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Contextual fit of residential structures in forested landscapes

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CONTEXTUAL FIT OF

RESIDENTIAL STRUCTURES IN FORESTED LANDSCAPES

by

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STATEMENT BY AUTHOR

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ABSTRACT

Contextual fit relationships have been examined in many different man-made environments. To date, however, investigation of contextual fit relationships between man-made structures and natural settings has been minimal. The present research examines contextual fit of residential structures to their forested settings. Structure color contrast to setting was found to be inversely related to both perceived fittingness and aesthetic appeal. A positive relationship between fittingness and aesthetic appeal was uncovered. The bearing that these findings can have on visual quality, preservation of forest setting sense of place, and quality of life, is discussed.

Introduction

Urban areas of the United States are growing in number and population. In 1970, 243 metropolitan areas in the United States supported a population of 155,937,000 people (U.S. Bureau of Census, 1989). From 1970 to 1987, those numbers increased to 282 and 187,072,000 respectively (U.S. Bureau of Census, 1989). At the time of the census work in 1987 76.9% of the population of the United States resided in metropolitan areas, as opposed to 23.1% of the population which resided in nonmetropolitan areas.

It is clear that the United States population has become an urban one. Urban growth and expansion has brought, and will continue to bring, increased pressure on the finite natural resource base of the United States. The increased pressures, on both commodity and non-commodity resources, are of concern to both utilization and preservation interests, and bring environmental issues to the attention of the American public daily.

This exposure and recognition have brought increased awareness of problems associated with forest management near urban areas, or what has been labeled the "urban fringe." More specifically this zone of confrontation is known as the "urban/forest interface."

"The urban/forest interface is a term chosen to draw attention to yet another area of concern regarding the use of land and natural resources on the urban fringe, in this case the relation between urban land use and forest resources" (Bradley, 1984. p. 3). The urban/forest interface is not a new phenomenon. It has been the subject of debate and conflict throughout U.S. history since the first clearing of forested landscapes for urban expansion (Bradley, 1984., Vaux, 1982).

Two problems arise when urban land use and forest resource interests converge: (1) the development that encroaches on forested lands; and (2) the types of resources produced by forest lands and their method of production (Bradley, 1984). The present research effort will address the first problem.

Residential development affects forested landscapes in two ways: (1) the infrastructure needs of people; and (2) the presence of people.

Human infrastructure needs such as transportation routes, health care services, emergency and safety services, utilities, community services (sewage and garbage disposal), educational services, and commodity supply (grocery and retail distribution) are physical changes that people make which play an important role in the course taken by development, as well as the impact of that development. The presence of people influences the forest landscape in a less direct manner.

The impact of the presence of people will surface in such areas as forest management, wildlife management, recreation management, fire management, resource preservation, and resource conservation. These resource management categories are interrelated, where actions taken in any one specific category will be influenced by, and will influence, the activities in the other categories. The presence of people influences the methods, and the procedural process for implementation of methods chosen for addressing management activities in each resource management area.

As people are introduced into forested landscapes so too are their artifacts such as roads, buildings, telephone lines, and automobiles. The presence of human artifacts in natural environments has been the source of past controversy. In 1979, Wohlwill stated: "The appropriateness and suitability of particular buildings and other works of man in natural settings have likewise been at issue in recent controversies pitting environmentalists and conservationists against developers and commercial and industrial concerns" (p. 48). One has only to examine the pages of the local newspaper to find that this statement is as true today as it was in 1979.

Wohlwill, in commenting further on the issue of man-made structures in natural settings, stated that, "In spite of the practical relevance of the problem, little actual research has been carried out on the individual's response to this aspect of congruity or fittingness between man-made and natural elements" (1979, p 48). This statement is also quite appropriate for the present.

Wohlwill and Harris (1980), in their research on congruity or fittingness, defined fittingness as, "the sense of harmony or clashing between the man-made feature and the background" (p. 357). This research effort considers the issue of congruity or fittingness between man-made elements and their natural setting. The purpose of this research is to examine how building color influences the perceived level of congruity between residential structures and their forested landscape context. This examination will test the following hypothesis:

> As the level of contrast between structure color and forest landscape context decreases, the perceived level of fittingness of the structure in the forested landscape setting will increase.

This research is expected to show the extent to which inappropriate color negatively impacts the perception of congruity between man-made structures and forested landscapes as well as the perception of visual aesthetic appeal of the building in its forested landscape setting. The research effort may contribute to the resolution of conflicts between pro and anti development groups in issues concerned with the aesthetics of development projects.

The landscape architect has traditionally been concerned with the introduction of elements of nature into the realm of the man-made. He has endeavored to match plant material and construction material characteristics such as color, texture, mass, and form to adjacent man-made structures to provide pleasant and functional environments for man. One goal of the present research is to illustrate how a landscape architect could apply his knowledge and ability in reverse.

Specifically, how the color of man-made structures could be manipulated by the landscape architect in an endeavor to match man-made structures (single family homes) with the natural environments into which they are placed. In doing so, the landscape architect could enhance the congruity or fittingness of the structures to their natural landscape setting.

Escalation of public concern for environmentally sensitive land use planning places greater pressure on the decision making process of the planner. One goal of this research is to provide the planner information on the relationship between contextual fit and visual aesthetic appeal that can be used to address questions on the visual impacts of development. The information furnished could also be used to provide insight into how development on private lands impacts the visual experience on adjacent public lands.

The results of this study will contribute to further research about the human impact on the natural environment. This contribution will lead to a greater degree of sensitivity to visual resource management objectives on the part of the architect, the landscape architect, and the land use planner. This research effort alone does not address all visual resource management concerns. The insight provided through this study must be expanded through continued research. The greatest benefit of this research effort will be the inspiration that it gives others to continue to extend the knowledge that it provides.

Literature Review

The man-environment phenomenon has attracted considerable attention from researchers and practitioners from numerous fields and professions (Altman, 1976., and Zube, Sell, and Taylor, 1982). Examinations of this relationship have implicitly adopted one of several theoretical models of man:

A). Mechanical Model
B). Perceptual-Cognitive-Motivational Model
C). Behavioral Model
D). Ecological Social Systems Model

(Altman, 1976).

The present research project adheres to the Perceptual-Cognitive-Motivational Model. That model will be defined prior to an examination of the literature on contextual fit. For definitions of the remaining models, the reader is directed to Altman (1976).

The Perceptual-Cognitive-Motivational Model approaches the man-environment relationship by addressing a variety of internal processes of man. Altman (1976) has described the processes as:

1). perceptual reactions to environment - how man senses, perceives, and organizes environmental stimuli

2). cognitive responses to the environment - subjects estimates of the richness, complexity, meaning, and evaluation of the environment

3). motivational and emotional states associated with environmental stimuli - such as stress, as well as negative and positive affect

The goal of studies which use this model has been to, "uncover how man sees, perceives, feels and reacts to aspects of his environment" (Altman, 1976. p 33).

The collection of, or prediction of, human cognitive responses to the environment has been the primary approach taken for research on contextual fit. Dr. Joachim F. Wohlwill, who has examined the relationship of "fittingness" or "congruity" of man-made structures in natural landscapes, and Professor Linda N. Groat, who has studied the perceived compatibility between new infill buildings and an established urban setting, have been the major contributors to the research relevant to contextual fit.

The work of Wohlwill and Groat serves as the basis for this review of the literature on contextual fit. First the research of Wohlwill along with relevant studies by other authors will be reviewed. Second, Groat's research, accompanied by a review of relevant, similar, research will be examined. The in-depth review thus provided will synthesize the available knowledge on cognitive responses to contextual fit in both natural and urban environments.

Wohlwill has examined the topic of contextual fit by investigating how incongruity influences perceived fittingness of particular man-made structures in specific natural settings. Wohlwill contends that incongruity, "may result first of all, from a clash of styles, such as most older cities (c.f. the center of post war Rotterdam) or campuses inevitably display in the appearance of their buildings. Alternatively it may arise from marked disparity of scale, color, or shape between a particular building and its surroundings." (Wohlwill, 1976. p 55).

Wohlwill (1979) examined incongruity by investigating observers' judgements of appropriateness of a man-made feature (a building) in its natural setting. Scale models of buildings, a factory and a lodge, identified by signs reading "Pacific Lumber" and "Ocean Inn" respectively, were constructed. Increasing levels of contrast with and obtrusiveness to simulated natural settings were depicted by variations in building color and size. Depictions of coastal landscapes of California were utilized as natural settings.

Each building was presented in three settings: a "scenic" setting - wooded, hilly, and generally rugged landscape lacking any man-made elements; and two "plain settings" - one which represented a rather flat area devoid of vegetation and lacking any man-made elements, and a second similar to the first in vegetative cover but exhibiting the stimulus building in a context that included other buildings near by.

Color slides of the buildings were presented in triads illustrating three different views of the building in its natural setting. A series of 24 slide triads was presented to each subject. Subjects were asked to rate the appropriateness of the building to its particular setting based on its appearance in the three views. A seven point rating scale, ranging from +3 to -3, was provided to the subjects.

Wohlwill hypothesized that :

> 1). judgements of appropriateness would vary inversely with the amount of contrast and obtrusiveness;
>
> 2). in a highly scenic area the observer would make more stringent demands on fittingness or congruence between a man-made object and its natural surroundings than would be the case in a more ordinary one, ... in undeveloped landscapes the function relating contrast to judged appropriateness should display a steeper negative slope than in developed landscapes;
>
> 3). judgement of appropriateness would decline more sharply with increasing contrast with respect to buildings that bore no essential relation to their landscape than with respect to buildings that could be considered functionally appropriate in their setting.

The results of the experiment supported the inverse relationship predicted by Wohlwill: " The change from the intermediary to the high level of both color and the size manipulations produced the major effects, it appears the two variables contributed equally to the overall effects shown in the main study" (Wohlwill, 1979. p 52). Overall, Wohlwill found that appropriateness ratings for the lodge were consistently higher than those for the factory.

Wohlwill, in a replication and extension of his study, compared judgements of appropriateness with ratings of liking on a "like very much" to a "dislike very much" scale. This continuation was performed under the same conditions and through the same methodological approach as that outlined above except that the subjects were asked to rate how well they "liked" each building as opposed to its appropriateness.

The results of the second phase of the study indicated that, in the case of the factory, "there was an overall decrease in appropriateness with contrast for all groups combined ... this effect was virtually absent in the case of the "scenic" setting which was precisely the one showing the steepest gradient in the previous study" (p. 54). In the case of the lodge an intermediate degree of contrast was regarded as most appropriate.

The influence of context was evident only in the case of the lodge in the "scenic" setting, where ,as stated by Wohlwill, "the scenic setting appears to enhance both appropriateness and liking ratings relative to the two plain settings" (p 54). As for the factory, there was a significant interaction between the contrast variable and the sequence in which the ratings were made. The interaction was such that (for both appropriateness and liking) "whichever rating occurred first showed a rather irregular inconsistent change with contrast, while that occurring in the second half of the session showed a rather steeper, roughly linear function" (pp 54).

In discussing the results from both the original study and the replication study, Wohlwill commented that the results "provide concrete testimony to the efficacy of the contrast-obtrusiveness as a primary determinant of rated appropriateness of building to natural surroundings ... the contrast-obtrusiveness variable was a highly significant source of variance of these ratings" (p 54).

The context variable was said to have yielded inconsistent results over the two studies with ratings tending to be most favorable under the scenic setting. It was suggested that a "halo effect" may have been the source of this condition, where, as Wohlwill stated, "instead of judging a building as particularly inappropriate or disliking it most strongly because of its appearance in a highly scenic setting, the subjects tended to give that building the most positive rating in the scenic setting possibly because the attractiveness of the setting spilled over into the judgements of the building itself" (p. 54).

The influence of building meaning, as identified by a label indicating its function, was shown in the higher ratings of appropriateness given to a lodge compared to those given to a lumber mill. The results of a study by

Anderson (1981) give additional insight into the influence of labeling on the perceptions of observers.

Anderson found that the random assignment of "wilderness area" and "National Park" labels to color slides of forested landscapes consistently elevated observers' evaluations of landscape quality. Labels of "leased grazing range" and "commercial timber stand" consistently reduced observers' judgements of attractiveness.

While the work of Anderson (1981) does not specifically address congruity, or fittingness, of man-made structures in natural landscapes, it does identify how labeling can induce expectations of scenic quality in the landscape.

Wohlwill and Harris (1980) followed the initial study of Wohlwill (1979) with a study dealing with people's responses to scenes featuring man-made structures in natural recreation settings. The purpose of the study was to "determine the relationship between variables of contrast or fittingness and diverse evaluative judgements , as well as voluntary exploratory activity, in response to scenes featuring some major man-made feature or features amidst plainly visible natural surroundings" (Wohlwill and Harris, 1980. p. 351).

Color slides were used to capture man-made elements (houses, concession stands, comfort stations, picnic areas, etc) in urban and state parks. A team of graduate students (enrolled in environmental programs at Pennsylvania State University) scaled the slides for the visual contrast or congruence between the man-made structure present and the surrounding natural context on the following dimensions:

1). contrast between the color of the man-made feature in the scene and its natural context;

2). contrast between the texture of the man-made feature and its context;

3). obtrusiveness of the size of the man-made feature in its context;

4). congruity between the shape or form of the man-made feature and its context; and

5). overall fittingness of the man-made feature in its context,

using 7 point scales. A group of 65 subjects was asked to rate the slides (scenes) on six different 7-point scales: (1) boring - interesting; (2) attractive - unattractive; (3) relaxing - exciting; (4) inharmonious - harmonious; (5) like - dislike (as a picture on a living room wall); and (6) like - dislike (as a background for a picnic).

Wohlwill and Harris found the overall agreement between the rating judges to be acceptable, and the intercorrelations among the various stimulus dimensions scaled to be consistently positive. A composite index, obtained by summing the color, texture, size and shape ratings, correlated very highly with the judgements of overall fittingness, thus "bearing out the relevance of the components isolated for these scaling measures to the overall sense of relatedness or appropriateness" (Wohlwill and Harris, 1980. p. 358). It was also noted that, "none of the four stimulus dimensions clearly dominated over the remainder as a determinant of the overall fittingness ratings; texture, color, and shape all contributed about equally, while the correlation with size-obtrusiveness measure was only slightly lower" (p. 358).

Intercorrelations between the ratings of the judges and the 65 subjects proved to be the most important aspect of the results (Wohlwill and Harris, 1980.) The stimulus dimensions (color contrast, texture contrast, size-obtrusiveness, and congruity of shape) and either of the two composite measures (composite index and overall fittingness) where highly effective as predictors of the evaluative judgements of the 65 subjects.

Wohlwill and Harris concluded: "Individuals, at least those represented by the population of young college students from diverse backgrounds that provided our subjects, evaluate park scenes such as those used in this investigation in terms that are very closely correlated with the dimensions of contrast, obtrusiveness, and fittingness between the man-made elements of such scenes and their natural surroundings" (p. 360).

A later study combined the approaches used by Wohlwill and Harris, and Anderson. Gobster (1983) examined the influence that perceived changes in the landscape had on the judged appropriateness of shoreline development. The approach taken by Gobster was somewhat of a combination of that of Wohlwill and Harris (1980), in its examination of man-made elements in natural settings, and Anderson (1981) in that the appropriateness of residential development was examined in landscape settings labeled as "wild", "natural", "recreational", and "urban".

Gobster's research was prefaced by two hypothesis:

> 1). There would be significant differences in the judged appropriateness of shore line structures as a function of different setting types, implied through verbal descriptions given to subjects;
>
> 2). Those variables that synthesized properties of the entire scene (naturalness, complexity, and contrast) would be better predictors of appropriateness than those which describe only specific aspects of the scene (setback, vegetation screening, distance, and size).

Specifically, Gobster asked subjects to rate color slides of typical second home residential homes or cottages (lake and river front residences in Wisconsin) on the appropriateness of the structure in each of four (wild, natural, recreational, and urban) settings. The rating scale was modeled after the semantic differential, with "highly inappropriate" and "highly appropriate" as the extremes of a

7 point range. Prior to rating the slides the subjects were given descriptions of "wild", "natural", "recreational", and "urban" settings in terms of degree of naturalness and levels of development.

Each slide was scaled to determine the percent of the scene depicted in sky, water, vegetation, visible development, and vegetative screening. Scene variables of structure size and distance to the structure were also measured, and the variables of naturalness, contrast, complexity, and setback were evaluated on 5 point scales by a panel of ten trained judges.

Gobster found that "low levels of contrast and complexity and high levels of naturalness were associated with high levels of appropriateness of structures in wild and natural settings" (p. 108). The reverse was true of recreational and urban settings where, "higher levels of complexity and contrast and lower levels of naturalness were found to be more appropriate" (Gobster, 1983. p. 108).

Gobster found the variables of naturalness, complexity, contrast, and visible development to consistently be the best predictors of appropriateness in each of the four settings, evidence which supported his second hypothesis. In light of these findings Gobster concluded that: "In terms of policy and standards for protecting landscape aesthetics, perhaps these types of concepts are the most appropriate ones to measure for they are not so concrete as to be trivial or meaningless in an aesthetic sense, nor are they so abstract to prevent their reliable assessment" (p. 110).

Vining, Daniel, and Schroeder, (1984), in a two phase study, examined the feasibility of developing scenic quality prediction models for forested residential sites. The first phase was an attempt to extend the Scenic Beauty Estimation Method (Daniel and Boster, 1976) to assess landscape quality in forested areas where human artifacts are present. In the second phase, an attempt was made to identify specific features of homes, and the forest sites on which they are built, which might successfully predict the public's perception of scenic quality. For the purpose of this literature review, attention will be directed toward the second phase of the study.

Vining et al., identified and measured 37 home and forest characteristics. For the purpose of the present research, only those variables associated with the home will be discussed. The following 11 home characteristics were investigated :

1). Residence size
2). Residence Cost
3). Privacy
4). Residence Crowding

5). Fittingness - (defined as : the extent to which the home seems to be congruent with the natural landscape; ie., cabins in forest, modern homes in suburbs)

6). Obtrusiveness - (defined as: the extent to which the residence intrudes on its setting by size or lack of vegetative cover)

7). Feature Incongruity - (defined as: incongruity of color, ornamentation, style, or design features)

8). Design Congruity

9). Naturalness - (defined as: the extent to which the home is constructed of natural appearing materials)

10). Primary and secondary building materials
11). Building Style

Two separate Scenic Beauty Estimation Models were developed by relating scenic beauty estimates to the landscape feature variables: one model for scenes in which no homes were present; and one model for scenes in which homes were present.

In the model for scenes with homes present, the following variables predicted low scenic quality: high residence crowdedness, increased cost of the home, and high feature incongruity. Homes high in feature incongruity were characterized as having loud color accents, mixed styles, and relatively more ornamentation. Building materials of a less natural nature, such as aluminum and painted wood, were associated with lower scenic beauty ratings, while the more natural materials of log or stained wood were associated with higher scenic beauty ratings.

Vining et al., also discovered that scenes in which homes were rated high in obtrusiveness were also rated high in scenic beauty. This result, was explained by the relationship between the variables of feature incongruity and obtrusiveness in the regression equation of the model. In light of the strong correlation between obtrusiveness and feature incongruity, Vining et al., made this stipulation: "With feature incongruity in the equation as a negative predictor perhaps the remaining shared variance of obtrusiveness and scenic beauty is positive" (p. 132). The possibility that obtrusiveness of a structure may be congruent with and enhance the landscape as noted by Wohlwill (1979) was cited as well.

Groat examined the perception of contextual fit in architecture to formulate a conceptual framework within which questions concerning building suitability to its context, and building compatibility to its older neighbors, could be addressed.

The objectives of her research to date have been: (1) to develop a comprehensive conceptual frame work from the variety of contextual design techniques cited in the architectural literature; (2) to identify the ways in which lay people interpret contextual compatibility both in terms of its significance and the specific design features which contribute to its success; (3) to identify which design strategies are consistently viewed by people as generating contextually compatible buildings; and (4) to determine the extent to which familiarity with a specific environment influences people's evaluation of contextual compatibility (Groat, 1982, 1983, 1983b, 1984, 1988).

These objectives have surfaced in each of Groat's studies pertaining to contextual fit either individually or in combination. A detailed study entitled, "Contextual Compatibility in Architecture: An Investigation of Non-Designers Conceptualizations," (1984) addresses each of the stated objectives, and serves as the vehicle used to integrate Groat's research efforts to produce the first empirical investigation of non-designers conceptualizations of contextual fit in architecture (Groat, 1984). An in-depth review of this publication will serve to document Groat's contributions.

To fulfil her first objective, Groat conducted an extensive review of the critical literature on contextualism. The review had two goals: 1) to collect information on general issues or concepts which were considered important for distinguishing between contextual design strategies; and 2) to collect information on specific design variables that were seen by the authors as contributing to the contextual compatibility among buildings (Groat, 1984).

The contextual framework that resulted was organized on the basis of its hierarchial nature, and the major subheadings utilized. "An important advantage of the conceptual framework developed through this research study is that it is both comprehensive and hierarchical. Its unique feature is that it distinguishes the critical design issues - which define an overall strategy from the specific design features - or tactics - which embody a given strategy in built form" (Groat, 1984. p. 13).

Groat examined contextual fit in architecture by combining the research method of the case study with environmental simulation procedures. Three case study sites of recent infill projects were selected and 73 people were interviewed during the research project.

Each case study subject pool consisted of three distinct categories of people: (1) daily users or residents of the in-fill project; (2) nearby neighbors (defined as people living or working in close proximity who would therefore encounter the building on a daily basis); and (3) distant neighbors (defined as people who would encounter the building on a less regular basis).

The subjects were asked to comment on and categorize a set of 25 buildings simulated through color photography. The multiple sorting task technique was utilized as the primary format for eliciting subject response. The sorting task consisted of nine sections: (1) free sort; (2) alternative sorting; (3) building preference sort; (4) building preference ranking; (5) surroundings preference sort; (6)

contextual relationship sort; (7) contextual relationship ranking; (8) identification of significant features; and (9) open ended questions.

Contextual compatibility was found to be an important concept for the subjects. Contextual compatibility ranked third in building interpretation criteria, with 40% of the respondents using contextual compatibility as a criterion for sorting. Concern about contextual compatibility was expressed by all but 10% of the subjects with approximately half of the respondents expressing a moderate to high degree of concern for contextual compatibility. Groat (1984) cautioned that simply affirming the importance of an environmental attribute does not necessarily imply an active commitment to it.

Materials, windows, and apparent age were mentioned by two thirds of the respondents as features important in linking new to old, with over half of the respondents mentioning color, degree of detail, and style. Components of facade design accounted for approximately half of all the design features mentioned by the respondents as affecting contextual compatibility. The facade design features most often mentioned, in order of decreasing frequency, were: materials, windows, age, color, and degree of detail. In reviewing these findings, Groat noted that the above mentioned facade design features are also some of the primary items that an architect is able to manipulate.

The design strategies most frequently viewed as providing contextual compatibility were those defined by strategy profiles characterized by a high degree of replication of adjacent building facades. The design strategies found to be least contextually compatible were those which exhibited a high degree of contrast. Groat noted that "replication of at least some aspects of facade design is more critical for perceived compatibility than replication of either site organization or massing" (p. 47).

In discussing methodological approaches to research on the visual impact of development, Wohlwill (1982) commented that "information on the extent and nature of individual and group differences in response to the environment (and where possible on the correlation of those differences) is equally important for the researcher and for the professional" (p. 241). Groat (1984), conducted rank order correlations to examine relationships within the subject groups of her study. Groat found that there was a consistent pattern of preferences among various user/observer groups and among three distinctly different locations. Groat suggested that "similar patterns of preferences in contextual relationships would likely exist among other middle-class respondent groups in other locations at least in the upper Midwest, if not other regions of the country" (p. 49).

Groat compared the responses of subjects to their own case study site to responses of other individuals not as familiar with the site in an attempt to investigate the influence that familiarity with an environment would have on evaluations of contextual compatibility. In all cases, Groat found that respondents ranked the buildings of their own site more favorably then did respondents from other case study sites. Within the three categories of respondents, "users" and "most immediate neighbors" tended to rank their case study sites more favorably than did "distant neighbors". Groat concluded that "in these three cases, familiarity with a given building has tended to elicit more favorable responses" (p. 77).

In addition to an examination of site familiarity, Groat also investigated how the respondents felt about their working/living space. In all three cases Groat found that "users" were generally pleased with their working/living spaces. In the context of this finding Groat concluded that, "it is not surprising that increased familiarity with the case study buildings is associated with more favorable evaluations" (p. 80).

Low and Ryan (1985) examined the vernacular architecture of Oley Pennsylvania in an attempt to identify what about the buildings signified "Oleyness" to the residents. It was suggested, that once identified, these physical characteristics of the architecture could be used to, "suggest culturally appropriate design guidelines for preserving, modifying, or in-filling the existing physical pattern" (p. 3).

Eleven architectual elements of Oley farmhouses were selected as characteristics for investigation: windows, wall openings, shutters, exterior material, main facade, gable, chimneys, porches and porticoes, roof detailing, overall mass of the farm house, and roof accessories. Drawings were made to serve as examples of the variations within each architectual element category. The drawings were then shown to a panel (representative of the Oley Valley populace) to elicit their responses to three questions: 1) which examples looked the most like a farmstead/farmhouse that would be found in the Oley valley, 2) which examples looked the least like a farmstead/farmhouse that would be found in the Oley valley, and 3) which of the remaining drawings look like a farmstead/farmhouse that might be found in the Oley valley.

Low and Ryan found that the drawings dealing with architectual elements that were easily observed, such as chimneys, dormers, volume, and materials, produced relatively rapid decisions on the questions posed. Their findings lead Low and Ryan to conclude: "It would seem that those architectual elements that are easily observed, but not so specific as to be tied into a "stylistic" category, provide the best opportunity for establishing communication based on the communities perception of their environment rather than on what the members of the community have been taught about their environment. If those qualities that can be noticed without looking can be identified, the professional has forged a link to the community's day - in - day - out experience with their environment" (p. 21).

Method

Slides

To represent scenes of houses in forested landscapes, slides were taken of residences in the Rangely Lakes Region of Maine. Residences were photographed as they would appear to one who was driving through a forested area. Only those houses with front facades facing a road, with minimal human artifacts visible (automobiles, toys, lawn furniture, etc.), and with an unobstructed view of the building were considered. Each scene photographed contained only one residence. All photographs were taken in August of 1989.

A Minolta Maxima X7000 auto focus camera with a 24-50mm wide angle lens was used to take the photographs. The camera was mounted on a tripod at a fixed height of 5'8'' above the ground. A grid screen, inserted in the camera, was used to insure that the relationship of building size to overall picture composition remained the same across all photographs. The variables of date, time, location, compass bearing of the line of camera sight, weather conditions, and photograph number, were recorded.

From a total of 72 slides, 20 were chosen for conversion to digital images. To accomplish conversion, a video camera, used as a low resolution scanner, "grabs" the image on the slide providing an output signal of analog composite video format (Orland, 1989.) "Analog," describes the signal characteristics, and, as a format of broadcast video, does allow for subtle and realistic definition of colors and shading, while "composite" indicates that red, green, blue and synchronization portions of the video are carried by a single composite signal (Orland, 1989.). A decoding process is used to break down the composite signal into red, green, and blue components for processing by digital computers. The images were stored on computer disks.

The digital images were reviewed for quality and clarity: one image was discarded because of video distortion. Four images (Figure 1) were chosen from the remaining 19 as scenes for color manipulation. The manipulation process involved three steps: 1) windowing, 2) color transformation, and 3) scene creation. All manipulations were done on a Compaq 286 personal computer using "TIPS Imaging Software" (Truevision Inc., 1986) and "Toolbox" (Gupta and Orland, 1989.) computer software packages.

Windowing

Windowing is a process that allows a specific portion of a digital image to be separated from the total image, creating a new image containing only the desired portion of the original (Figure 2). The "TIPS" imaging

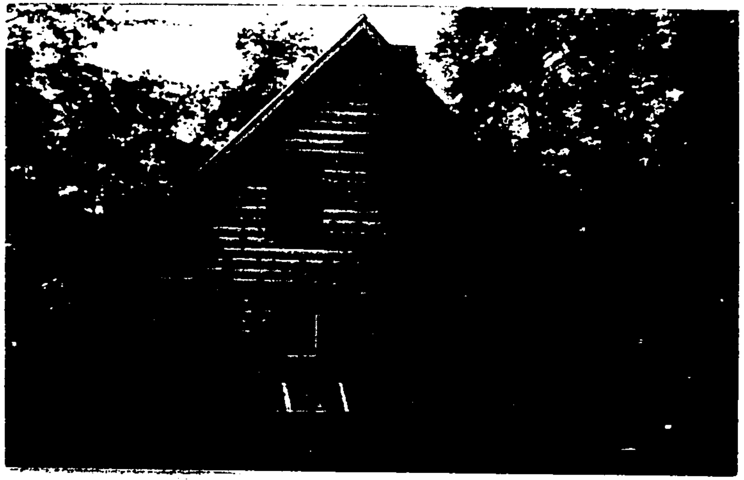


Image SPT4

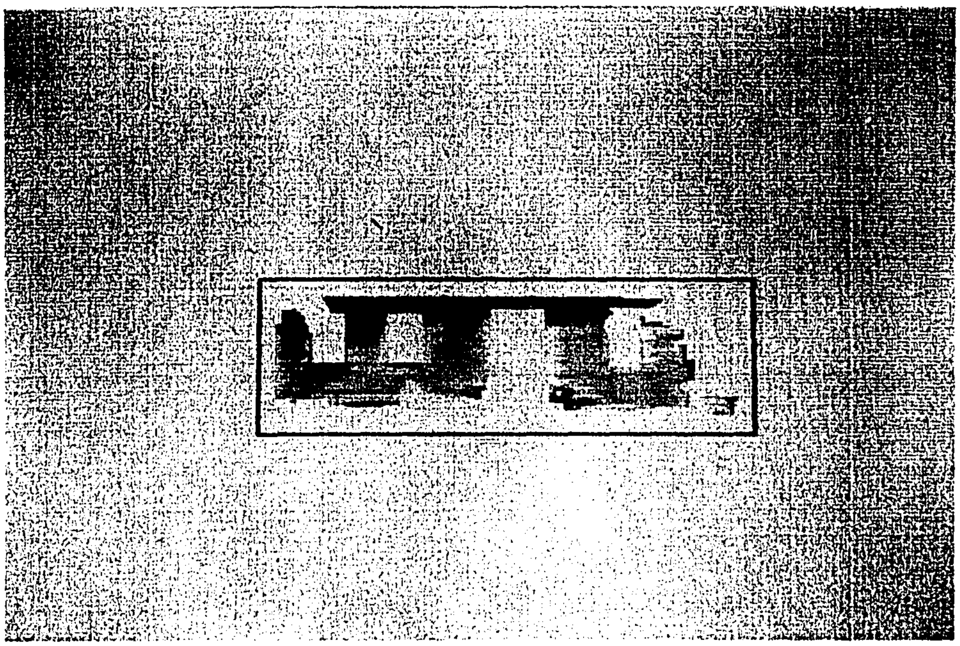
Image SPT10

Image SPT15

Image XPT18

Figure 1: Primary Images: Original Versions

Image XPT18 (original)



Window of Building Facade

Figure 2: Original Image with Window of Building Facade

software was used to create four windows: one depicting the front facade of the residence in each of the four scenes chosen for manipulation. The windowing process resulted in four new images in which the front facade of each building was isolated.

Color Transformation

Each window was used to create different color versions of the original building facade, one for each of three categories: 1) facade color contrast to setting lower than that of the original, 2) facade color contrast to setting higher than that of the original, and 3) facade color contrast to setting extremely higher than that of the original. Color contrast to setting, and the color of the original building facade, determined color selection. An effort was made to avoid obvious contradictions in colors, for example, choosing to change the facade of a log building to an orange color.

Once a color was selected, the red, green, and blue components of the color were identified using the "TIPS" imaging software. The "TIPS" software provided a numeric value between 0 and 31, representing the red, green, and blue components of the color. The "Colorize" function of the "Toolbox" software was used to identify the mean and standard deviation of the red, green, and blue color components of the building facade isolated in a window. The means provided were also within the range of 0 to 31 for each color (red, green, blue). By dividing the red, green, and blue color values of the building facade by those of the selected color, factors for color manipulation were determined.

The numeric factors were used to alter the color of the building facade to that of the selected color. The "Multiplication" function of the "Toolbox" Colorization Menu changed the color of the building facade by multiplying the color values (red, green, and blue) of the facade by the numeric factors (for red, green, and blue) on a pixel by pixel basis ("pixel" is a short form of "picture element", the smallest area of an image that can be isolated for color manipulation). By changing color on a pixel by pixel basis, the texture of building material, and contrast in building color (i.e. that which would result from weathering or age), inherent in the original facade was preserved, providing a copy of the original facade which differed in color only.

Once the desired color variation was achieved, the altered building facade was named and saved on computer disk as a window using the "TIPS" imaging software. Each original building facade was used to create three color versions of itself, resulting in a total of 12 windows (Table 1).

Table #1: Primary Image Facade Color Contrasts

Original	Version	Color	Facade Color Contrast to Setting* Low	High	Ex-High
SPT4		NAT-LOG			
	SPT4-2	BRICK RED		X	
	SPT4-3	BROWN	X		
	SPT4-4	BLUE-GRAY			X
SPT10		GRAY			
	SPT10-2	BLUE		X	
	SPT10-3	BROWN	X		
	SPT10-4	RED-BROWN			X
SPT15		BROWN			
	SPT15-2	GREEN	X		
	SPT15-3	PURPLE			X
	SPT15-4	BLUE-GRAY		X	
XPT18		OAK STAIN			
	XPT18-2	BLUE			X
	XPT18-3	RED		X	
	XPT18-4	BROWN	X		

* Low = facade color contrast to setting lower than that of the original
High = facade color contrast to setting higher than that of the original
Ex-High = facade color contrast to setting extremely higher than that of the original

Scene Creation

Using the "TIPS" imaging software, each window (version) of a color manipulated building facade was inserted into the scene of its origin to create a new scene. By overlaying a color manipulated window onto an original scene it was possible to create a new scene which differed from the original only in the color of the building facade (Figure 3). This "overlay" process produced a total of 12 manipulated scenes, 3 new scenes for each of the 4 original scenes.

Figure 4 shows an original scene accompanied by 3 color variations. The 4 scenes are identical except for the color of the building facade. Obtaining this condition was necessary for the research project. Differences in perception of fittingness of the residence in each scene, and aesthetic appeal of the scene, would result from a reaction to the building facade color because all other variables remained constant.

Slide Shows

A set of 16 "primary images" was created by combining the 12 color manipulated scenes with their respective originals. The primary images were randomly assigned to one of four groups so that each group contained an image from each of the four different stimulus conditions

Image XPT18 (original)

Image XPT18-4

Figure 3: Scene Creation

Image SPT4 (original)

Image SPT4-2

Image SPT4-3

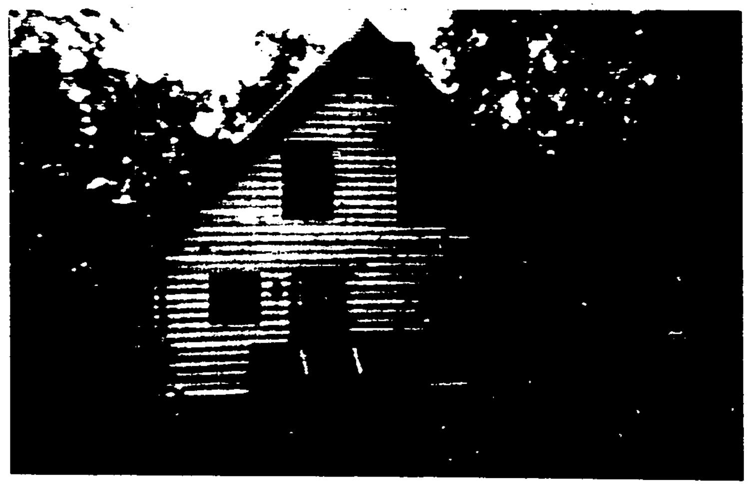


Image SPT4-4

Figure 4: SPT4 Image Series

available (Table 2). Each group of 4 primary images was combined with a set of 15 common (baseline) images resulting in four groups of 19 images.

Each group of 19 images served as the stimuli for two rating tasks: an "aesthetic appeal" rating, and a "fittingness" rating. A randomized complete block design was employed to create 12 experimental treatments of 38 images, each consisting of two sets of 19 images: one set for the rating of "aesthetic appeal", and one set for the rating of "fittingness". Slide presentations were created from each of the 4 groups of 19 images using the following process:

1). the 19 images of each group were randomly arranged 6 times using 6 computer generated random sequences of the numbers 1 through 19

2). the 6 random arrangements were randomly paired to produce 3 sets of 38 slides.

The 3 slide shows prepared from each of the 4 groups of 19 images differed only in their order of presentation, with no image of the second set of 19 being within 3 places of its position in the first set of 19.

Subjects

Subjects were drawn from the Psychology 101 Experimental Subject Pool of the Department of Psychology at the University of Arizona, Tucson Arizona (Fall semester

Table #2: Slide Show Groupings of Primary Images

	Random Assignment of Versions to Group			
Group Number	SPT4	SPT10	SPT15	XPT18
1	SPT4*	SPT10-3	SPT15-4	XPT18-2
2	SPT4-2	SPT10-2	SPT15*	XPT18-4
3	SPT4-3	SPT10-4	SPT15-2	XPT18*
4	SPT4-4	SPT10*	SPT15-3	XPT18-3

(* denotes original version of the image)

Table #3: Experiment Participant Sample

	Age (years)						
Gender	**15-20**	**21-25**	**26-30**	**31-35**	**36-40**	**41 & older**	**Total**
Male	22	8	0	0	0	0	30
Female	29	3	1	0	1	0	34
Total	51	11	1	0	1	0	64

1989). All of the subjects were students attending the University (Table 3). Research by Daniel and Boster (1976) has indicated that student subject pools are representative of the general population for scenic beauty judgements of forest scenes.

Experimental Procedure

Subjects were asked to participate in one of 12 experiment sessions. The desired number of subjects per session was five, numbers varied from a minimum of three to a maximum of seven. A total of 64 subjects participated in the research project.

An introductory statement and a set of instructions (Appendix A) were read to each group of subjects at the beginning of each session. Subjects were asked to rate the "aesthetic appeal" of scenes (a total of 19), depicting residences in forested landscapes, on a 10 point scale where a rating of 1 indicated very low aesthetic appeal, and a rating of 10 indicated very high aesthetic appeal. Subjects were shown a set of preview slides depicting the range of scenes they would be asked to rate prior to the actual rating itself.

Upon completion of the rating task, subjects were instructed that they would be shown the same set of scenes for a second time but were to rate the level of "fittingness" between the residence and its forested setting. Fittingness, for the purpose of the research project, was defined as a measure of the degree of harmony between two items. Subjects were asked to rate , on a 10 point scale, whether the residence clashed with the forested setting, or whether the residence was congruent (in harmony with) the forested setting. A rating of 1 indicated that the residence strongly clashed with the forested setting (it did not fit), a rating of 10 indicated that the residence was highly congruent (in harmony) with the forested setting (it fit in the forest setting). The second showing of scenes, as indicated in the discussion of slide show preparation above, was of a different random order than that of the first to avoid any order effect on ratings.

Upon culmination of the second rating task, subjects were asked to complete a questionnaire (Appendix B) that was developed for the research project. The purpose of the questionnaire was to gain insight into the subjects' familiarity with, and exposure to, forested landscapes. The subjects were asked to complete the questionnaire, but not told of its purpose.

Each experiment session lasted approximately 3/4 of an hour. Once all subjects had completed the questionnaire, the purpose of the experiment was discussed and questions were answered.

Two experiment sessions were held following the completion of the original twelve. The purpose of the additional sessions was to see if rating task order, "fittingness" first as opposed to "aesthetic appeal" first, influenced subject response. The slide sequence used for the additional sessions was identical to that used for the first experiment session. The format for the additional sessions was identical to that used for the first twelve sessions, except that the subjects were asked to rate "fittingness" in the first rating task and "aesthetic appeal" in the second rating task. The introduction and instructions were adjusted to conform to the order change.

Results

Two types of stimuli were used in this research: baseline stimuli, and primary stimuli. Baseline stimuli consisted of a set of 15 images common to each experiment session. Primary stimuli consisted of 4 original images and the 3 color manipulations created from each original. The baseline stimuli were rated by each subject who participated in the research project. The primary stimuli were rated by different subsets of the subjects who participated.

The baseline stimuli were used to establish the level of agreement between all subjects. "RMRATE" (Brown, Daniel, Schroeder, and Brink, in press), a computer program for analyzing rating data, was used to examine the responses of subjects to the rating tasks. Group agreement on the rating of baseline images (aesthetic appeal and fittingness ratings) was .977 (1.00 is 100% agreement). With a level of observer group consensus of this magnitude, ratings of primary stimuli could be compared using the baseline stimuli as a foundation for comparison.

The stimuli were rated on two 10 point scales: one for aesthetic appeal, and one for fittingness (Appendix C). An indication of an observer's ability to discriminate between stimuli, based on differences in the given parameter being rated, is the degree to which he applies the full range of the rating scale. Over half, 50.90%, of the observers used the full range of the rating scale, with 94.60% using 7 or more of the 10 increments, to indicate the perceptual quality of the baseline stimuli in terms of both aesthetic appeal and fittingness. In rating the primary stimuli, 36.10% of the observers used the full range of the scale, 82.20% used 7 or more of the 10 increments.

The scaling methods of "Baseline Adjusted Z Score" (Brown et al., in press) and "Scenic Beauty Estimate" (Daniel and Boster, 1976) were employed for data analysis.

Baseline Adjusted Z-Score Analysis

The baseline stimuli provided a common basis for the transformation of individual observer ratings of the primary stimuli to a standard scale for comparison. RMRATE calculated baseline adjusted Z-scores by using the mean and standard deviation of an observer's rating of baseline stimuli to adjust the origin and interval of ratings of non-baseline stimuli respectively (Brown et al., in press). Each observer's ratings of the primary stimuli were transformed individually, without consideration of the ratings assigned by other observers. Equation 1 illustrates how RMRATE calculated baseline adjusted Z-scores.

Equation 1 (Brown et al., in press):

$$MZ^{*}_{ij} = \frac{1}{n} \sum_{j}^{n} (R_{ij} - BMR_j) \,/\, BSDR_j$$

where

MZ^{*}_{ij} = baseline adjusted standard score of stimulus i for observer j

R_{ij} = rating of stimulus i by observer j

BMR_j = mean rating of the baseline stimuli by observer j

$BSDR_j$ = standard deviation of ratings of the baseline stimuli by observer j

n = number of observers.

The baseline adjusted Z-scores of each primary image were used in a one way analysis of variance (alpha level = .05) to test the null hypothesis that: there was no difference between the Mean Baseline Adjusted Z-Score of an original image and its three manipulated versions. Table 4 shows the results of the analysis of variance for the aesthetic appeal ratings of the primary images and their associated manipulations, and Table 5 shows the results of the analysis of variance for the fittingness ratings.

SPT4 Image Series

Mean baseline adjusted Z-scores significantly differed for the aesthetic appeal ratings (Table 4) and fittingness ratings (Table 5) of the SPT4 series (Figure 4). Fisher's Least Significant Difference procedure, (Fisher, 1949) for determination of the nature of the difference between paired means, produced two significantly (alpha level = .05) different groups of images. Group 1 consisted

Table #4: ANOVA Results for Aesthetic Appeal Ratings of Primary Images

Image	Mean Baseline Adjusted Z-Score	One Way ANOVA Results* F	P-value
SPT4	-0.34		
SPT4-2	-0.44	5.07**	0.002
SPT4-3	-0.06		
SPT4-4	-1.16		
SPT10	-1.32		
SPT10-2	-1.43	1.03	0.387
SPT10-3	-1.46		
SPT10-4	-1.13		
SPT15	-0.81		
SPT15-2	-0.54	2.4	0.078
SPT15-3	-1.09		
SPT15-4	-1.23		
XPT18	-0.14		
XPT18-2	-1.44	8.97**	0
XPT18-3	-0.58		
XPT18-4	-0.03		

(* alpha level = .05)
(** denotes significant test statistic)

Table #5: ANOVA Results for Fittingness Ratings of Primary Images

Image	Mean Baseline Adjusted Z-Score	One Way ANOVA Results* F	P-value
SPT4	0.06		
SPT4-2	-1.18	6.41**	0.001
SPT4-3	0.02		
SPT4-4	-0.76		
SPT10	-1.53		
SPT10-2	-1.9	4.07**	0.011
SPT10-3	-1.14		
SPT10-4	-1.65		
SPT15	0.11		
SPT15-2	-0.32	14.86**	0
SPT15-3	-1.83		
SPT15-4	-0.91		
XPT18	0.18		
XPT18-2	-1.9	15.69**	0
XPT18-3	-1.45		
XPT18-4	-0.79		

(* alpha level = .05)
(** denotes significant test statistic)

of the original image (SPT4), the brick red manipulation (SPT4-2) and the brown manipulation (SPT4-3), the blue-gray manipulation (SPT4-4) was assigned to group 2.

The building color contrast to forest setting relationship of the images in group 1 resulted in significantly higher mean baseline adjusted Z-scores for the aesthetic appeal rating (Table 4). Image SPT4-3 received the highest score, image SPT4-4 received the lowest.

For fittingness ratings, Fisher's LSD divided the images into 2 significantly different groups: group 1 consisting of images SPT4-2 and SPT4-4, and group 2 consisting of images SPT4, and SPT4-3. The less obtrusive building colors of Group 2 images (Figure 4) resulted in significantly higher mean baseline adjusted Z-scores (Table 5). The building color contrast to setting of image SPT4-2 resulted in the greatest difference between aesthetic appeal and fittingness mean baseline adjusted Z-scores.

SPT10 Image Series

The analysis of variance for aesthetic appeal was not significant at the .05 alpha level (Table 4). The building and the forest setting of the SPT10 image series (Figure 5) were low in aesthetic appeal. Individually, the baseline mean Z-scores were low in spite of color manipulation, as a group, the SPT10 images posted the lowest set of aesthetic

Image SPT10 (original)

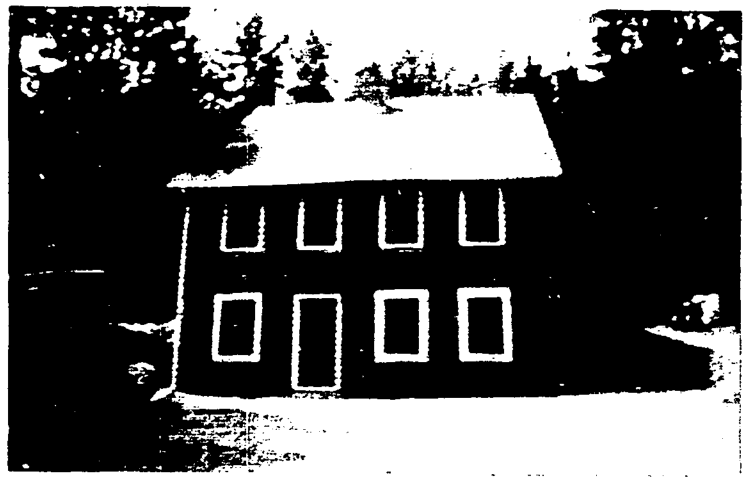


Image SPT10-2

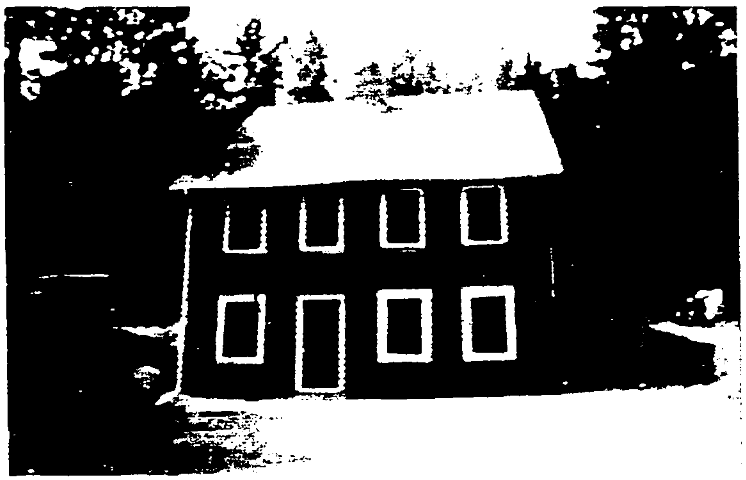


Image SPT10-3

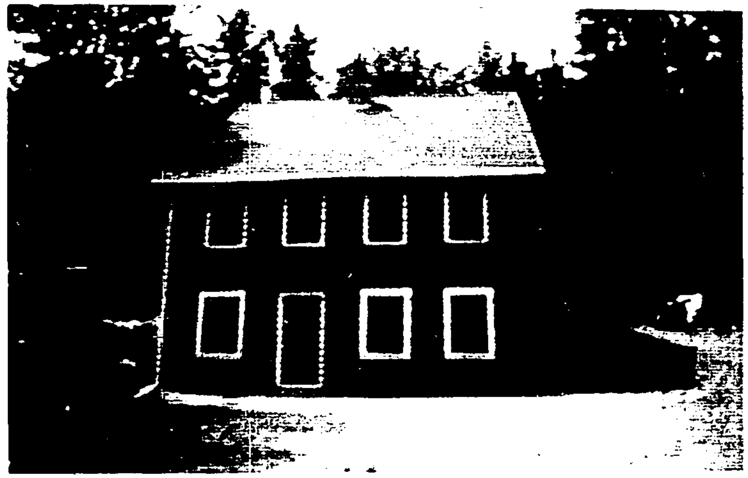


Image SPT10-4

Figure 5: SPT10 Image Series

appeal mean baseline Z-scores of the four image series (Table 4).

Fittingness mean baseline Z-scores significantly differed (Table 5). Fisher's LSD procedure, though, did not uncover definitive differences between the means. Image SPT10-2 and image SPT10-4 were significantly different from image SPT10-3 , but not significantly different from image SPT10. Image SPT10, though, did not significantly differ from image SPT10-3. Image SPT10-2 did not significantly differ from image SPT10-4. It appears as though building color contrast to setting, regardless of level, was an insufficient determinant of difference due to poor site and building stimuli (Figure 5).

SPT15 Image Series

Mean Baseline adjusted Z-scores for aesthetic appeal did not significantly differ. Image SPT15-2 received the highest score, and image SPT15-4 received the lowest score (Table 4). The aesthetic appeal of the site, and a relatively low magnitude of difference of building color contrast to setting between color manipulation versions (Figure 6), most likely contributed to the analysis of variance results.

The fittingness mean baseline adjusted Z-score of image SPT15-3 significantly differed from those of the other

Image SPT15 (original)

Image SPT15-2

Image SPT15-3

Image SPT15-4

Figure 6: SPT15 Image Series

images in the series. The score for image SPT15-3, -1.83 (Table 5), was greater than twice that of the second lowest mean baseline adjusted Z-score, the most distinct of the differences identified by Fisher's LSD.

The fittingness mean baseline adjusted Z-score for image SPT15 significantly differed from that of image SPT15-4, but not from that of image SPT15-2. The score of image SPT15-2 did not significantly differ from that of image SPT15-4 (Table 5). The magnitude of difference of the building color contrast to setting between color manipulations SPT15-2 and SPT15-4 was relatively low in comparison to that between SPT15 and SPT15-4 (Figure 6).

XPT18 Image Series

The analysis of variance for aesthetic appeal ratings was significant (Table 4). The contrast between the blue color of the building and the setting of image XPT18-2 (Figure 7) resulted in the lowest mean baseline adjusted Z-score for aesthetic appeal ratings, significantly different from those produced by the building color to setting contrast of the other images in the series. The blue building color significantly reduced the aesthetic appeal of the image, where as the other building color manipulations, and the original, did not differ in their impact on aesthetic appeal.

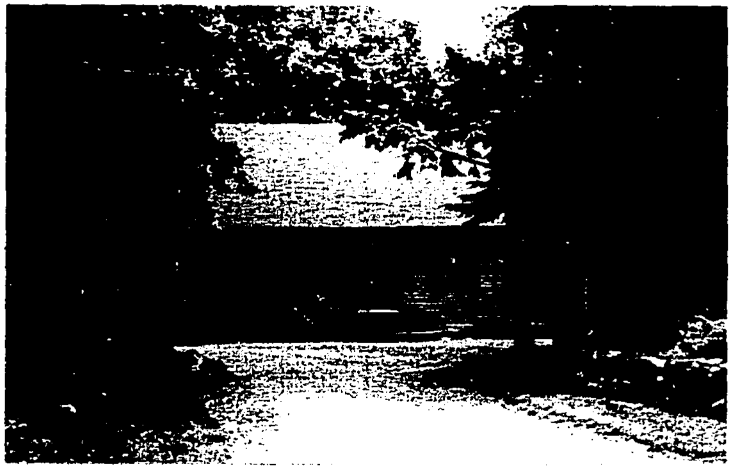


Image XPT18 (original)

Image XPT18-2

Image XPT18-3

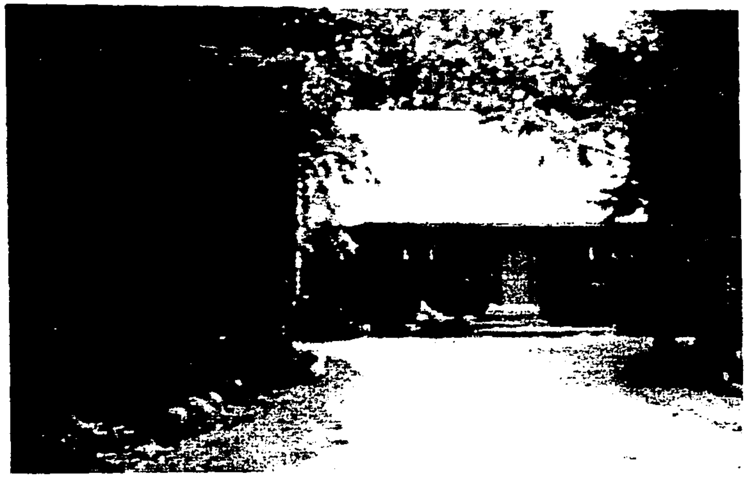


Image XPT18-4

Figure 7: XPT18 Image Series

Fittingness mean baseline adjusted Z-scores significantly differed, separating the images into three different groups. Scores for image XPT18-2 and XPT18-3, while not significantly differing from each other, did significantly differ from the scores of images XPT18-4 and XPT18 (Table 5). The score for image XPT18-4 significantly differed from that of image XPT18.

Images XPT18-2 and XPT18-3 had the lowest and second lowest fittingness mean baseline adjusted Z-scores respectively. The blue (XPT18-2) and red (XPT18-3) building color manipulations were perceived as less congruent - not fitting as well - with the forest setting than was the original building (XPT18) or the brown (XPT18-4) color manipulation (Figure 7).

Scenic Beauty Estimate Analysis

The Scenic Beauty Estimation Method (Daniel and Boster, 1976) measures perceptual preference for landscapes using observer ratings of color slides of those landscapes. Observer ratings are adjusted to account for the effects of differing judgement criteria, resulting in scenic beauty estimates (SBEs) which provide a quantitative index of the perceived scenic beauty of the landscapes (Daniel and Boster, 1976).

Traditionally, scenic beauty estimates have been calculated on either a "by observer" or "by stimulus" basis from observer responses to scenic beauty rating tasks (Daniel and Boster, 1976). For this research, two categories of by stimulus scenic beauty estimates (SBEs) were calculated: an aesthetic appeal score, from observer ratings of aesthetic appeal, and a fittingness score, from observer ratings of fittingness.

Using RMRATE, aesthetic appeal scores and fittingness scores were calculated through the three step process outlined by Daniel and Boster (1976) and Brown et al. (in press). In the first step a mean Z-score was computed for each stimulus.

Equation 2 (Brown et al., in press):

$$MZ_i = \frac{1}{m} \sum_{k=1}^{m} \phi^{-1} (P_{ik} - 0.5)$$

where

MZ_i **= mean Z for stimulus i**

ϕ^{-1} **= inverse normal integral function**

P_{ik} **= proportion of observers giving stimulus i a rating of k or less**

m **= number of rating categories minus 1.**

(if Pik = 1.0, Pik = 1-1/2n and if Pik = 0, Pik = 1/2n where n is the number of observers)

Second, the mean and standard deviation of the mean Zs of the baseline stimuli were computed. The third step employed equation 3 to adjust the mean Z of each stimulus to the origin of the baseline stimuli and to remove decimals through multiplication by 100.

Equation 3 (Brown et al., in press):

$$SBEi = (MZi - MZb)\ 100$$

where:

SBEi = SBE of stimulus i
MZi = mean Z of stimulus i
MZb = mean of mean Zs of baseline stimuli

The sign of an SBE reveals where the SBE falls in relation to the baseline SBE which is 0. As an SBE approaches 0, the closer the scenic beauty of the scene approaches that of the baseline.

For image series SPT4, SPT15, and XPT18, aesthetic appeal scores decreased as the level of building color contrast to setting increased (Table 6). The brown building color manipulation for series SPT4 (image SPT4-3) and series XPT18 (image XPT18-4) received the highest aesthetic appeal score of their series, with the blue building color

Table #6: By Stimulus Aesthetic Appeal Scores

Stimulus	Building Color	Building Color Contrast to Setting* Low	High	Ex-High	Score
SPT4*	NAT-LOG				-18.26
SPT4-2	BRICK RED		X		-37.34
SPT4-3	BROWN	X			-0.18
SPT4-4	BLUE-GRAY			X	-103.63
SPT10*	GRAY				-114.27
SPT10-2	BLUE		X		-120
SPT10-3	BROWN	X			-127.69
SPT10-4	RED-BROWN			X	-94.33
SPT15*	BROWN				-64.78
SPT15-2	GREEN	X			-37.35
SPT15-3	PURPLE			X	-89.26
SPT15-4	BLUE-GRAY		X		-104.07
XPT18*	OAK STAIN				-11.19
XPT18-2	BLUE			X	-122.97
XPT18-3	RED		X		-45.88
XPT18-4	BROWN	X			7.6

* Original Image
** Low = building color contrast to setting lower than that of the original image
High = building color contrast to setting higher than that of the original image
Ex-High = building color contrast to setting extremely higher than that of the original image

manipulation of each series (image SPT4-4 and image XPT18-2) receiving the lowest score.

Manipulation SPT15-2 (green building color) received the highest aesthetic appeal score for the SPT15 series. Manipulation SPT15-3 (purple building color), created to represent the highest degree of building color contrast to setting for the series, received an aesthetic appeal score higher than that of image SPT15-4 (blue-gray building color) (Table 6).

All images of the SPT10 series received low aesthetic appeal scores (Table 6). Image SPT10-4 received the highest score for the series. This was the only instance, across the entire data set, where the manipulation that was created for highest building color contrast to setting resulted in the highest aesthetic appeal score of an image series.

Fittingness scores for the images of series SPT4 and XPT18 increased as building color contrast to setting decreased, except for original images SPT4 and XPT18 which had higher scores than the images (SPT4-3, and XPT18-4) created for lowest level of building color contrast to setting (Table 7). Image SPT4-2 was the only image of its series that had a fittingness score lower than its aesthetic appeal score (Figure 8). Image XPT18 was the only image of

Table #7: By Stimulus Fittingness Scores

Stimulus	Building Color	Building Color Contrast to Setting* Low	High	Ex-High	Score
SPT4*	NAT-LOG				4.4
SPT4-2	BRICK RED		X		-101.24
SPT4-3	BROWN	X			3.6
SPT4-4	BLUE-GRAY			X	-62.04
SPT10*	GRAY				-134.51
SPT10-2	BLUE		X		-174.62
SPT10-3	BROWN	X			-117.13
SPT10-4	RED-BROWN			X	-158.9
SPT15*	BROWN				16.98
SPT15-2	GREEN	X			-31.53
SPT15-3	PURPLE			X	-149.89
SPT15-4	BLUE-GRAY		X		-96.96
XPT18*	OAK STAIN				18.51
XPT18-2	BLUE			X	-194.65
XPT18-3	RED		X		-112.18
XPT18-4	BROWN	X			-64.04

* Original Image

** Low = building color contrast to setting lower than that of the original image

High = building color contrast to setting higher than that of the original image

Ex-High = building color contrast to setting extremely higher than that of the original image

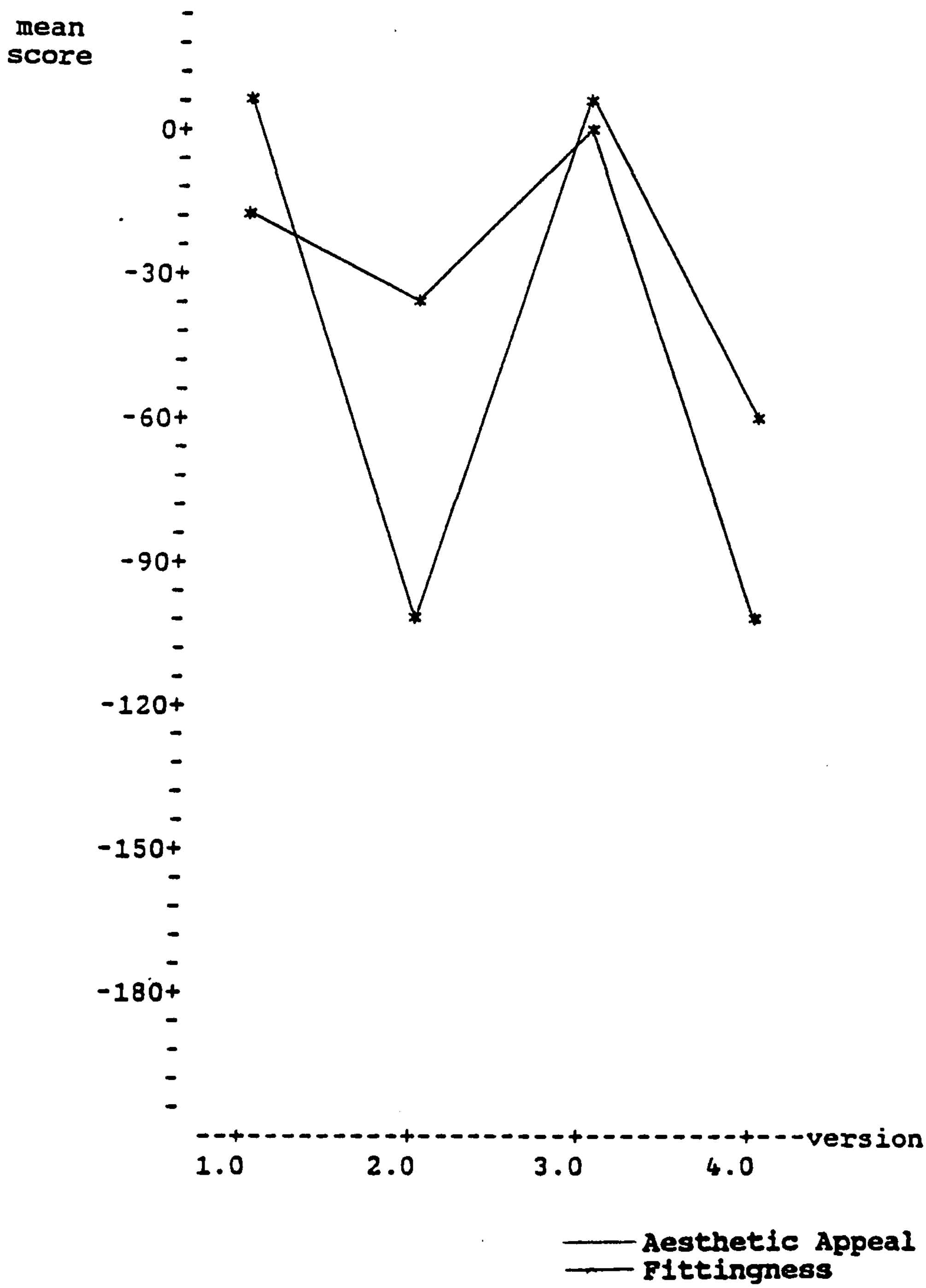


Figure 8: Aesthetic Appeal and Fittingness Scores
Image Series SPT4

its series that had a fittingness score greater than its aesthetic appeal score (Figure 11).

Fluctuations in image fittingness scores and aesthetic appeal scores exhibited a positive relationship in image series SPT4 ($r = .560$) and XPT18 ($r = .847$) (Figure 8, and Figure 11 respectively). A fittingness score and an aesthetic appeal score approached equivalence for image SPT4-3 (Figure 8) and image XPT18 (Figure 11).

The fittingness scores for image series SPT10 were all low (Table 7), and fluctuated within a very limited range (Figure 9). Image SPT10-4 received a fittingness score higher than that of image SPT10-2 (Table 7), interrupting the trend of higher building color contrast to setting resulting in lower fittingness score (Figure 9).

Image series SPT10 did not exhibit a positive relationship between aesthetic appeal scores and fittingness scores (Figure 9). Image SPT10-3 received the highest fittingness score and the lowest aesthetic appeal score, while image SPT10-4 received the highest aesthetic appeal score and the second lowest fittingness score (Table 7, and Figure 9).

Building color contrast to setting was negatively related to fittingness score for all images of series SPT15, except for image SPT15 which had the highest score while exhibiting the second lowest level of contrast (Table 7).

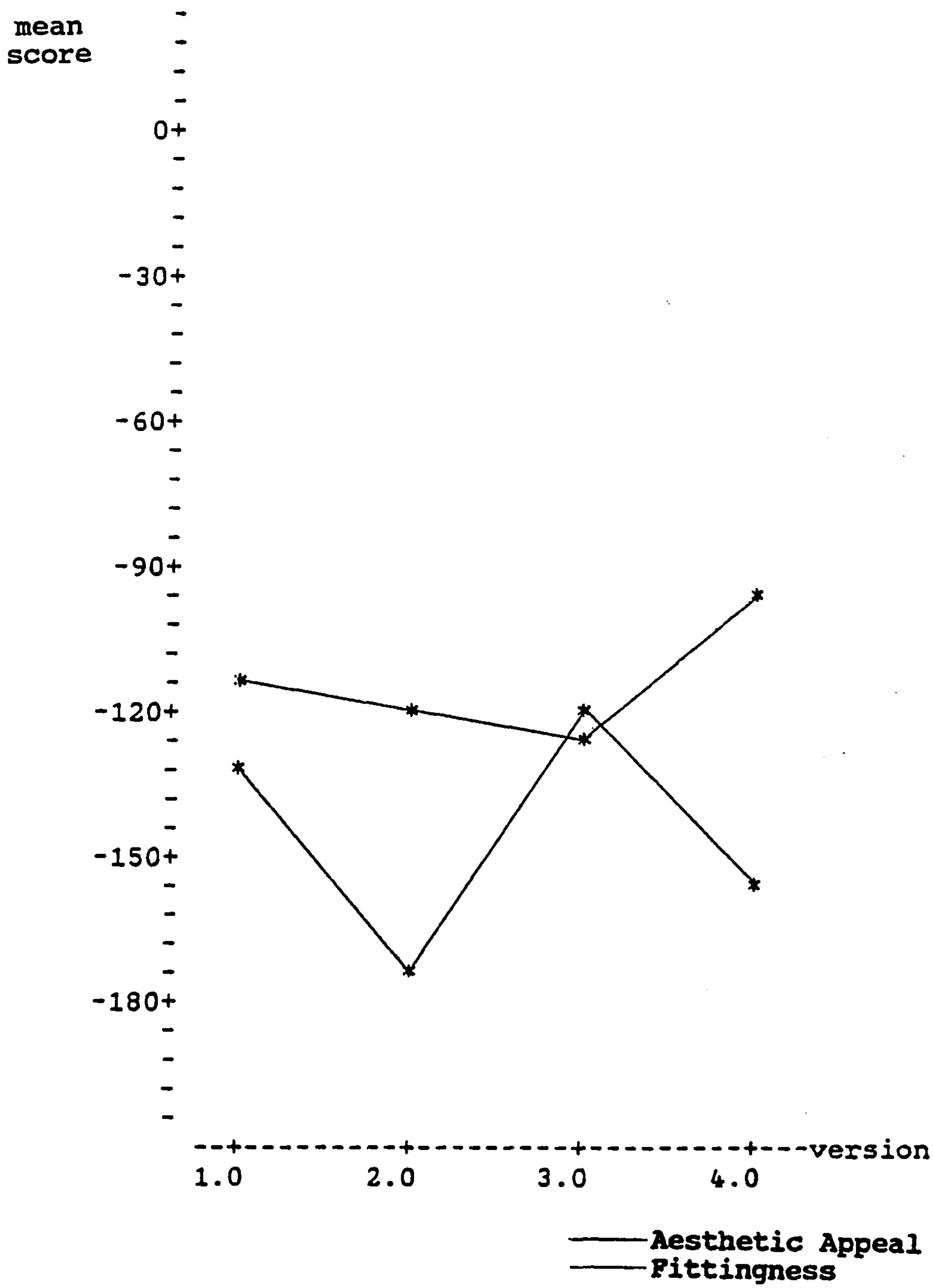


Figure 9: Aesthetic Appeal and Fittingness Scores
Image Series SPT10

Fittingness scores for the image series were dispersed over a broader range of values then were aesthetic appeal scores (Figure 10).

For images SPT15-2 and SPT15-4, fittingness scores came closest to equaling aesthetic appeal scores, the fittingness scores being slightly higher (Figure 10). A move from image SPT15 to image SPT15-2, a step down in building color contrast to setting, resulted in a lower fittingness score and a higher aesthetic appeal score (Figure 10). A similar move, from image SPT15-4 to image SPT15-3, also resulted in a lower fittingness score and a higher aesthetic appeal score.

With the exception of image SPT10-4, images that received high aesthetic appeal scores received relatively high fittingness scores (r = .730 for primary images) (Figure 12) (r = .792 for all images rated). The inverse (low aesthetic appeal score relatively low fittingness score) was true as well, except for images SPT10-3 and SPT15-4. Image XPT18-2 was the only image of a series to receive both the lowest aesthetic appeal score and lowest fittingness score (Figure 12).

Image series XPT18 exhibited the greatest degree of variability in aesthetic appeal and fittingness scores (Figure 11). Over all 16 primary images: image XPT18-4 received the highest aesthetic appeal score; image SPT10-3

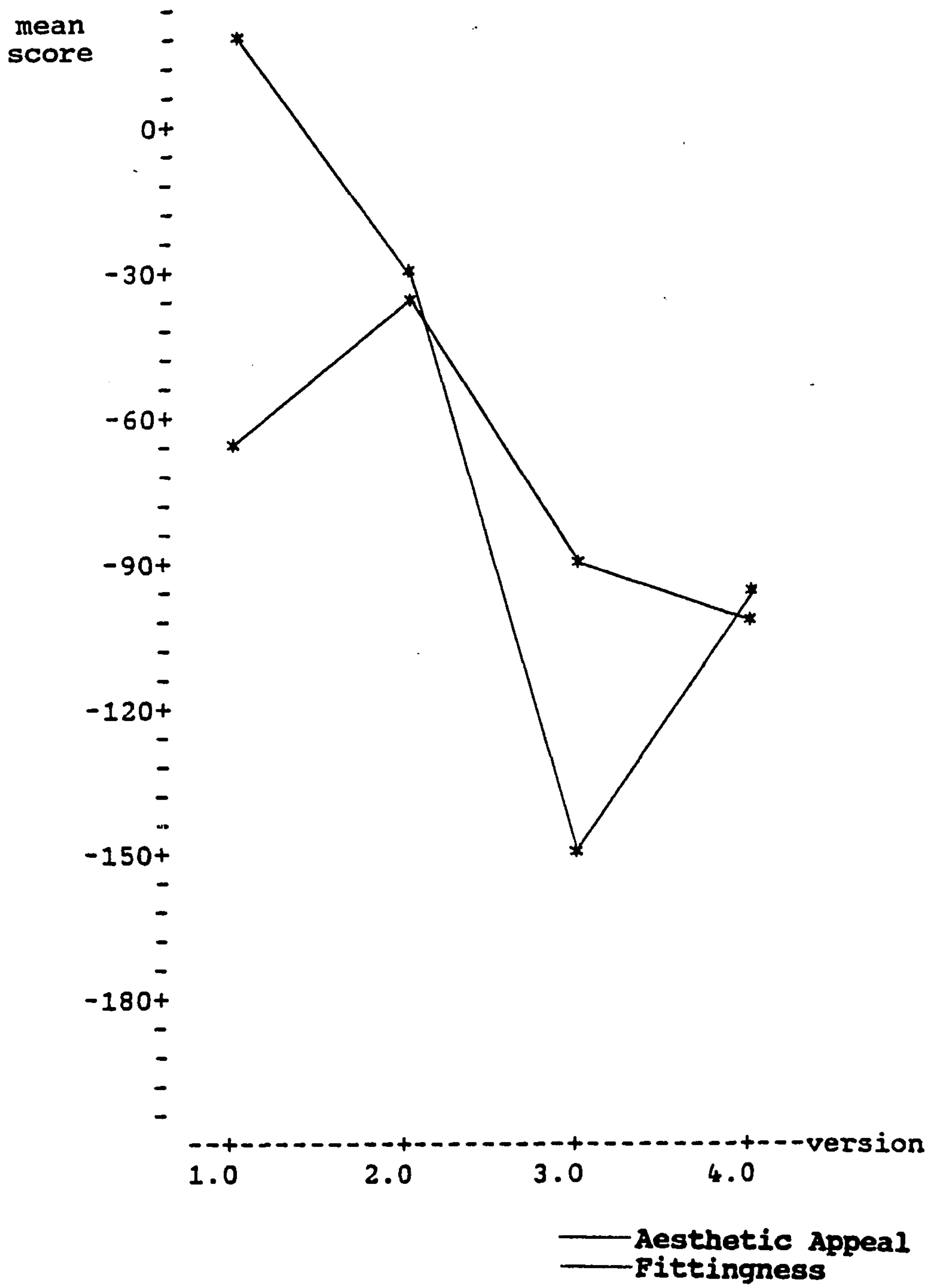


Figure 10: Aesthetic Appeal and Fittingness Scores
Image Series SPT15

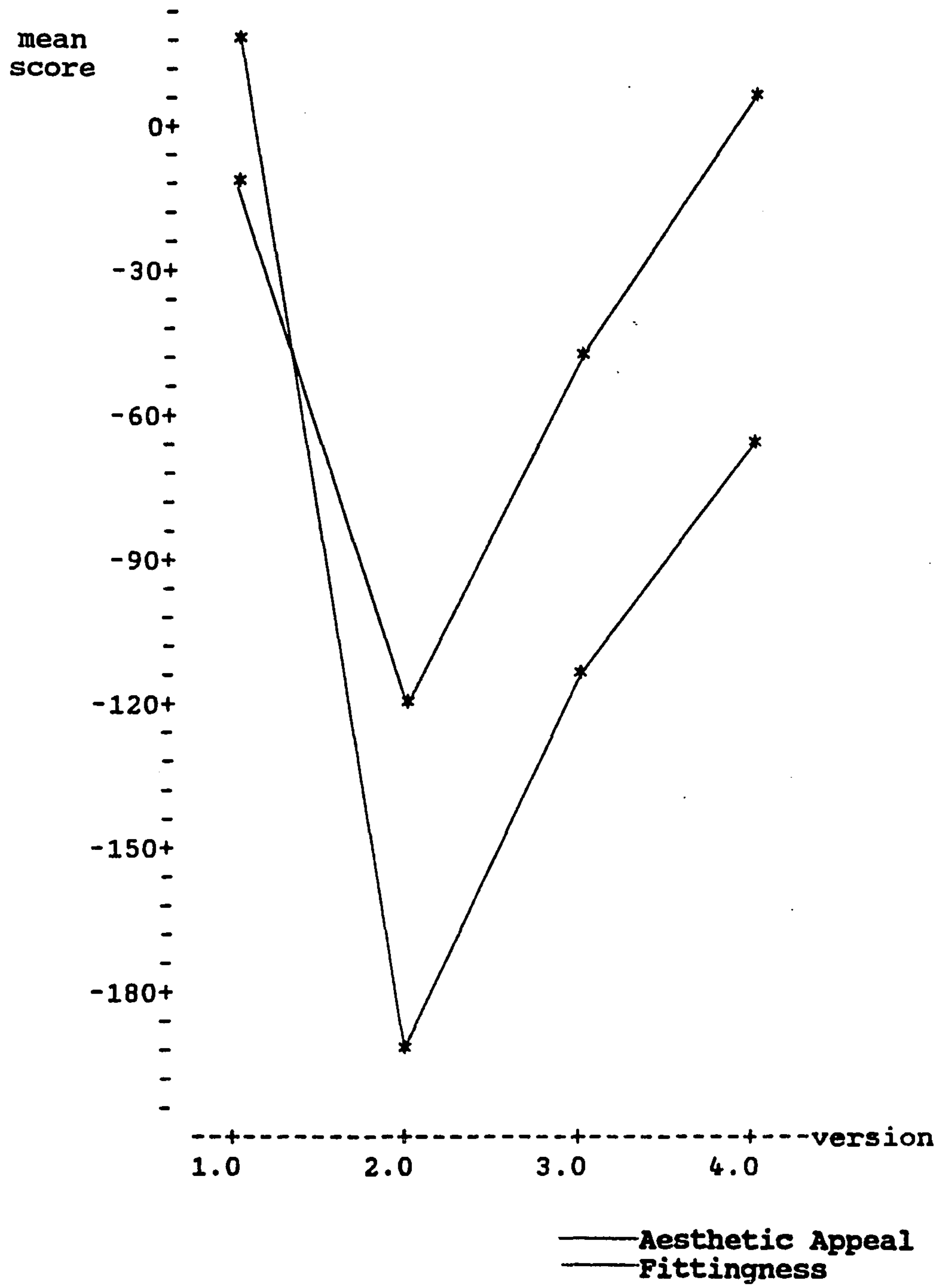
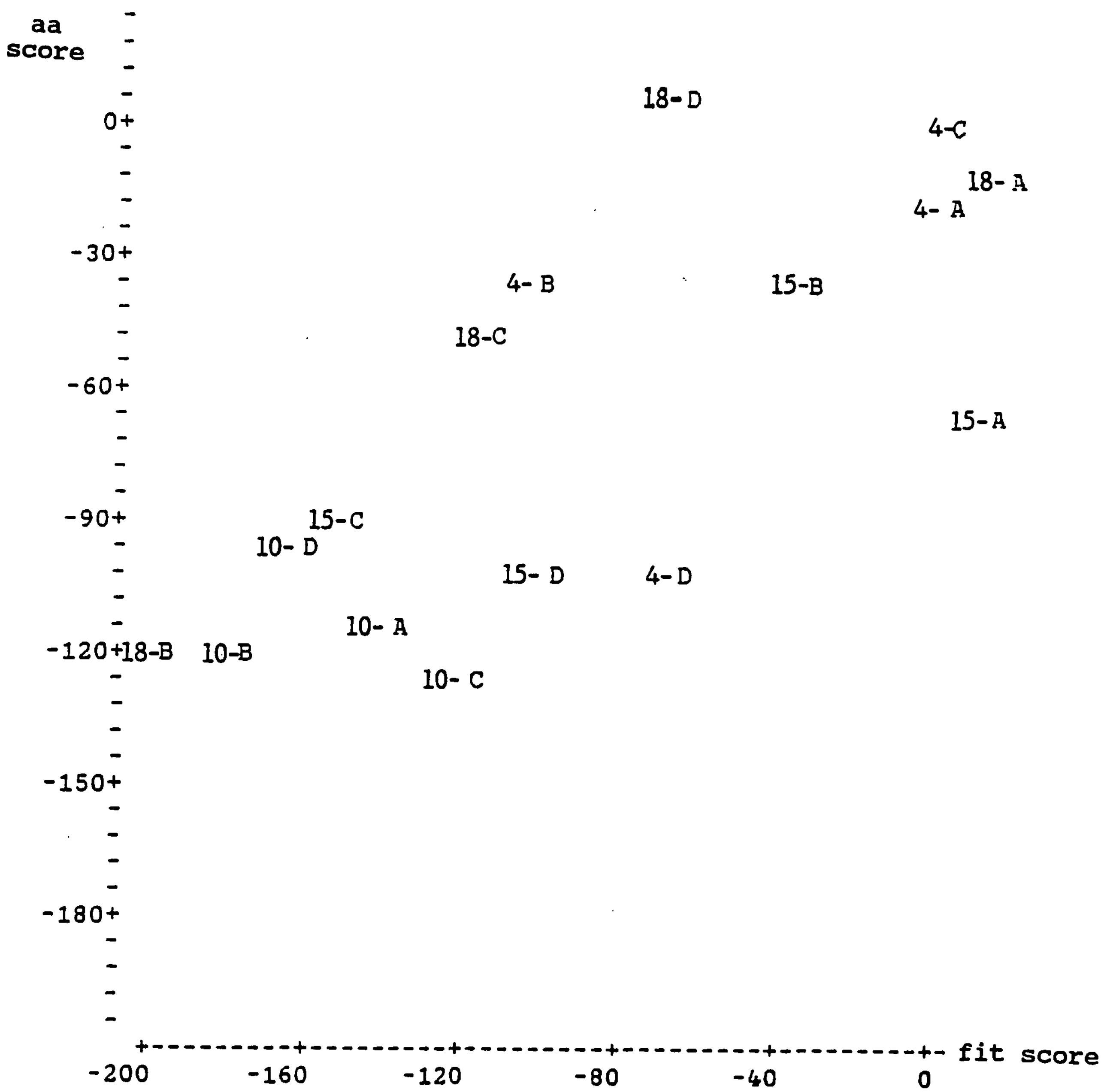


Figure 11: Aesthetic Appeal and Fittingness scores Image Series XPT18



4-A(SPT4)	**10-A(SPT10)**	**15-A(SPT15)**	**18-A(XPT18)**
4-B(SPT4-2)	**10-B(SPT10-2)**	**15-B(SPT15-2)**	**18-B(XPT18-2)**
4-C(SPT4-3)	**10-C(SPT10-3)**	**15-C(SPT15-3)**	**18-C(XPT18-3)**
4-D(SPT4-4)	**10-D(SPT10-4)**	**15-D(SPT15-4)**	**18-D(XPT18-4)**

**Figure 12: Aesthetic Appeal vs. Fittingness Scores: (r = .730)
All Primary Images**

the lowest, and image XPT18 received the highest fittingness score; image XPT18-2 the lowest (Figure 12). Image series SPT10 had the lowest aesthetic appeal and fittingness scores, and the least amount of variability in scores among its members (Figure 12).

Factor Analysis

A factor analysis was preformed to identify observers who varied from the group consensus. In factor analysis, intercorrelations among a set of observers are examined by identifying a set of inferred variables called "factors" (Brown et al., in press). Factors represent a weighted sum of observers' ratings where the weights are mathematically defined "to capture the maximum amount of observer variance subject to the constraint that the factors must be uncorrelated among themselves" (Brown et al., in press, p.63).

Eigenvalues

The amount of variance in a data set that can be attributed to a particular factor is represented by that factor's eigenvalue. Eigenvalues for this research were calculated based on raw ratings (standard scores), therefore each observer's variance was equal to 1. The proportion of

Table #8: Factor Eigenvalues

Factor	Eigenvalue	Proportion of Variance (%)	Number of Observers Loading Highest On Factor	Proportion of Observers Loading Highest On Factor (%)
1	26.01	47.3	49	89.10
2	4.67	8.5	2	3.64
3	3.45	6.3	2	3.64
4	2.79	5.1	0	0.00
5	2.18	4.0	1	1.81
6	1.89	3.5	0	0.00
7	1.71	3.1	1	1.81
8	1.43	2.6	0	0.00
9	1.31	2.4	0	0.00
10	1.19	2.2	0	0.00
11	1.02	1.9	0	0.00

variance in the data set, accounted for by a factor, was calculated by dividing each factor's eigenvalue by the total number of observers. Table 8 shows the eigenvalue and proportion of variance accounted for by factors identified from observer ratings.

The eigenvalue of factor 1 represents the best fit of a factor to the group's ratings that can be obtained from data using a 1-dimensional rating scale (ie. aesthetic appeal or fittingness). Factor 1 was clearly the dominant factor, as well as the only significant factor for the data set. For a second factor to have been significant the eigenvalue for that factor would have had to be comparable to that of factor 1, or the eigenvalues of all factors identified would have had to be similar in their magnitude.

Factor Loading

Factor loading is a measure of how strongly an observer's ratings are related to that particular factor. When an observer loads high on a factor that factor is highly correlated with the observer's ratings. For the group of observers (55 of 64), who rated aesthetic appeal first, 89.10% (49 out of 55 observers) loaded highest on factor 1. The remaining 10.90% of the observers (6 observers) loaded highest on four different factors, clearly illustrating that factor 1 was highly correlated with the majority of observer ratings, and that factor 1 was the only significant factor of the 11 identified.

Factor 1 accounted for 47.30% of the variance in the data set. The remaining variance was spread across 10 factors, four of which approached significance but had only 1 or 2 observers loading high on them, (Table 8) the other 6 had no observers loading high on them. The 10 additional factors most likely resulted from random, temporary variations in the rating responses of a minority of observers.

The proportion of variance for factor 1 (47.30%) can also be interpreted as a measure of consensus among the observers. Approximately half of the variance in observer ratings can be accounted for by a 1-dimensional scale. This indicates that the majority of observers (49 out of 55) rated the stimuli along one dimension. Since the factor analysis included both aesthetic appeal ratings and fittingness ratings, it is clear that the rating of aesthetic appeal and fittingness was determined by the same factor (dimension).

Inclusion of the second factor would account for only 8.50% additional variance. With only 2 observers having ratings that correlated highly with the second factor, it is clear that the second factor was not significant to the majority of observers, that it most likely resulted from random variation in the ratings of the 2 observers, and that the majority of observers rated the images on 1 factor regardless of the rating task (aesthetic appeal or fittingness) assignment.

Factor Scores

A factor score indicates the position of a stimulus on the dimension that the factor represents (Brown et al., in press). A positive factor score implies that the stimulus rates favorably on the dimension, a negative factor score represents an unfavorable rating. The higher the factor score, positive or negative, the greater the favorable or unfavorable association to the dimension.

Images SPT6 and SPT2 received high positive factor scores for aesthetic appeal and fittingness ratings (Table 9). Three images, SPT11, SPT10-2, and XPT18-2, received high negative factor scores for aesthetic appeal and fittingness ratings. From the comparison of image SPT6 to SPT11 (highest factor score vs. lowest factor score for aesthetic appeal rating) (Figure 13) and image SPT9 to image SPT10-2 (highest factor score vs. lowest factor score for fittingness rating) (Figure 14), it was apparent that the dimension represented by factor 1 was scene attractiveness.

Table #9: Aesthetic Appeal and Fittingness Factor Scores

Aesthetic Appeal Factor Scores

Image	High Factor Score	Low Factor Score	Aesthetic Appeal Score	Fit Score
SPT6	0.939		53.73	98.04
SPT17	0.929		38.53	12.01
SPT2	0.885		25.78	61.04
SPT12	0.836		44.67	51.28
SPT11		-1.557	-182.74	-136.95
SPT10-2		-1.203	-120.00	-174.62
SPT10-3		-0.972	-127.69	-117.13
XPT18-2		-0.948	-122.97	-194.65

Fittingness Factor Scores

Image	High Factor Score	Low Factor Score	Aesthetic Appeal Score	Fit Score
SPT9	0.980		33.77	94.09
SPT6	0.884		53.73	98.04
SPT13	0.690		47.76	32.77
SPT2	0.671		25.78	61.04
SPT10-2		-1.485	-120.00	-174.62
XPT18-2		-1.332	-122.97	-194.65
SPT15-3		-1.140	-89.26	-149.89
SPT11		-1.087	-182.74	-136.95

Image SPT6 Highest Factor Score: Aesthetic Appeal

Image SPT11 Lowest Factor Score: Aesthetic Appeal

Figure 13: Aesthetic Appeal Factor Score Comparison

Image SPT9 Highest Factor Score: Fittingness

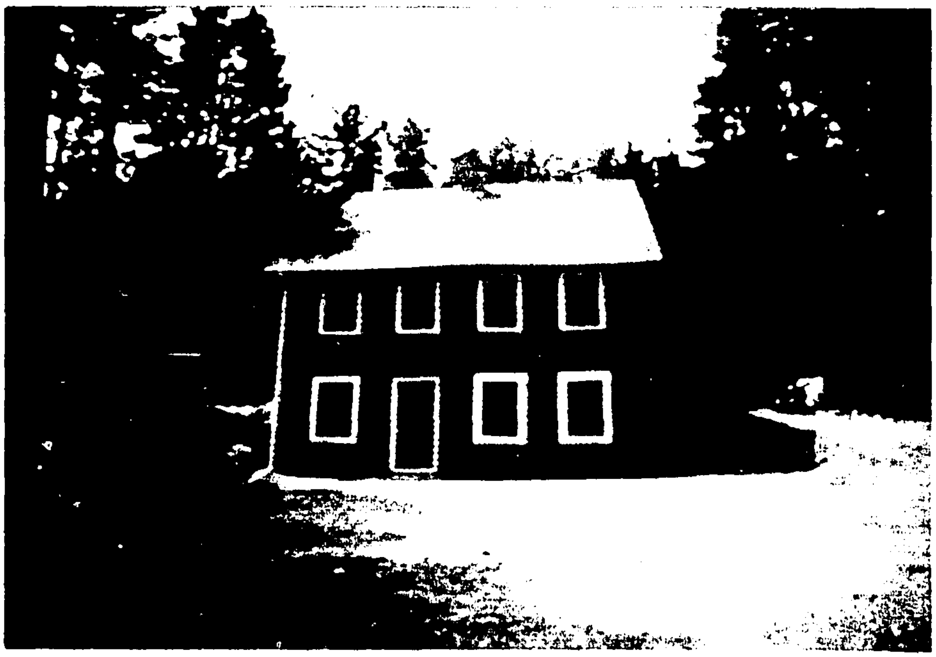


Image SPT10-2 Lowest Factor Score Fittingness

Figure 14: Fittingness Factor Score Comparison

Questionnaire

The questionnaire (Appendix B) was designed to gather information on observer exposure to, and familiarity with, forested landscapes. It was hypothesized that an observer's level of exposure and familiarity would influence his sensitivity to the rating tasks, resulting in a large number of factors determining observer ratings of stimuli. An observer's exposure and familiarity level could be examined to provide insight into the source of the difference between his ratings of the stimuli and the ratings of other observers.

Questions addressing observer familiarity with forested landscapes requested observers to respond in terms of where they grew up : where they had lived longest prior to their 18th birthday. Familiarity was examined through four variables: 1) the state in which observers grew up, 2) whether the region of the country (United States) where observers grew up was associated with a forest cover type, 3) the social environment, urban, suburban, or rural, in which observers grew up, and 4) proximity of observer residence to a forest.

Familiarity varied greatly over the observer group. Twenty states were represented, the majority of observers having grown up in Arizona (Table 10). Over half of the

Table #10: States Represented in Observer Sample

State	Number of Observers	Percent of Sample
Arizona	31	48.4
California	8	12.5
Colorado	1	1.6
Connecticut	1	1.6
Illinois	3	4.6
Indiana	1	1.6
Iowa	1	1.6
Maine	1	1.6
Maryland	2	3.1
Massachusetts	1	1.6
Michigan	1	1.6
Missouri	1	1.6
New Jersey	3	4.6
New Mexico	1	1.6
New York	3	4.6
Ohio	1	1.6
Pennsylvania	1	1.6
Texas	1	1.6
Virginia	1	1.6
Wisconsin	1	1.6

Table #11: Forest Cover Type Regions*

	Number of Observers	Percent of Sample
Eastern Forest Cover Types		
Maple-Beech-Birch and Oak Hickory	1	1.6
Oak-Hickory and Oak-Pine	14	22.2
Aspen-Birch, Spruce-Fir and Maple-Beech-Birch of Greatlakes Area	2	3.2
Western Forest Cover Types		
Pinyon-Juniper, Ponderosa Pine, Chaparral, Hardwoods, Doug-Fir, and Fir-Spruce	17	27
Total		54
Land that has never supported forests and land formerly forested which is now developed for other uses.	29	46

(* Society of American Foresters, 1980.)

observers (54%) grew up in regions of the country which contain at least one forest type, the remaining 46% grew up in areas which never supported forests or where forest land had been developed for other uses (Table 11).

Forty two (42) of the observers (65.5%) grew up in urban environments, the majority of which (19 of 42) grew up in cities with populations of 250,000 to 500,000 people (Table 12). Twenty of the observers (31.3%) grew up in suburban towns, 14 of those individuals having grown up in towns with populations of 10,000 to 25,000 people (Table 12). Rural communities, with populations of 5,000 people or less, provided the social environment for 3.2% of the observers.

The majority of observers (84.4%) grew up in single family homes located on individual lots (Table 13). Six observers grew up in residences located in forests, 35 observers grew up in residences located greater than 10 miles away from a forest (Table 13).

Observer exposure to forested landscapes was measured by participation in forest related activities. Of the 23 activities listed, visiting the forest to think, to walk, to picnic, to camp, and to hike were the most popular (Table 14). Level of observer exposure, low, medium, or high, was determined from the number of activities each observer participated in.

Table #12: Social Environments

Urban

Type	Population	Number of Observers	Percent of Sample
Major Metropolitan	1,000,000. or greater	7	10.9
City	500,000. to 1,000,000.00	12	18.7
City	250,000. to 500,000.00	19	29.7
City	50,000. to 100,000.00	1	1.6
City	25,000. to 50,000.00	3	4.6
Total			65.5
Suburban			
Town	10,000. to 25,000.00	14	21.9
Town	5,000. to 10,000.00	6	9.4
Total			31.3
Rural			
Community	2,500. to 5,000.	1	1.6
Community	2,500. or less	1	1.6
Total			3.2

Table #13: Residence Type and Proximity to Forest

Residence Type	Number of Observers	Percent of Sample
Apartment, Townhouse, Condominium or Duplex	5	7.8
Row Home	5	7.8
Single Family Home on its own lot	54	84.4
Proximity to Forest		
Located in Forest	6	9.4
Within one Mile	11	17.2
Between 1 to 5 Miles	10	15.6
Between 5 to 10 Miles	2	3.1
Greater than 10 Miles	35	54.7

Table #14: Forest Related Activities

Activity	Number of Observer Participants	Percent of Sample
Picnic*	47	73.4
Photograph Nature	18	28.1
Horseback Ride	13	20.3
Birdwatch	3	4.6
Sightsee	25	39.1
Ride Dirt Bikes or All-Terrain Cycles	6	9.4
Camp*	42	65.6
Snowmobile	4	6.3
Backpack	24	37.5
Study Plants	3	4.6
Walk*	49	76.6
Down-Hill Ski	31	48.4
Hunt	8	12.5
Hike*	35	54.7
Observe Wild Flowers	12	18.8
Cut Wood	8	12.5
Collect Rocks	4	6.3
Fish	21	32.8
Just Drive Through	19	29.7
Cross-Country Ski	3	4.6
Collect Leaves	6	9.4
Collect Pine Cones	19	29.7
Think*	52	81.3

(* denotes most popular activities)

Table 15#: Observer Group Forest Exposure Levels

Number of Observers	Number of Activities Participated In By Each Observer	Percent of Total Activities Listed	Percent of Observer Sample	Activity Level
12	3	13	18.8	low
4	4	17.4	6.3	low
9	5	21.7	14.1	low
		Total	39.2	low
3	6	26.1	4.6	med.
9	7	30.4	14.1	med.
7	8	34.8	10.9	med.
5	9	39.1	7.8	med.
6	10	43.5	9.4	med.
3	11	47.8	4.6	med.
		Total	51.4	med.
2	12	52.2	3.1	high
3	13	56.5	4.6	high
1	15	65.2	1.6	high
		Total	9.3	high

The low exposure level, accounting for 39.2% of the observers, consisted of individuals which participated in 25% or less of the activities (Table 15). The medium exposure level, participation in 26% to 50% of the activities, accounted for 51.4% of the observers. The remaining 9.3% of the observers received a high exposure level rating by participation in 51% or more of the activities (Table 15).

Forested landscapes were valued as places to go to escape from congested environments by 68.8% of the observers. Observers, 67.2%, also valued forests as places of solitude, and 60.9% valued forests as locations where they could go to experience the natural environment first hand.

The majority of the observers rated the stimuli based on 1 factor. Observers, therefore, rated the stimuli, regardless of rating task, on 1 dimension, in spite of the differences that existed in their levels of exposure to, and familiarity with, forested landscapes.

Effect of Rating Task Order

Changing the order of the rating tasks, where images were rated on fittingness first and aesthetic appeal second, did not significantly influence observer rating of

Table #16: Two-Way ANOVA Results for Effect of Order Change

Image	Aesthetic Appeal Mean Baseline Adjusted Z-score Treatment*** #1	#2	Fittingness Mean Baseline Adjusted Z-score Treatment*** #1	#2	F-value	Critical Value**
SPT4*	-0.24	0.56				
SPT10-3	-1.35	-1.09			8.51!	3.98
SPT15-4*	-1.12	-0.45				
XPT18-2	-1.37	-1.43				
SPT4			0.25	-0.22		
SPT10-3			-0.93	-1.08	0.11	3.98
SPT15-4			-0.87	-0.69		
XPT18-2			-1.95	-1.35		

* images with significantly different mean baseline adjusted Z-scores

** alpha level = .05

*** treatment #1 = aesthetic appeal rated first
treatment #2 = fittingness rated first

(! denotes significant test statistic)

fittingness (Table 16). Observer rating of aesthetic appeal, however, was significantly different.

Mean baseline adjusted Z-scores for aesthetic appeal were significantly higher, when fittingness was rated first, for two of the four images examined (Table 16). Rating fittingness first caused the aesthetic appeal ratings of two images to be greater than they would have had aesthetic appeal been rated first ($r = .893$ for aesthetic appeal score vs. fittingness score when aesthetic appeal was rated first, $r = .998$ for aesthetic appeal score vs. fittingness score when fittingness was rated first).

Discussion

The results of this research uncovered the nature of three relationships: 1) how building color contrast to setting influenced perceived fittingness, 2) how aesthetic appeal and fittingness were related, and 3) how stimulus characteristics can influence rating tasks.

For the majority of images, the level of building color contrast to setting determined the perceived level of fittingness of a residence in its forested landscape setting. As building color contrast to setting decreased, became less obtrusive, perceived fittingness increased. Structure colors which were more natural, most like those of the setting, resulted in more contextually compatible buildings which received higher fittingness ratings. This finding is similar to that of Groat (1984), who found that buildings which had colors indicative of urban environments were perceived as more contextually compatible in urban settings.

Building color contrast to setting determined perceived level of aesthetic appeal as well. For the majority of images, aesthetic appeal ratings were positively related to fittingness ratings ($r = .792$). Images which received high fittingness ratings also received high aesthetic appeal ratings. In most cases, the recipient of the highest aesthetic appeal rating for a series was the image which received the highest, or second highest, fittingness rating.

Precautions were taken, through experimental design and instruction of the subjects, to limit the influence of variables other than those being investigated. For the respective rating tasks, observers were instructed to rate aesthetic appeal and fittingness. Observers were told of the second rating task, fittingness rating, only after all observers had completed the aesthetic appeal rating. There was no mention of, nor was it implied that, a relationship existed between fittingness and aesthetic appeal. The results indicated that the observers did in fact rate aesthetic appeal and fittingness, their ratings were based on obtrusiveness of the structures as determined by building color contrast to setting, and a clear relationship between fittingness and aesthetic appeal was revealed.

The relationship between the rating tasks themselves, specifically, whether or not the order of the rating tasks influenced the ratings which resulted, was unclear. Changing the order, so that fittingness was rated first, did not influence fittingness ratings, but did result in significantly higher aesthetic appeal ratings for two of the four images examined. This result, though, was inconclusive because of significance in only half of the sample. This researcher feels that the design of the experiment, and the nature of the instructions provided, precluded any influence of rating task order. Further investigation is needed to determine the validity of this assertion.

The majority of observers based their ratings of aesthetic appeal and fittingness on one factor. An examination of image factor scores, aesthetic appeal scores, and fittingness scores lead to the conclusion that the response determining factor, in spite of rating task, was scene attractiveness: a result of the residence to setting relationship of an image. Images exhibiting structures of low color contrast to setting: 1) resulted in residences rated as fitting best in the setting, 2) were scenes rated higher in aesthetic appeal, and 3) in general had residence to setting relationships that "looked better" than those of images exhibiting higher levels of structure color contrast to setting.

Experimental design included the showing of "preview" stimuli allowing observers to set their rating criterion to encompass the range of stimuli that would be encountered in actual rating tasks. Different random orders of the stimuli were presented to different groups of observers to account for problems in ratings due to order of stimulus presentation. Observer ratings were examined on the basis of mean baseline adjusted Z-scores which accounted for origin shifts and interval size differences among observer ratings.

SBEs, as a second scaling method for comparison of observer rating of images, adjusted for unequal interval judgement criterion scales and origin differences among the observer groups.

The questionnaire results revealed that observers grew up in: 1) a variety of different states; 2) regions of the country representing different forest cover types; 3) a diverse assortment of social environments; 4) residences located at different distances from a forest; and 5) that observer level of exposure to forested landscapes varied over the group. Factor analysis results indicated that the observers did not disagree in their perception of the stimuli, regardless of differences in familiarity and exposure, and in spite of the rating task.

One series of images departed from the inverse relationship of structure color contrast to fittingness and aesthetic appeal rating. Departure from this scenario probably resulted from the quality of the stimulus rated. Each stimulus (primary image) consisted of two components: a residence, and a forested setting. In one series, the components of the original image were extremely low in aesthetic appeal and fittingness. Departures from the hypothesized relationship most likely resulted from the poor quality of the original stimulus, rather than from the influence of the building color to setting contrasts of the manipulations.

The effect of poor stimulus quality on observer ratings encountered in this research is similar to the "halo effect" discussed by Wohlwill (1979). Wohlwill attributed a high rating received by an obtrusive structure to the possibility that high setting quality acted as a halo, overshadowing the negative influence of structure obtrusiveness. For the present research, a "negative halo effect" was the most plausible explanation for the specified results, given the experimental design and data analysis techniques employed.

Reducing the obtrusiveness of man-made structures in forested settings positively influenced perceived fittingness, which was shown to be positively correlated with aesthetic appeal. Encouraging contextual fit between man-made structures and forested settings will contribute to the preservation of visual quality of the forest, maintain and perpetuate the identity, or "sense of place", of the forest setting, and will preserve an important aspect of the forests' contribution to the quality of life of the public.

The human presence in forested landscapes is most often detected through visual recognition. Of the dominant visual impacts of people, - timber management, forest fires, and residential development - residential development is the most flexible in terms of planning and design. Residential development which limits structure obtrusiveness will mitigate its visual impact by "contextually fitting" into its surroundings, fostering more aesthetically appealing conditions than would have prevailed had structure obtrusiveness not been constrained.

Forested landscapes result from different combinations of characteristics such as vegetation, and topography. Each forest is unique because of its distinctive combination. Those same characteristics "fit together" to make forested landscapes attractive as residential sites. As urban areas expand more individuals will seek out forested settings to take advantage of the opportunities that a forest's features provide.

Obtrusive residential structures break down the "fit" between forest characteristics by negatively impacting the visual relationship of those features. A breakdown in "fit" ultimately results in destruction of the identity, or "sense of place", of a forest setting. When sense of place is lost, or changed significantly, the attraction which brought residents to the forest setting is dissipated. Residents will move to other forested areas to regain what was lost.

This cycle of development, loss, and relocation has occurred throughout the history of the United States. At this point in time it is painstakingly clear that neither the forest land base, nor the public, will support the continuation of the cycle. This researcher proposes that contextual fit is a major aspect of the problem, and that fitting structures to their forest settings will contribute to its resolution.

That forested landscapes were, and are still, allowed to lose their sense of place is perplexing. American society has determined that the preservation of certain landscapes, historical sites, scenic highways, and scenic waterways is necessary for perpetuation of the quality of life in the United States, for past, present, and future generations. Historically, the unique, the grand, and the awe inspiring have received the brunt of attention in matters of landscape preservation, while the ordinary, subtle, and commonplace have been allowed to slowly disappear.

This researcher contends that the preservation of the vernacular landscape is as important to the quality of life of American citizens, if not more so, than is that of the spectacular. Contextually fitting man-made structures to forested settings preserves setting identity by complementing and respecting the uniqueness of a setting. Striving for contextual fit between man-made structures and forested landscapes will contribute to the preservation of sense of place, and the perpetuation of vernacular landscapes and, as a result, will enhance quality of life.

Preservation of visual quality and sense of place, and improving quality of life, are endeavors traditional to the occupation of landscape architecture. Landscape architects have customarily achieved results in such undertakings by fitting landscape materials to man-made structures or settings. The characteristics of material color, texture, form, and mass, employed to make the "fit" of landscape materials to structures, are exactly those which can be utilized to fit a structure to a landscape. This research has shown how color can be used in such an effort.

Computer technology was vital to this research effort. The landscape architect can apply similar, or more advanced, computer graphics to problems of contextual fit. The ability to see real color contrasts, texture, mass, and form relationships, as they would appear in actual landscape settings, is the role that computer technology will fill in bringing the knowledge of landscape architecture to bear on problems of contextual fit.

The landscape architect has before him, the opportunity to heighten his involvement in land development issues which will determine visual resource quality, preservation of vernacular landscapes, and improvement and perpetuation of quality of life for the public. By seizing this opportunity, the landscape architect could contribute to issues of concern to pro and anti development groups by illustrating how variations in characteristics, such as building color obtrusiveness to setting, would appear in the landscape in question. Such information could prevent conflicts, or assist in conflict resolution, before development began.

This research project has fulfilled three of its four proposed goals: 1) the relationship of structure color contrast to setting and fittingness was shown to be inverse in nature, 2) the relationship between fittingness and aesthetic appeal of scenes of residences in forested landscapes was examined and conclusions were drawn, and 3) the bearing that these relationships can have on visual quality, preservation of forest setting sense of place, and quality of life, was discussed.

The fourth goal, that of inspiring others to extend the knowledge provided, has been partially fulfilled. The seed of interest has been planted, responsibility for its nurturing to maturity has been placed in the hands of inspired researchers. Will the tree grow only to be obscured by that which does not fit?

APPENDIX A

Introductory Statement and Questionnaire Instructions

EXPERIMENT #36 INTRODUCTION AND INSTRUCTION SHEET

(1) HAS ANYONE PARTICIPATED IN A SESSION OF EXPERIMENT #36 BEFORE TODAY?

(2) SHOW HOW I WANT THE ANSWER SHEET USED

a/. place social security # in area marked "identification #"

b/. check special codes block for the appropriate show number

(3) MARK YOUR RESPONSES ON THE ANSWER SHEET ONLY

In many parts of the country urban and suburban developments are rapidly extending into previously undeveloped forest areas. Part of what attracts people to these areas is their visual aesthetic appeal.

Responsible federal and local land planning and zoning agencies are seeking design and building guidelines that will assure that developments in forest areas retain their aesthetic appeal. The concern is not only for the residents but recreators, tourists, and others who encounter these developments in the course of visits to the surrounding forest areas.

In this context, I am going to show you pictures of a number of houses which you might come across during a visit to a forest area. You will be asked to rate the visual aesthetic appeal of the house on a 10 point scale, where 1 signifies that you judge the house to be very low in aesthetic appeal, and 10 indicates very high aesthetic appeal.

The house will be shown on this T.V. monitor. Please use the T.V. picture to get an impression of what the house and its setting would be like. Do not base your ratings on the quality of the T.V. picture itself.

In summary, you will be shown a number of houses that have been built in forest areas. You you will rate each house on a 10 point scale where 1 indicates that the house has very low aesthetic appeal, and 10 indicates very high aesthetic appeal. You will mark your rating for each house on the green sense-mark sheet I have given you. (show blow up of sheet and how I want it marked).

Before we begin the actual rating I am going to show you a set of preview scenes so you can get an idea of the range of scenes that you will be evaluating. When you see the preview scenes DO NOT MARK ANYTHING ON THE RESPONSE SHEET IN FRONT OF YOU. But try to imagine how you would rate them on a ten point scale where 1 indicates low aesthetic appeal, and 10 indicates high aesthetic appeal.

If there are no questions, I will begin by showing the Preview scenes. (**SHOW PREVIEW SCENES**).

Now we will begin with the ratings. Each scene will be shown for about 10 seconds, which is not very long, but it should be long enough for you to get an impression of the scene and to record your rating. Between the scenes the screen will indicate which scene is to appear next, eg. NEXT IS 1, NEXT IS 2, etc., This is to help you keep your place on the rating sheet.

Please be sure to record a rating for every scene, marking your rating for each scene in the appropriate space on your answer sheet. Try to use the full range of the scale to indicate the relative aesthetic appeal of the scenes. **(START SLIDE SHOW)**

Second Half of the Slide Show.

I am now going to show you the same group of slides, but this time I would like you to rate the level of FITTINGNESS between the house and its forested setting. FITTINGNESS is a measure of the degree of harmony between two items. In this case you are rating, on a 10 point scale, whether the house clashes with the forested setting, or whether the house is congruent (in harmony with) the forested setting, where 1 indicates that the house strongly clashes with the forest setting (ie: it does not fit in the forest setting), and 10 indicates that the house is highly congruent (in harmony) with the forest setting (ie: the house fits in the forest setting).

Please be sure to record a rating for every scene, marking your rating for each scene in the appropriate space on your answer sheet. Try to use the full range of the scale to indicate the relative FITTINGNESS of the house to its forested setting.

This group of scenes begins with number 20. Are there any Questions? THE SLIDE SHOW WILL BEGIN WHEN THE PHRASE NEXT IS 20 APPEARS ON THE T.V. MONITOR.

Questionnaire:

I have a questionnaire that I want you to complete. If you have any questions about the questionnaire please feel free to ask. The numbers of the questions correspond to the row numbers of your answer sheet where you are to mark your response. Answer each question. Please do not place any marks on the answer sheet.

(1) THE MAP THAT I HAVE GIVEN YOU APPLIES TO QUESTION #40

(2) THE LAST PAGE OF THE QUESTIONNAIRE IS A STATE ABBREVIATION LIST FOR YOU TO USE ON QUESTIONS 41 THROUGH 46 IF YOU NEED IT

APPENDIX B

Questionnaire

How we respond to different environments has much to do with the characteristics of the environment in which we grew up. I am interested in knowing about the environment in which you grew up. In questions #40 through #49 I would like you to characterize the environment in which you lived the longest prior to your 18th birthday.

Question #40:

In which region of the country did you live the longest prior to your 18th birthday? Please refer to the map for identification of the regions by number. (mark the correct space of row number 40 on your answer sheet)

1/. region 1
2/. region 2
3/. region 3
4/. region 4
5/. region 5
6/. region 6
7/. region 7
8/. region 8
9/. region 9
10/. region 10

Question #41 through #46:

In which state did you live the longest prior to your 18th birthday? (please mark the correct space of row number 41, 42, 43, 44, 45, or row 46)

	1	2	3	4	5	6	7	8	9	10
row 41	AL	AK	AZ	AR	CA	CO	CT	DE	DC	FL
row 42	GA	HI	ID	IL	IN	IA	KS	KY	LA	ME
row 43	MD	MA	MI	MN	MS	MO	MT	NE	NV	NH
row 44	NJ	NM	NY	NC	ND	OH	OK	OR	PA	RI
row 45	SC	SD	TN	TX	VT	UT	VA	WA	WV	WI
row 46	WY									

Question #47

Which of the following best describes the place where you lived the longest prior to your 18th birthday? (please mark the correct space of row 47 of your answer sheet)

An urban area which was :

1/. a major metropolitan area with a population of 1,000,000 or more (such as New York, Chicago, Dallas, Los Angles or Philadelphia)

2/. a city with a population of 500,000 to 1,000,000. (such as Boston MA, Washington DC, Phoenix AZ, Milwaukee WI, or Memphis TN)

3/. a city with a population of 250,000 to 500,000. (such as Albuquerque NM, Cincinnati OH, Tucson AZ, Miami FL, ST Paul MN, or Pittsburgh PA)

4/. a city with a population of 100,000 to 250,000. (such as Hartford CT, Tempe AZ, Grand Rapids MI, Baton Rouge LA, Orlando FL, Salt Lake City UT, or Syracuse NY)

5/. a city with a population of 50,000 to 100,000. (such as Boulder CO, Wilmington DE, Portland ME, Las Cruces NM, Charleston SC, Green Bay WI, or Chandler AZ)

6/. a city with a population of 25,000 to 50,000. (such as Flagstaff AZ, Morgantown WV, Augusta GA, or Bangor ME)

A suburban town which:

7/. had a population of 10,000 to 25,000. (such as Williamsburg VA, Laguna Beach CA, Bozeman MT, Asbury Park NJ, Pullman WA, Chippewa Falls WI, or Decatur GA)

8/. had a population of 5,000 to 10,000. (such as Bisbee AZ, Litchfield IL, Steamboat Springs CO, Cape May NJ, Jackson WY, Kennett Square PA, or Barre VT)

A rural community which had:

9/. a population of 2,500 to 5,000

10/. a population below 2,500.

Question #48:

Would you describe the home in which you lived the longest prior to your 18th birthday as: (please mark the correct space in row 48 of your answer sheet)

1/. an apartment, townhouse, condominium, or duplex
2/. a mobile home
3/. a row home
4/. a single family home on its own lot

Question #49:

For the purpose of this question a "forest" is any undeveloped piece of land which is larger than 1 acre and is dominated by trees. Was the home in which you lived prior to your 18th birthday: (please mark the correct space of row 49 of your answer sheet)

1/. located in a forest?
2/. located within 1 mile of a forest?
3/. located from 1 to 5 miles away from a forest?
4/. located from 5 to 10 miles away from a forest?
5/. located further than 10 miles away from a forest?

I am interested in knowing about what you do when you visit a forest. Which of the activities listed below in questions #50 through #52 are activities in which you partake when you visit a forest? Choose as many of the listed activities that you feel best describe things that you do when you visit a forest. (please mark the correct space, or spaces, of row number 50, 51, or 52, on your answer sheet)

Question #50:

For the following activities please mark the correct space, or spaces, of row 50 of your answer sheet.

1/. picnic
2/. photograph nature
3/. horseback ride
6/. ride dirt bikes or all terrain cycles
7/. camp
8/. snowmobile

4/. birdwatch
5/. sightsee
9/. backpack
10/. study plants

For the following activities please mark the correct space, or spaces, of row 51 of your answer sheet.

1/. walk
2/. downhill ski
3/. hunt
4/. hike
5/. observe wildflowers
6/. cut wood
7/. collect rocks
8/. fish
9/.just drive through
10/. cross-country ski

For the following activities please mark the correct space, or space, of row 52 of your answer sheet.

1/. collect leaves
2/. collect pine cones
3/. think

Question #53:

Do you value the forest because it allows you to: (please mark the correct space, or spaces, in row 53 of your answer sheet.

1/. escape from a congested environment?
2/. find a place of solitude?
3/. experience the natural environment first hand?

Question #54: Sex (please mark the correct space of row 54 of your answer sheet)

1/. male
2/. female

Question #55: Age (please mark the correct space of row 55 of your answer sheet)

1/. 15 to 20
2/. 21 to 25
3/. 26 to 30
4/. 31 to 35
5/. 36 to 40
6/. above 40

When you finish this questionnaire please check to see that you have answered each question. After having checked you answer sheet please hand it in and return to your seat. When everyone has finished I would like to take a few moments to explain my research project.

Thank you for your time and consideration.

Stephen B. Tibbels

APPENDIX C

Rating Scales

This is an example of the scale that you will use for rating the first group of scenes.

Low			Aesthetic Appeal						High
1	2	3	4	5	6	7	8	9	10

Please mark your response in the row number of the answer sheet that corresponds to the number of the slide.

This is an example of the scale that you will use for rating the second group of scenes.

Low				Fittingness					High
1	2	3	4	5	6	7	8	9	10

Please mark your response in the row number of the answer sheet that corresponds to the number of the slide. For the second group of slides you will begin with number 20.

Selected Bibliography

Altman, Irwin. 1976. "Some Perspectives on the Study of Man-Environment Phenomena." In Proshansky, Ittelson, Witt, and Rivlin (eds.). Environmental Psychology, 2nd ed. New York: Heit, Rinehart, and Winston. pp. 27-37.

Anderson, L. M. 1981. "Land Use Designations Affect Perception of Scenic Beauty in Forest Landscapes." Forest Science, 27 (2), pp. 392-400.

Bradley, G. A. 1984. "The Urban/Forest Interface." In G Bradley (ed.). Land Use and Forest Resources In a Changing Environment: The Urban/Forest Interface. Washington, University of Washington Press. pp. 3-16.

Brown, T.C., Daniel, T.C., Schroeder, H.W., and Brink G.E. "Analysis of Ratings: Concepts, Methods and Guide to RMRATE." USDA Forest Service General Technical Report RM- , Rockey Mountain Forest and Range Experiment Station, Fort Collins Colorado.(in press).

Daniel, T. C., and Boster, R. S. 1976. "Measuring Landscape Aesthetics: The Scenic Beauty Estimation Method." USDA Forest Service Research Paper RM-167, Rocky Mountain Forest and Range Experiment Station, Fort Collins Colorado.

Fisher, R.A. 1949. The Design of Experiments. Edinburgh: Oliver and Boyd.

Gobster, P. H. 1983. "Judged Appropriateness of Residential Structures in Natural and Developed Shoreline Settings." In D. Ameadeo, J. Griffin, and J. Potter (eds.). EDRA 1983. Washington DC: EDRA. pp. 105-112.

Groat, L. 1982. "Meaning in Post-Modern Architecture: an Examination Using the Multiple Sorting Task." Journal of Environmental Psychology, 2 (1), pp. 3-22.

Groat, L. 1983. "Environmental Meaning: The Problem of Contextual Fit." In D. Amadeo, J. Griffin, and J Potter (eds.). EDRA 1983. Washington, DC: EDRA. pp. 154-161.

Groat, L. 1983b. "Measuring the Fit of New to Old." Architecture, The AIA Journal. November, pp. 58-61.

Groat, L. 1984. Contextual Compatibility in Architecture: An Investigation of Non-Designers Conceptualizations. Publications In Architecture and Urban Planning Report R84-3, Univ. of Wisconsin-Milwaukee.

Groat, L.1988. "Contextual Compatibility in Architecture: An Issue in Personal Taste?" In J Nasar (ed.). Environmental Aesthetics. New York: Cambridge Press. pp. 228-253.

Gupta, A. and Orland, B. 1989. "Toolbox". Unpublished Computer Software, University of Illinois, Department of Landscape Architecture, Urbana Illinois.

Low, S. M., and Ryan, W. P. 1985. "Noticing Without Looking: A Methodology For The Integration of Architectual and Local Perceptions in Oley, Pennsylvania." Journal of Architectural and Planning Research, 2. pp. 3-22.

Orland, B. 1989. Personal Communication.

Society of American Foresters. 1980. "Forest Cover Types of the United States and Canada." F. H. Eyre (ed.). Washington D.C.

Vaux, H. J. 1982. "Forestry's Hotseat: The Urban/Forest Interface." American Forests, 88(5):37. pp. 44-46.

Vining, J., Daniel, T. C., and Schroeder, H.W. 1984. "Predicting Scenic Values in Forested Residential Landscapes." Journal of Leisure Research, 16 (2). pp. 124-135.

Wohlwill, J. 1976. "Environmental Aesthetics: The Environment as a Source of Affect." In I. Altman and J. Wohlwill (eds.). Human Behavior and Environment: Advances in Theory and Research, Vol. 1, New York: Plenum Press. pp. 37-86.

Wohlwill, J. 1979. "What Belongs Where: Research on Fittingness of Man-Made Structures in Natural Settings." In T.C. Daniel, E. H. Zube, and B. L. Driver (eds.). Assessing Amenity Resource Values. USDA Forest Service General Technical Report RM-68. Rocky Mountain Forest and Range Experiment Station, Ft. Collins, Colorado. pp. 48-57.

Wohlwill, J. 1982."The Visual Impact of Development in Coastal Zone Areas." Coastal Zone Management Journal, 9 (3/4). pp. 225-248.

Wohlwill, J., and Harris, G. 1980. "Response to Congruity or Contrast for Man-Made Features in Natural-Recreation Settings." Leisure Sciences, 3 (4). pp.349-365.

Zube, E. H., Sell, J. L., and Taylor, J.G. 1982. "Landscape Perception: Research, Application and Theory." Landscape Planning, 9. pp. 1-33.