students were told they could make slight inferences, it is quite likely that students highly familiar with landscape types used more leeway in assigning suitability ratings for these two water required activities, than those students less familiar with settings. Those less familiar probably relied on an either-or approach to suitability. If water were obviously present, the setting was suitable for these activities, if not present, it was not. Thus, for these special cases, those more familiar with the settings would have displayed more variance in ratings.

It is interesting to note that the mean variance levels of activities for those highly familiar slides did not differ greatly, while they did for the low familiarity slides. In other words, these differences in variability in the opposite direction than that predicted were not due to a change in variance levels in the high familiarity group, but to a much lower than average variability of scores just for those two activities in the low familiarity group, where decisions were likely simplified to a dichotomous choice based upon the presence or absence of water.

If one accepts this reasoning, the results now appear more favorable in terms of support of the original hypothesis. Six of eight variances are in the predicted direction (four of which are significant) and only one of the two non-supporting cases is significant. If nothing else, these results certainly warrant follow-up testing of this issue, where the proposal that familiarity quite likely affects variability (and hence reliability) of utility ratings is examined.

Conclusions: Environmental Familiarity as a Utility Moderator

Overall, some fairly convincing evidence has been presented suggesting that familiarity with specific settings moderates the accuracy with which one perceives the environment, at least in terms of potential for carrying out specific activites. Although the exact nature of this relationship is uncertain, two proposals were made. The first suggested that greater familiarity increased one's awareness of what opportunities a setting might offer in terms of potential activities, thereby enhancing total perceived utility. From an expectancy theory framework, this increase corresponded to higher expectancy (and not valence) values. Fairly solid evidence exists to support this proposal.

A second suggestion was that greater familiarity led to greater accuracy in judgements made in general, thereby enhancing reliability in one's measures, and reducing random error variance (which might decrease "true" levels of correspondence between utility and preference judgements). There was less conclusive evidence supporting this contention, however, irregardless of what explanation is behind the moderating effect, the fact that it exists at all should be of interest to scenic resource managers.

At this point, it would seem prudent to require those who are utilized in making ratings, especially if a utility based predictor is incorporated in the overall assessment plan, to be fairly familiar with those settings being evaluated. Differential, less useful (predictive) results will likely surface otherwise. Obviously, future investigations need to be carried out in this area, if such utility measures are eventually to be considered reliable enough to achieve equal status with other predictor types.

SUMMARY AND CONCLUSIONS

The following points represent a condensed outline of the major findings and conclusions that have been presented throughout this report.

I. Theme 1: Comparison of Aesthetic Quality Criteria

A. Although conceptually distinct (by definition), the two aesthetic quality criteria, scenic quality (SQ) and preference, were empirically, nearly identical (r= .98).

B. In addition, the pattern in which these two criteria correlated with 33 predictor variables was nearly identical (r-rho= .99).

C. Although empirically the same on several bases, several hypothesized differences were noted between the two, thus confirming some conceptual distinctiveness between them.

1. Preference ratings had slightly higher (statistically significant) variances, thus supporting the contention that they were open to a wider range of associational influences whan were SQ scores.

2. Multivariate analyses indicated that the relationship between predictors and the criteria differed as a function of predictor type. Predictors that required higher degrees of individual interpretation (i.e., transactional variables, familiarity, and utility ratings), displayed significantly different beta weights on prediction equations between the two criteria. Physical variable predictors were much more likely to yield non-significant differences in such tests.

D. From a pragmatic standpoint, research utilizing either criterion should yield nearly identical results.

1. Past research using either of the two criteria is probably directly comparable; especially if the predictor variables are physical features of the environment.

2. When conducting future research, selection of which criterion to use should be based upon one's conceptual purpose since empirical distinctions are nearly non-existant. If concerned with aesthetic quality alone, selection of the more "sterile" SQ is warrented; if one's concerns are broader, for instance, aesthetic quality in conjunction with possible uses of the landscape, then preference measures are desirable.

II. Theme 2: <u>Examination of Predictors of Aesthetic Quality</u>

A. Predictors stemming from all three research paradigms were highly effective. Thus, approaching aesthetic response from any of these perspectives was empirically validated.

B. It was suggested that different predictor types might be differentially effective given the context of the task.

1. Multiple regression equations utilizing physical features of the environment were effective (R^2p= .54), yet not to the degree as has been found elsewhere (e.g., Buhyoff, Gauthier, & Wellman, 1984--R^2p= .91). Two explanations were offered for these differences:

a) The specific physical features used here were too general to effectively differentiate between environments, or

b) Overall, physical feature predictors do best when fairly specific measures are selected for specific land types, i.e., they may be less effective across a variety of biome types, as was the case with the current slide sample.

2. Multiple regression equations utilizing transactional variables (e.g., complexity, congruity, spatial enclosure) were highly effective (R^2p= .84). Perhaps the value of such concepts in prediction and understanding is that they do apply to the general case, i.e., they represent

aesthetic concepts that transcend specific setting attributes and are applicable at a level above specific physical features.

3. Multiple regression equations utilizing a utility concept, framed here in terms of a setting's ability to support various recreation activities, were also highly predictive of aesthetic response (R^2p= .79). It was suggested they might be quite valuable in situations where both consideration of aesthetic quality and potential multiple uses of the land are required by managers, especially if those uses are of a recreational nature.

4. Familiarity with a setting was an effective predictor (R^2p= .59), however, assessment of its true contribution to aesthetic perception could not be made as the subject sample was regionally biased (i.e., all from the eastern United States). It was therefore impossible to determine what part of this relationship was due to familiarity per se, and what part was due to the physical features typical of eastern landscapes, which were more positively related to SQ than many western features like scrub brush and bare soil.

5. Finally, use of multiple predictor types was advocated in future research and project efforts, for both theoretical and pragmatic reasons.

a) Pragmatically, prediction equations are enhanced beyond what would be achieved using only one type of predictor (although this may not apply to all cases, i.e., involving specific settings where physical predictors alone have done quite well--see point #1 above).

b) Theoretically, more information needs to be gathered concerning the interrelationships between predictor types (especially physical to transactional or utility), and the general efficacy of utility and transactional types within different circumstances.

C. Regression modeling relating the transactional and utility variables to proven physical feature predictors indicated much variance in common and "legitimized" these concepts from a managerial perspective by indicating they could be linked to and defined by controllable (physical) aspects of the land.

1. Transactional variables were likely differentially predictable as a function of how much they represented composite measures of the presence or absence of specific physical features (e.g., spatial enclosure with an $R^2p= .66$) versus the arrangement of specific physical features into meaningful patterns (e.g., congruity with an $R^2p= .30$). While these effective predictive attempts pave the way to utilize such concpts as defined in manageably controllable ways, their advantage may lie in that part of their variance not tapped by the physical predictors alone.

2. Utility variables (defined here as environmental activity suitability) were also strongly linked to specific physical features of the environment (e.g., canoeing with an $R^2p= .70$; hunting with an $R^2p= .72$) thus supporting the contention of those in the recreation behavior and leisure research fields--that outdoor recreation opportunities are strongly related to different sets of physical features. The relative success with which utility variables of this type relate to SQ, the established empirical link they have to manageable physical features, and the need to consider multiple uses of the land when making policy decisions involving SQ, should make them a valuable contribution to the field.

III. Theme 3: <u>An Expectancy Theory Conceptualization of Environmental Utility</u>

A. Environmental utility scores (ratings of how suitable the environment would support a variety of outdoor recreation activities) were conceived as expectancy (E) scores within an expectancy theory framework. When combined with ratings of expected satisfaction gained from participation in these activities (valence (V) scores), a final motivational force score was derived. It was hypothesized such scores would be stongly related to environmental preferences.

1. A variety of expectancy models and model components were strongly related to both preferences and SQ (r= .88).

2. The results suggest the importance of considering factors related to individual meaningful interpretation of a setting, and perhaps specifically, a utilitarian interpretation, as potential components of aesthetic assessment. In other words, aesthetic perception is related to (and perhaps dependent on) more than just universal design principles.

B. Tests examining the effectiveness of several expectancy model variations and their components were conducted.

1. Expectancy terms (ΣE) were as predictive of preferences as were full models (e.g., $\Sigma(E * V)$, r= .88). Valence terms (ΣV) were not significantly related to preference (r= .01).

2. Full range (+/-) scaling of valence values was no more effective in prediction than simple positive value scaling.

3. Additive (Fa) and multiplicative (Fm) force models were equally effective in prediction.

4. Partial (3 or 5 best) term models were as effective in predicting preference as were the full (10 activity) term models.

5. Explanation for the lack of difference between numerous model variations (especially the full range (+/-) versus positive range (+) valence scaling models, and additive versus multiplicative force models) involves a probable scaling problem with a restiction of range in the valence scores. Specifically, nearly all

activities were satisfying to the subjects. Only two of ten were expected to be dissatisfying, and at that, only slightly so. In essence, the range of scores was likely too small to yield large differences between Fa and Fm models, and comparing (+/-) to (+) scaling was running a nearly identical test, since virtually no negative valence scores existed.

C. These results point to several practical implications should managers wish to implement such a utility variable as part of an environmental assessment scheme.

1. If using recration activities as the environmental outcome, use of expectancy terms alone is probably all that is required. If valence terms are used as well, full range (+/-) scaling would not likely be necessary since most all activities are liked by subjects in general.

2. Managers need not worry about collecting information on numerous activities, as a measure of the best few suited activities to an area will likely yield just as effective prediction as would one involving an exhaustive list.

D. Familiarity with a setting type moderates utility-preference relationships in terms of predictive accuracy.

1. Familiarity moderates utility ratings through its effects on the expectancy component and not the valence component.

a) Expectancy values are highly related to familiarity (r= .70) i.e., those more familiar are likely more aware of enviornmental opportunities for activity.

b) Some evidence suggests E ratings may also be more reliable (i.e., have lower variances) for those settings that are more familiar.

2. From a pragmatic standpoint, managers would be advised to use raters familiar with the settings being assessed if they plan to incorporate utility measures in an assessment system.

E. Further research should be conducted regarding utility variables in relation to:

1. their efficacy over a variety of different settings,

2. the nature of environmental familiarity as a moderating variable, and

3. the effects of using outcomes other than recreation activities. Utilizing more specific environmental outcomes might alter other relationships as well, like the thus far noted unimportance of valence terms, by providing a wider range of (both) positive and negative values.

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Appendix A

Sample Questionnaire/Rating Scale Packet

Statement of Informed Consent

The purpose and procedures of this research have been fully explained to me by the investigator. I understand that I am to view a series of photographic slides of landscape scenes, which I will rate with regard to several descriptive characteristics. In addition, I will be answering an opinion inventory regarding recreation activities.

I understand that the duration of my participation will be no more than two hours, and that I will receive two experimental credit points towards my grade in Psychology 2000 (Introductory Psychology).

I know that I am free to terminate participation at any time and for any reason. I also understand that my participation involves no psychological or physical health risk, and that my responses will be kept confidential and anonymous.

I hereby agree to voluntarily participate in the research project described above and under the conditions described above:

Date:____________________________

Name:____________________________

Soc. Sec. #:____________________

Signature:______________________

Questions about this research project and the prodedures used should be directed to:

Lawrence D. Greene
Investigator
Department of Psychology
5091 Derring
(703) 382-2658

Dr. Christopher M. Peterson
Principle Investigator
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Human Subjects Committee
Department of Psycholgy
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Section A: Ratings of 10 Outdoor Activities

The following list represents a series of activities that one might be able to participate in, in an outdoor recreational setting:

1--Backpacking/Hiking	6--Horseback Riding
2--Camping	7--Motorcycle (Trail) Riding
3--Canoeing/Kayaking	8--Photography
4--Hunting	9--Bird Watching/Nature Study
5--Fishing	10--Mountain Climbing

You may or may not have participated in such activities before, but in either case we would like you to estimate for each activity in turn, how much you might value participating in them.

Use the scale provided here to make your estimates of how much expected satisfaction or dissatisfaction you would derive from participating in each of these activities, given an ideal setting and conditions. Mark your ratings on the opscan sheet provided. The experimenter will instruct you as to which rows on the opscan should be used for these ratings. Are there any questions?

I-----Dissatisfaction-----I I-------Satisfaction------I

1	2	3	4	5	6	7	8	9
High		Moderate		Don't Know or Neutral		Moderate		High

When you have completed making your ratings, please wait for further instructions from the experimenter before proceeding.

Section B: Familiarity Ratings

You will soon be viewing a series of slides representing different types of environments. We would like to get an idea of how familiar or knowledgeable you are with each of these sample environments. Since this can be conceived in several ways, for each slide shown, we would like you to answer the following three questions related to familiarity:

1) I have lived in or near to this type of environment.

1______2______3______4______5______6______7

Never — A Fair Amount of My Life — All of My Life

2) I have visited or have made trips to this type of environment.

1______2______3______4______5______6______7

Never — A Few Times — Quite Often

3) I have knowledge of this type of environment through my reading of books or magazines, watching films or television, or through friends and/or relatives.

1______2______3______4______5______6______7

No Knowledge — Some Knowledge — Very Knowledgeable

For each slide, make your ratings in the order that these questions have been presented, on the opscan sheet provided. The experimenter will announce to you which rows on the opscan should correspond to ratings for each presented slide. Are there any questions?

Section C: Utility Ratings

You will soon be shown a set of slides representing different types of environments. For each slide presented, we would like you to rate how much you feel that the specific environment shown would allow or support participation in each of 10 different activities that one might engage in, in an outdoor recreational setting.

Use the scale provided below in making these ten ratings for each slide presented. Remember, this has nothing to do with whether you would like to participate or not. Rather, it is a judgement based on whatever knowledge you might have, as to how well you would expect the environment to support that activity (or how successful one might be able to engage in the activity in that particular environment).

How suitable and/or supportive would this environment be for [activity]?

Activities:

1--Backpacking/Hiking	6--Horseback Riding
2--Camping	7--Motorcycle (Trail) Riding
3--Canoeing/Kayaking	8--Photography
4--Hunting	9--Bird Watching/Nature Study
5--Fishing	10--Mountain Climbing

1_______2_______3_______4_______5_______6_______7

Not at All Suitable — Moderately Suitable — Extremely Suitable

Please mark your opscan sheets in the order in which these 10 activities are listed above. The experimenter will announce to you which opscan numbers you should be marking for each slide presented. Are there any questions?

Section D: Environmental Ratings

You will shortly be viewing a series of slides that represent different types of environments. We would like from you, some ratings that reflect various characteristics of these environmental scenes. In doing this we will use some concepts that stem from fields related to landscape architecture and forest management. For each slide presented we would like you to rate the scene on the following characteristics: Scenic Quality, Complexity, Congruity, Mystery, Novelty, Spatial Enclosure, and Preference.

Some of these measures are more subjective than others, (e.g., preference) and are meant to be so; others may seem to be somewhat confusing or subjective, but past research has shown that they can be quite reliable and useful given that they are derived from enough subjects.

For the purposes of this study you should use the following definitions when making your ratings:

Scenic Quality--The overall aesthetic quality of the scene; its general beauty.

Complexity--The diversity of the scene in terms of the number of perceptually distinct elements present. The greater the number and more varied the elements in the scene, the greater its complexity.

Congruity--The degree of harmony, fittingness, and compatability evident in the interrelation of the scene's elements. The more a scene's elements seem to interrelate, go together, or form a comprehensible pattern, the greater the scene's congruity.

Mystery--The degree of alluring uncertainty projected by the scene, as if more information could be obtained from deeper exploration of it. Is everything contained in the landscape evident from one's current perspective, or could one better comprehend it by "walking into it" for further exploration? The more a scene promises additional information as a result of such exploration, the greater the mystery of the scene.

Novelty--The degree to which the scene or its elements are novel, unexpected, or surprising. The greater a scene's uniqueness, the greater its novelty.

Spatial Enclosure--The extent of surrounding enclosure found in a scene. The more enclosed one's view (due to vertical topographic and vegetative elements), the greater a scene's spatial enclosure. Conversely, the more open a scene is; the less covered, encompassed, or obstructed one's view, the lesser the spatial enclosure of the scene.

Preference--The degree to which you like or are attracted to the scene; your general preference towards it.

In general, there are no explicit standards for making these ratings. You must use your own judgement. For each scene shown, rate it on each of these seven characteristics, using the following 7-point scales, in the order in which they are presented here. Record your ratings on the computer opscan rating sheet provided. The experimenter will instruct you as to which numbers on the sheet should correspond to the ratings for the current slide being viewed.

Rate each slide on the following scales:

1______2______3______4______5______6______7

Very Low	Moderate	Very High
Scenic Quality	Scenic Quality	Scenic Quality

1______2______3______4______5______6______7

Very Low	Moderate	Very High
Complexity	Complexity	Complexity

1______2______3______4______5______6______7

Very Low	Moderate	Very High
Congruity	Congruity	Congruity

1______2______3______4______5______6______7

Very Low	Moderate	Very High
Mystery	Mystery	Mystery

1______2______3______4______5______6______7

Very Low	Moderate	Very High
Novelty	Novelty	Novelty

1______2______3______4______5______6______7

Very Low	Moderate	Very High
Spacial Enclosure (High Openness)	Spacial Enclosure	Spacial Enclosure

1______2______3______4______5______6______7

Very Low	Moderate	Very High
Preference	Preference	Preference

You will be given as much time as necessary to complete these ratings. Are there any questions? Does anyone need some redefinition as to what these terms mean?

Appendix B

Definitions of Physical Feature Predictors

Physical Variable Definitions

Rock: Any surface area of distinguishable rock.

Soil &/or Gravel: Any surface area that is not rock and not covered by vegetation.

Water: Any surface area covered by enduring water bodies (e.g., ponds, lakes, rivers, streams).

Man-Made Modifications: Surface areas that represent major modification to otherwise "natural states", due to man's influences (e.g., roads, fences, buildings, downed trees). Note that dirt roads were not included in this category but in the category "Soil &/or Gravel".

Sky: Surface area of visible sky, including clouds.

Clouds: Surface area of clearly distinguishable clouds.

Trees: Any surface area consisting of tree-like vegetation. Tree-like is defined as a large plant consisting of a central "stem" and having greater height than width.

Grass: Any surface area consisting of grasslike vegetation, or low lying (less than 18") vegetative groundcover.

Scrub Brush: Surface area consisting of clearly defined small woody and ground (herbacious) vegetation between 18" and 3' in height; often vegetation with a width greater than or approximately equal to its height.

Shrubs: Surface area consisting of clearly defined woody plant vegetation between 3' to 15' in height; often vegetation that has multiple stems.

Mixed Scrub and Grass: Any surface area consisting of a fairly homogeneous pattern of vegetation from both the "Grass" and "Scrub" categories.

Flat Topography: Any topographic surface areas that are relatively flat, i.e., which show only minor deviations in elevation where the apparent slope is less than approximately 10 degrees.

Hilly Topography: Any topographic surface areas consisting of slightly elevated land masses (approximate height of not more than 2000 feet). These are usually characterized by land masses whose topographic features are rounded, in comparison to those in the "Mountainous" category.

Mountainous Topography: Any topographic surface areas consisting of substanstially elevated land masses (approximate height greater than 2000 feet) whose slope is greater than 10 degrees. Often characterized by a land mass which projects conspicuously above its surroundings and is distinguished from the "Hilly" category in any of three ways: 1) Its height is substantially greater than the maximum elevation allowed for a hilly classification. 2) Its apparent slope is at some point greater than 50 degrees, and often contains large topographic areas that are nearly vertical cliffs. 3) Its features are more pronounced and/or sharp than the rounded contours associated with the hilly classification.

Other and/or Nonidentifiable Vegetative Features: Any surface area covered with vegetation not included in the previous categories (e.g., cactus, vines) or any surface area that contains an undistiguishable vegetative covering (i.e., out of focus, due to extreme distance in the bakground of a scene).

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