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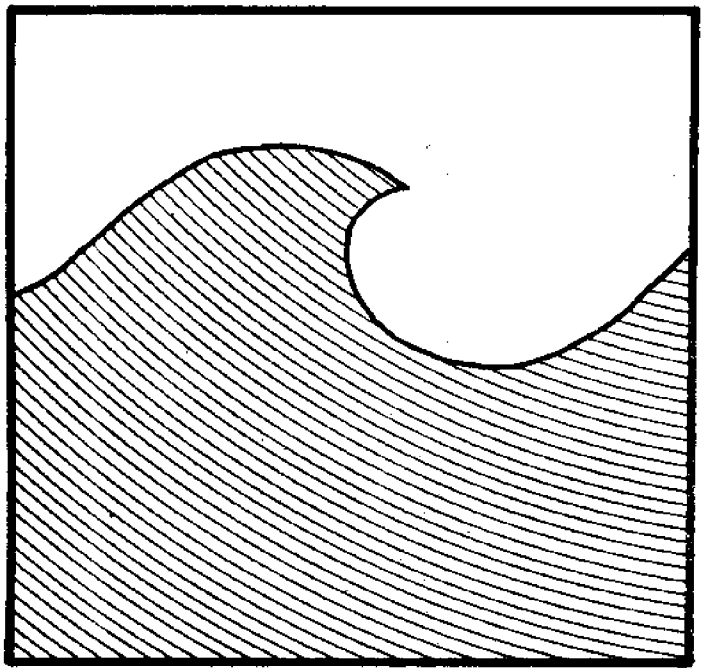
VISUAL QUALITY OF THE COASTAL ZONE



SEA GRANT PROJECT

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VISUAL QUALITY OF THE COASTAL ZONE

- WORKING PAPERS -

New York's coastline comprises a wide spectrum of visual environmental character, ranging from the aesthetically pleasing to the physically revolting. Natural processes over time, modified to varying degrees by human activities, have produced unique regional characteristics central to the quality of life of both permanent residents and seasonal visitors. While high aesthetic quality may occur in man-dominated as well as in undisturbed natural environments, thoughtless coastal development often destroys natural scenic values and creates visual horrors.

The vital importance of protecting and enhancing aesthetic values is widely recognized. Public concern has been translated into legislation, such as the National Environmental Policy Act of 1969 (NEPA) and the Coastal Zone Management Act of 1972, requiring that aesthetic values be duly considered along with ecological, cultural, economic and other values in land use decisions. State, regional, and local directives concerned with environmental quality concur. The need for action is clear, but defining, evaluating, and managing the vulnerable visual quality of our coastal zone is highly elusive.

In November 1974, the New York State Sea Grant Institute awarded a grant to the School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse, N.Y., to investigate the issues of visual quality pertaining to the New York State's coastlines. The long range objective is to provide practical methods by which coastal managers can evaluate visual quality and integrate these findings into land use decisions. The project's initial steps have included the preparation of a series of working documents, intended to provide background information on the subject and to elicit responses from selected readers.

1974-75 Research Staff

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LANDSCAPE EVALUATION:
A REVIEW OF CURRENT TECHNIQUES AND METHODOLOGIES

by Richard C. Viohl, Jr.

Introduction

The importance of the visual landscape as a scenic "resource" has gained wide public support within the past decade. Resource planners and managers have been hard pressed to develop systematic methods of assessing the visual quality of landscapes in response to increased public interest in the protection and preservation of the environment in all its aspects -- ecological, social, and aesthetic.

Visual quality as a distinct and important component of the environment has received special attention within the past six years. A variety of techniques and methods for describing, inventorying, and evaluating landscapes has been advanced in an attempt to objectively quantify the visual quality of the environment. Objective measurement of visual quality would give it more equitable consideration when weighing it against other more tangible resources. This important concept, first recognized and stated in the National Environmental Policy Act of 1969 (NEPA) and incorporated in other recent environmental legislation (see related paper in this series, "Visual Quality in Land Use Control", Ross, 1975), implies the need for logic, innovation, and inter-factor consideration in assessment techniques.

A review of recent studies concerned with the assessment of visual quality suggests that there are two general approaches

to the problem: (1) perception/preference studies and (2) descriptive inventories. The first approach, perception/preference studies, deals with the nature of man's perception, interpretation and subsequently his preference for his visual environment. Studies in this area can be further classified as to whether they are concerned with a) understanding the nature of man's perception and preference mechanisms or with b) simply gauging observer preferences.

STUDIES IN VISUAL QUALITY

(1) Perception/Preference Studies		(2) Descriptive Inventories
a) Conceptual Investigations	b) Preference Surveys and Questionnaires	

Conceptual studies of visual perception and preference rely most often on the expertise of the psychologist. They tend to lay the groundwork for other studies as they investigate the underlying theories, concepts, and phenomena involved in experiencing the visual environment. (Refer to Visual Perception Model in related paper in this series, "Evaluating Visual Quality of the Coastline: Some Significant Issues", Haskett, 1975). Surveys and questionnaires directed toward either recreation site users or observers of the landscape in general are used by resource planners in an attempt to define the preferences of those sampled. Such survey results may provide an evaluation of landscape quality if an important assumption is made -- that such preferences as recorded relate either directly or indirectly to scenic quality.

The second approach, through descriptive inventories, is the

most common means of representing and evaluating landscape quality. Of the 33 studies reviewed, 22 are of this type. They range from subjective lists of descriptive adjectives (e.g., semantic differentials) that are suggested as having a relationship to scenic quality to more sophisticated methods for weighting and ranking landscape dimensions. Some are simple checklists that array the distribution of landscape elements within a given study area. Others go on to weight and rank the elements based on complex yet generally well-defined scaling factors. The levels of complexity, sophistication, and subjective versus objective judgement vary from study to study.

The critical importance of semantics in the slippery subject area of aesthetics presents a special problem in analyzing and comparing studies concerned with evaluating visual quality. Terminology in one case is often contrary to that used in another. The common use of such terms as landscape "elements", "properties", and "dimensions" is particularly sloppy. For the purposes of this review landscape "elements" refer to the physical features of the environment, either natural or man-made or some combination of each, which can be measured by standard scientific techniques. Landscape "properties" are descriptive attributes of landscape elements such as color, scale, and texture, which can also be scientifically described. Landscape "dimensions", however, are observed relationships between landscape elements and properties (e.g., complexity, unity, uniqueness), which are less easily quantified. A general list of elements, properties, and dimensions as identified in current literature includes:

Landscape Elements

Topography/relief/slope

land use

water forms

land forms

vegetative forms

man-made objects

Properties of Landscape Elements

scale (height, width, depth)

color

edges

texture

Dimensions of Landscape Elements

complexity/variety/diversity

uniqueness/novelty/contrast

naturalness

urbanization

pollution

unity/harmony/order/compatibility/coherence

disharmony/misfit

pattern/sequence

movement/rhythm

surprise/mystery

character types/regional identity

view characteristics: enframement, enclosure, focal point, observer position, direction

scenic "beauty"

legibility/vividness/identifiability

vulnerability

Thirty-one studies relating to the assessment of scenic quality were compared on the basis of (1) their approaches, (2) the types of landscapes they deal with, (3) the landscape elements and properties they analyze, (4) the dimensions they use for evaluation of the elements, (5) the data sources and analysis techniques they employ, and (6) the nature of the evaluations and judgments inherent in their use. Comparison in these six areas can be seen in the Appendix. Certain trends and conclusions can be drawn from the material.

Perception/Preference Studies

Conceptual Investigations

Complexity or "diversity" of the viewed scene has been a major variable in studies of landscape preference (Burns and Rundell, 1969, Wohlwill, 1968; Rapoport and Hawkes, 1970; Newby, 1971; Cox et al., 1972; Zube, 1973). There is almost universal agreement that complexity is positively related to preference, up to a point where the ability of the observer to digest and react to the visual inputs becomes overtaxed and he becomes frustrated. In this context, Wohlwill (1966) discussed an optimal level of stimulation. There is, however, no universal agreement on the definition of complexity. The general consensus of the reviewed reports seems to be that diversity/complexity means a great number of distinct visual elements (Newby, 1971; Wohlwill, 1968). This may be interpreted as being the number of landform elements, the pattern of land use, or a combination of both present in the landscape.

That complexity alone does not account completely for landscape preference was shown by Burns & Rundell (1969), R. Kaplan (1973) and others. A second dimension generally agreed upon is a preference for natural landscapes over urban landscapes, i.e. "naturalness". Kaplan, Kaplan, and Wendt (1972) surveyed 88 college freshmen and found that nature scenes were greatly preferred to urban scenes, that complexity predicted preferences within the nature scenes and within the urban scenes but did not account for the preference for nature over urban. Preference for naturalness is further documented by Wolhwill (1968) and Zube (1973).

Other factors that have been identified as playing a part in landscape preferences include "novelty" or "uniqueness" (Leopold and Marchand, 1968; Leopold, 1969) and the presence of water (Kiemstedt, 1968; Zube, 1973; Litton, 1974). The effect of a sense of mystery or surprise upon preference has received some of the most recent attention (R. Kaplan, 1973). Another variable considered is the relative coherence or legibility of a visual scene (Kaplan and Wendt, 1972; R. Kaplan, 1973).

All of these dimensions- complexity, naturalness, uniqueness, mystery, legibility, and the presence of water - explain in part the observed preferences for certain landscapes. They begin to provide the resource planner with a set of general guidelines for predicting and optimizing scenic quality. They are based on the psychologist's inputs on how to gain an observer's attention, focus it, and sustain it. The dimensions themselves, however, remain relatively poorly defined and unrelated except on a one-to one basis with observed preference. Several researchers have attempted to relate as many as three or four of the variables together at one time with some success. There is an encouraging trend toward

comprehensive investigations of the nature and complex interrelationships of all of the dimensions identified as influencing landscape preference. Much remains to be done in this area.

Perception/preference studies have several points in common. Almost all of their authors are psychologists, which may help to explain the difficulty these studies have in translating their discussions of complexity, naturalness, uniqueness, and the like into physical landscape elements. With little exception, findings regarding preference are based on groups of subjects ranking photographs or colored slides. This technique has two possibly serious drawbacks--(1) subjects are rating pictures of landscapes and not the landscapes themselves and (2) they are almost entirely "sunny day" analyses which may or may not represent the majority of the real time views. Addressing the first question, Zube, Pitt, and Anderson (Environmental Simulation...", 1974) have found strong support for the use of color photography for eliciting resource values in non-urban landscapes. They found that photographs yielded findings that were highly correlated with values obtained by on-site evaluations. Shafer (1974) found less intense but still significant correlation. Additional documentation of the use of photos or slides for eliciting landscape preference is needed. The second question relating to variability in climate and visibility and how they relate to perception and preference remains unanswered.

Rank ordering is by far the most common technique for establishing preferences between photographed scenes. The use of semantic differentials is also common. Other possible psychometric scaling techniques, such as adjective lists and free description responses, are less often employed. The popularity of slide/photo

ranking techniques seems attributable to their simplicity and degree of closeness to on-site scenic evaluation in comparison to other methods used. A note of caution is necessary: slide/photo ranking techniques as well as other techniques already mentioned measure only what subjects say they perceive, a proposition of questionable objectivity.

Two alternative techniques are available to the researcher--pupillometrics and Thematic Apperception Tests (TAT's). Pupillometrics, the measurement of the pupil of the eye as it responds to visual stimuli (Wenger, 1969), is held to be largely involuntary and thus objective in indicating a subject's interest. However, the mechanics involved in this technique appear too complex and expensive for its serious consideration under most circumstances.

The TAT is administered by showing a subject a picture and asking him to tell a story about it or elaborate on what he thinks is going on in the picture. The subject will project his true inner feelings by the nature of the story he tells. This psychometric technique requires an experienced psychologist to set up and evaluate the test as well as a landscape architect to delineate the landscapes to be evaluated. While potentially useful in drawing out the inner feelings and values of the subject, it still requires much subjective judgment on the part of the professional evaluating the results.

An important consideration in any attempt to measure scenic beauty is the position of the observer (Litton, 1966). Some landscapes are seen as panoramic views from miles away while some others invite closer inspection. Some are best appreciated from a stationary position, others are viewed from cars at various speeds. Still

others appear markedly different when viewed in sequence with others. The relationship between observer position and visual preferences appears complex but should be considered when choosing and evaluating different landscapes for scenic quality.

Preference Questionnaires and Surveys

Using preference data obtained from rank ordering a number of studies seek to identify and/or predict which sites possess the highest aesthetic values or are most preferred for specific recreational activities. Peterson and Neumann (1969) studied preferences for swimming beaches in metropolitan Chicago. Using semantic differentials administered in surveys they found that preferences varied between two groups -- those that preferred scenic natural beaches and those that preferred city swimming beaches. Hecock (1970) studied Cape Cod beaches and found natural beauty, the facilities provided, and the socio-economic background of the user to be significant influences on preference. Brush (1973) studied northeastern forest recreationists and found the distribution of open versus forested land to be an important factor.

Landscape dimensions identified among the recreation site user studies concerned specifically with coastal areas are remarkably similar. The qualities of the sand, i.e., its color and texture, landforms (dunes, slopes, size of the beach), and water forms (expanse, surf characteristics), are all present in the work of Peterson and Neumann (1969), Hecock (1970), and Hart and Graham (1967). Peterson and Neumann add the attractivity of the buildings,

and the attractiveness and amount of vegetation as additional considerations.

Crowdedness or "intensity of use" is a concept unique to the recreation site user surveys. Aesthetic attractivity models can be derived from relative demand functions of specific sites. In place of observer preferences, user participation rates can be used in evaluating preferences. The assumption is that the attractiveness of a given site is reflected in user response or non-response (Coomber and Biswas, 1973).

"Surveys and questionnaires are often employed because they are an efficient and economical way to sample the reactions of a large segment of the public" (Daniel and Boster, 1975, p. 10). There are, however, numerous problems inherent in their use: (1) the phrasing of the questions; (2) sample selection: who?, when?, and how?; (3) evaluation of respondents' replies, especially when open response formats are used; (4) avoiding influencing responses by the length and format or the administration of the questionnaire; and last but not least (5) insuring sufficient returns for conclusive results. However, the use of surveys is not restricted to preference studies. They often appear in conceptual approaches as well as in some descriptive inventory studies.

Descriptive Inventories

Agreement among various descriptive inventories is not readily apparent. Each method seems to have its own set of landscape dimensions that are deemed important, its own preferred techniques for data collection and evaluation, and its own orientation on the continuum of simplicity to complexity of operation. There are

certain distinguishable trends.

Early studies tend to rely on only one or two data gathering techniques-- usually photographs, topographic maps, or professional field observation and evaluation (Fines, 1968; Litton, 1968; Burke, Lewis & Orr, 1968). The trend is toward more varied and sophisticated data gathering techniques employing computers, remote sensing techniques, and psychometric scaling methods (e.g., Zube, et al., Perception and Measurement..., 1974).

It is difficult to characterize the landscape elements and their properties identified by various studies as having a common basis for agreement. Landform, land use, frequency of vistas, and presence of water in the landscape appear to be the descriptive features used most consistently, though they may be labeled and defined differently in many cases. The next most frequently identified features include observer position, aspects of spatial composition and definition (e.g., form, line, edges, color, contrast, unity), and degree of pollution. The landscape elements and their descriptive attributes as identified by various individual studies are listed in the Appendix.

The critical task of relating these landscape elements to the relationships and dimensions (e.g., "complexity", "uniqueness", etc.) identified by perception/preference studies is the weakest link in present methodologies assessing scenic quality. Most early descriptive inventories rely on the expertise and personal judgement of their authors for determination of how to analyze the elements (e.g., Leopold, 1969). Only recently have parameters been defined for studies by more objective preference

measurement techniques, such as the adjective lists and free response questionnaires of Zube et al. (1974)

Evaluation of landscape dimensions proceeds in a number of ways. Ranking is the most common approach. Statistical analysis of ranking scores is relatively simple and reasonably successful results are assured. However, personal interests and biases of the evaluator, be he a professional or a layman, account for variation in responses to given vistas and views.

Another approach to evaluation is through an examination of uniqueness (Leopold and Marchand, 1968; Leopold, 1969). Uniqueness reflects the number of other sites or views under consideration that exhibit the same given set of landscape elements. The underlying assumption is that relative scarcity or "uniqueness" increases value to society.

A majority of the more recent studies employs yet another method of evaluating landscape components - rating the elements according to their relative importance and quality and subjecting them to statistical analysis, which yields indices or aggregate values for decision-making (e.g., U.S. E.P.A., 1972). This approach can be more comprehensive and rational than others, yet it tends to lead to an unacceptable level of complexity and expense in operation. It is also quite easy for biases to enter the weighting of elements and variables, although this need not occur if representative sampling techniques are used. However, all of the studies reviewed appear to be based to some extent on complex series of arbitrary and biased assumptions.

One of the clearest trends noticeable is the multidisciplinary aspect of the most recent general planning studies and their increasing incorporation of combined professional and

lay judgement in their decision-making process. Aesthetic evaluation is no longer characterized by individual planner/designer control. Evaluation is more the product of group consensus and objective sampling techniques.

Conclusions

Two general approaches to the assessment of landscape aesthetics can be identified -- perception/preference studies, and descriptive inventories. These approaches overlap to a great extent, although the connections are not well defined or understood. More comprehensive studies are needed to further define the relationships between perception/preference and measureable landscape elements and dimensions.

"One general criticism is that many techniques have been developed without adequate consideration of scientific criteria traditionally associated with measurement systems" (Daniel and Boster, 1975, p. 50). Their objectivity and thus their whole mission of giving scenic resources equal footing with other resources has not been a complete success. There is, however, no reason why positive aspects of various methodologies cannot be combined into a comprehensive planning and management system for evaluating scenic quality and subsequently balancing it against other values.

The positive trends evident in recent studies attempting to evaluate scenic quality should be expanded and developed. Utilization of modern data sources, increasing agreement in terminology, and public input in evaluation procedures and judgments are three of the most conspicuous trends.

Approach 1a - Perception/Preference Studies: Conceptual Investigations

Study Reference	Landscape Types Studied: coastal area	river	forest	general land types	Landscape Elements and Properties Analyzed	Dimensions Used for Evaluation of Landscape Elements	Data Sources and Analysis Techniques: resource specialists	photographs/slides	topographic maps	remote sensing	interviews/surveys	field observation	psychological analysis	computer data analysis	Nature of Evaluation: lay group judgment	professional group	mixed group	individual professional
Hart and Graham, 1967				o	landforms water forms climate patterns	landform texture (degree of contrast) plus climate = regional tone		o	o									o
Wohlwill, 1966, 1968, 1974				o		naturalness complexity/diversity novelty		o										
Burns & Rundell, 1969				o	topography open land	complexity of pattern degree of elevation or "openness"		o										
Shafer, Hamilton, and Schmidt, 1969				o	perimeter of immediate vegetation, per. of intermediate non-vegetation, per. of distant vegetation area of intermediate vegetation, area of any kind of water, area of distant non-vegetation	"ugly" to "outstanding"		o				o	o					
Rapoport and Hawkes, 1970				o		complexity as a function of ordering elements, speed of movement, and angle of view		o										
Newby, 1971				o	edges, no. of visual elements, degree of visual penetration, spatial definition, order within visual elements, color, presence of water	visual order visual complexity		o				o	o					
Calvin, Dearinger, and Curtin, 1972				o	perimeter of immediate veget., per. of immediate non-veget., per. of distant veget., area of intermediate veget., area of any kind of water, area of distant non-veget.	"natural scenic beauty" and "natural force"		o					o					o
Kaplan and Kaplan, 1972-73				o		complexity, identifiability, coherence, mystery		o										

Approach 1b - Perception/Preference Studies: Preference Surveys

Peterson and, Neumann 1969	beaches				size, sand texture, sand cleanliness, intensity of use, buildings, greenery	cleanliness & smoothness of sand, crowdedness, attractiveness of bldgs. and greenery, amount of greenery		o				o		o	o				
Becock, 1970	beaches				dunes of great height dunes of moderate height broad expanse of beach moderate to high surf white sand	most scenic = at least 4 of the elements moderately scenic = 2 or 3 least scenic = 1						o		o					
Daniel & Boster, 1975				o		observer judgments of "scenic beauty" versus their judgmental criteria		o						o				o

APPENDIX. STUDIES AND METHODOLOGIES FOR EVALUATING VISUAL QUALITY

Approach 2 - Descriptive Inventories

Study Reference	Landscape Types Studied				Landscape Elements and Properties Analyzed	Dimensions Used for Evaluation of Landscape Elements	Data Sources and Analysis Techniques						Nature of Evaluation			
	coastal zone	river	forest	general land types			resource specialists	photographs/slides	topographic maps	remote sensing	interviews/surveys	field observation	psychological analysis	computer data analysis	lay group judgment	professional group	mixed group	individual professional
Wisconsin Dept. of Resource Devel., 1964	o				Material, width, slope, vegetation, water, erosion, height (4 zones, dry beach, wet beach, bluff, upland	distinct character types		o	o	o		o						o
Litton, 1968		o			distance, observer position, form, spatial definition, light and sequence													
Burke, Lewis, and Orr, 1968		o			roadside zone, outer zone, and far zone where view is: superior, characteristic, inharmonious, harmonious but non-typical, non-visible			o				o						o
Linton, 1968		o			landform (relief) and land use (urban/industrial to wild)	"naturalness" "surprise"				o								
U.S. Dept. of Transportation, 1968		o			edge, enclosure, visual alignment, and dominance of objects (contrast, nearness and size)	continuity or "sequence" diversity		o										o
Fines, 1968		o			landscape value scale 0-32, unsightly to spectacular			o				o						
Leopold, 1969	o				46 physical, biological, and human interest elements - main ones are width of valley, height of nearby hills, breadth of view, and unique elements	uniqueness degree of urbanization												o
Lewis, 1969	o				vegetation, slopes >12.5%, water and wetlands plus a value point system for 47 resources	recreation corridors		o		o	o							o
Craik, 1972		o			observers positions, extent of view, presence of distant zone, presence of extent and panoramic view, direction of lighting, extent and kind of enclosure, presence of an isolated form, surface shape, focal landscape, kinds of clouds			o										o
Morisawa, 1971	o				vista, color, vegetation, spaciousness, serenity, naturalness, riffles, turbidity, and pollution					o								
Kiemstedt, 1971		o			forest edge, water edge, topography, land use, and climate	high diversity				o	o							
Battelle Columbus Laboratories, 1972		o			21 factors in 7 categories: land, air, water, biota, man-made objects, composition, mood/atmosphere	normalizing the actual predicted values, then multiplying by "importance" weights	o			o	o	o	o	o				o

APPENDIX. STUDIES AND METHODOLOGIES FOR EVALUATING VISUAL QUALITY

Approach 2 - Descriptive Inventories

Study Reference	Landscape Types Studied: coastal area	river	forest	general land types	Landscape Elements and Properties Analyzed	Dimensions Used for Evaluation of Landscape Elements	Data Sources and Analysis Techniques: resource specialists	photographs/slides	topographic maps	remote sensing	interviews/surveys	field observation	psychological analysis	computer data analysis	Nature of Evaluation: lay group judgment	professional group	mixed group	individual professional
Jensen and Fritz, 1972				o	subjective "beauty" and "ugliness", uniqueness, diversity, pervasiveness, regional identity	unique landscapes misfit landscapes pervasive landscapes		o	o	o	o				o			
Cox et al., 1972				o	open land, closed land, water surfaces, and man-made structures	landscape series and patterns in terms of diversity	o		o	o			o		o			
Malhorn and Keller, 1973				o	Leopold's 3 categories, physical, biological and human use and interest factors	uniqueness			o	o						o		
Fabos, 1973				o	land use types - No. and size, naturalness appreciability length of adjacency	visual compatibility and diversity equations		o	o	o	o		o		o			
USDA Forest Service, 1973, 1974				o	form, line, color, texture, contrast, sequence, axis, observer position, convergence, codominance, enframement, motion, light, atmosphere, season, distance, scale, time	characteristic landscape variety deviation	o	o	o	o	o							o
Litton, Tetlow, Sorensen, and Beatty, 1974				o	water, landform and veget. elements categorized within landscape, setting, and waterscape units	unity, variety, and vividness		o				o			o			
Reste and Oterholm 1974				o	character components: landform, surface, fauna, atmosphere, dynamics structural elements: edges, paths, districts, nodes, and landmarks	variation, uniformity, harmony, contrast, contrasting element										o		
Zube, Pitt and "Perceptional Measurement...", 1974				o	landform, land use area, land use edge, land use contrast, water, view	landform, land use diversity, complexity, and naturalness	o	o	o	o	o	o			o			
Litton, 1974				o	distinctive landscape types, sensitive parts and locations, and outside influences and inherent effects	vulnerability to alterations						o						

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