A Reader in Visual Quality

David B. Harper, Editor

What we see and why:
An analysis

A Reader in Visual Quality

What we see and why: An analysis

David B. Harper, Editor

NYSG-RR-80-26

This research was sponsored by New York Sea Grant Institute under a grant from the Office of Sea Grant, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce. The US Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation appearing hereon.

CONTENTS

Introduction
by D.B. Harper 5

Focusing on Visual Quality of the Coastal Zone
by D.B. Harper 7

Assessing the Visual Quality of the Coastal Zone
by T.J. Nieman 13

Coastal Landforms and Scenic Analysis: A Review
by J.P. Felleman 17

Viewing New York's Coast: Resources, Research Issues,
and "PREVIEW" a Computer Modelling Technique
by J.P. Felleman 29

Aesthetic and Recreational Factors in Barrier Island Planning
by J.P. Felleman 35

Bibliography: The Description, Classification,
and Assessment of Visual Landscape Quality
by T.J. Nieman and R.C. Viohl 41

Appendix: Update of Recent Research Activities 55

INTRODUCTION

Coastal areas, whether urban or wilderness, hold a particular fascination for most of us. The feel of wind and water, and the sound and smells we associate with the coast, play significant roles in this appeal. It is what our eyes sense, however, and the associations they conjure in our minds, that usually dominate our attraction to the land-water edge.

Coastal zone management, a recent priority in our national policy, is a response to increasing competition for this complex strip of limited resources. Declining visual quality is one of these limited resources. It also is an elusive, intangible resource which is difficult to quantify or define precisely.

This collection of articles is intended for the general reader who is curious about what landscape visual quality is and how it can be considered in coastal management decisions. These articles are previously published products of a research project sponsored by the New York Sea Grant Institute between 1974 and 1978, at the School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse.

The first paper, by Harper, provides an overview of growing visual quality concerns for our coastal zone and describes the focus and early results of this research effort. Two major research directions were indicated by those initial investigations: (1) perceptions of and attitudes toward coastal visual environments by their users and managers; and (2) actual descriptive and measurement methods for analyzing shorescapes. The papers which follow show some of the implications of these investigations. An appendix outlining more recent accomplishments is also included.

Nieman's paper identifies difficulties inherent in the first direction (attitude and preference measurement) and sets the stage for later surveys.

Felleman's papers likewise treat several aspects of the second direction above: shorescape analysis methods. His first paper, on "Coastal Landforms," presents a basic vocabulary and types of approaches which have been used to describe and classify landforms, with special emphasis on those typical of coastal areas.

Felleman's second paper deals more directly with the coastal character of New York State. A discussion of how landscapes are perceived is also included, followed by presentation of a computer technique for simulating landscapes which is currently being tested in shorescape visibility studies.

Felleman's third article focuses even more specifically on a particular coastal environment: the barrier island. A case is presented for the significant role which barrier islands can and do play in satisfying two closely related human needs: aesthetic and recreational experiences.

This collection closes with a bibliography which serves as a starting point for further exploration of the topic of visual landscape quality. Sources are grouped for convenience into three categories: aesthetics theory, landscape classification, and landscape preference assessment.

– David B. Harper

Reprinted from *The Present and Future of Coasts,* Proceedings of First Annual Conference, The Coastal Society, Arlington, VA, November 1975. Published by The Coastal Society, PO Box 34405, Bethesda, MD 20034.

FOCUSING ON VISUAL QUALITY OF THE COASTAL ZONE (1)

David B. Harper
State University of New York
College of Environmental Science and Forestry
School of Landscape Architecture
Syracuse, New York 13210

Abstract. Consideration of aesthetic values on an equal basis with ecologic, economic, and other values is mandated for planning decisions in the coastal zone. A Sea Grant research program in New York seeks to provide user-oriented methods for visual quality protection and control along the state's coastline.

Growing Concern for Visual Quality

Most of us would agree on the dramatic scenic beauty of jagged cliffs plunging abruptly down to beaches of golden sand washed by clear blue-green surf. And most of us would agree on the revolting ugliness of oil and sewage sloshing among the wrecks of rotting piers and rusting half-sunken barges at the backside of one of our coastal cities. Yet most of our shorescapes are neither as dramatic nor as revolting. Agreement on their visual quality is far less universal, but awareness of the importance of visual quality is growing.

Recent public concern for visual quality can be seen as a subset of the broader environmental quality movement. Consciously or not, we often attribute visual quality to environmentally harmonious features of our surroundings and attribute ugliness to products of environmental degradation or pollution. Our evaluation of visual quality is strongly influenced by the extent to which the high-rise, the tree, the sign, the beach is perceived as an integral, functioning part of its surroundings. As with most public outcries, the visual quality issue has been most stimulated by the negative aspects—the unsightly and ugly. They tell us something has gone awry. We have bemoaned the loss of visual quality and eventually turned our attention toward positive action—how to improve unsightly scenes and how to protect attractive areas from visual blight.

Public concern for visual quality, although not new, was focused nationally in Lady Bird and President Johnson's Beautification Program. Subsequent legislation has required equal consideration of aesthetic values along with ecological, economic, and other social values in land use decisions. One of six environmental objectives of the federal government, as stated in the National Environmental Policy Act of 1969 (NEPA), is to "assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings" (2).

In regard specifically to the coastal zone, the Coastal Zone Management Act of 1972 finds that "important ecological, cultural, historic, and aesthetic values in the coastal zone which are essential to the well being of all citizens are being irretrievably damaged or lost; special natural and scenic characteristics are being damaged by ill-planned development . . . ". This act encourages states to give "full consideration" to these values in coastal management programs (3). Under this act, federal grants to states for coastal management program administration are made contingent, in part, on whether "the management program makes provision for procedures whereby specific areas may be designated for the purpose of

preserving or restoring them for their conservation, recreational, ecological, or aesthetic values" (4).

State, regional, and local agencies concerned with environmental quality frequently also have mandates to consider aesthetic values (5). The aesthetic quality issue is currently being carried a step farther—court cases are testing whether aesthetic values *alone* are sufficient to halt or modify certain land use actions. The decisions are by no means in total agreement with one another, but the role of aesthetics (and particularly of visual quality) is clearly growing in significance (6).

To require consideration of aesthetic values is one thing; to incorporate them rationally and objectively into plans and programs is quite another. Many methods for evaluating the aesthetic qualities of landscapes have been devised, by psychologists, landscape architects, foresters, geologists, geographers, and others. Aesthetic or visual quality may be viewed as the interpretation by an individual, as influenced by his experience, motivation, attitudes, and other psychological factors, of a particular combination of external physical stimuli, predominantly visual. Consequently, these evaluation methods may be broadly classified according to whether they focus on identifying and classifying personal attitudes and preferences (individual interpretation) or physical landscape features (the visual stimuli) (7). Methods vary widely in scale (from regional to site-specific), in subjectivity or objectivity of evaluation, and in types of landscapes evaluated. Several recent reviews of landscape evaluation methods provide more detailed analysis (8).

Despite a certain availability of aesthetic evaluation methods, they rarely seem to have found their way into the public planning process. One analysis found that "most planners interviewed . . . either had never heard of the methods available or found them useless for their work (i.e. . . . too subjective, too time-consuming in data collection, not flexible enough for diverse planning situations, and too expensive)" (9). It might be added that they can also be too complex for the uninitiated to employ.

Specific applications of visual assessment methods to coastal landscapes and in coastal planning are even fewer. A recent volume succinctly compiles the aesthetic aspects of the water's edge and proposes an approach to systematic evaluation (10). Even more recent is a draft manual just produced for the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration (NOAA), as an aid to coastal zone management programs in the states (11). One of the most graphic and comprehensible applications of visual analysis and guidelines for coastal planning is *People and The Sound: Shoreline Appearance and Design, A Planning Handbook* produced for the Long Island Sound Study of the New England River Basins Commission (12).

A Visual Quality Research Program for New York

In light of the paucity of inclusion of visual considerations in the land use planning process, and in coastal zone planning in particular, a proposal to define and research visual quality issues pertaining to New York State's marine and Great Lakes coastal zone was prepared in 1974 by the School of Landscape Architecture, State University of New York College of Environmental Science and Forestry, in Syracuse. The proposal was endorsed by the New York Sea Grant Program (now New York Sea Grant Institute) and funded by the NOAA Office of Sea Grant for a two-year period (1974-76) (13).

The project, entitled "Visual Quality of New York State's Coastal Zone", has the ultimate objective of making visual quality an understandable concept and developing methods by which coastal planners and managers, residents, and other users can play a tangible role in promoting and protecting the coast's visual quality. The question of visual quality has been so open to a multitude of widely divergent interpretations that the investigation began with the preparation of four working papers of background information. They are currently being distributed to selected reviewers for their comments. These papers are:

1. EVALUATING VISUAL QUALITY OF THE COASTLINE: SOME SIGNIFICANT ISSUES

Reviews the literature to explore the complexity of defining aesthetic or visual quality. Both psychological and physical influences on individual evaluations of visual quality are reviewed and discussed. The unique aesthetic attractions of water are considered and some of the visual aspects of coastal zone boundary definition are presented. This paper provides a background for subsequent research on visual assessment methods, user perceptions, and landform analysis (14).

2. VISUAL QUALITY IN LAND USE CONTROL

Explores the growth of public concern for visual quality and the history of the translation of this concern into land use regulation laws in the United States. Emphasis is placed on actions at the State and Federal levels (e.g., NEPA). A closer look is then taken at the limited attention which has been given to visual quality regulation, specifically in the coastal zone and in New York State (15). Anticipated investigations to follow up on this paper will include detailed definition of current and innovative legal devices for controlling visual quality.

3. LANDSCAPE EVALUATION: A REVIEW OF CURRENT TECHNIQUES AND METHODOLOGIES

Classifies and compares some thirty recent approaches to evaluating the visual quality of landscapes. These methods fall broadly into measures of preference or perception of landscape viewers, or into descriptive classifications of physical landscape features. Discussion includes the types of landscape evaluated, the features of the landscapes analyzed, the criteria by which evaluations were made, who made them, and the techniques used for data collection (16).

In addition, a bibliography of some 300 entries on landscape perception and assessment has been compiled. It includes sections on theoretical and research approaches to aesthetics, on landscape preference assessment, and on landscape classification. With this paper and bibliography as a start, visual assessment methods are being screened for their applicability to the unique linear coastline conditions. Testing of one scenic beauty preference method has been initiated using randomly selected color slides of a large partly urbanized marsh complex on Long Island. Other methods will be tested and evaluated in the second year.

4. COASTAL LANDFORMS AND SCENIC ANALYSIS: A REVIEW OF THE LITERATURE, WITH A PRELIMINARY EXAMINATION OF NEW YORK'S SHORELINE

Surveys the evolution of methods of natural landform classification. Consideration is given to the varying requirements at different scales. Classifications relating specifically to shoreform morphology are discussed in greater detail. Nineteen coastal landform regions for New York's marine and Great Lakes shores are designated and described, on the basis of physiographic, geologic, and soil characteristics (17). Additionally, a representative two-by-four mile sample site has been selected in each region and cross sections and landform analysis prepared from topographic maps at 1:24,000 scale. Urban forms and land use patterns will be treated similarly. Detailed field measurements of landforms at selected sites on the coast will be undertaken.

To increase their familiarity with the State's shoreline, the researchers have undertaken a field reconnaissance of the entire shore, by air and by land. The dominant natural and man-made patterns and features, visual and physical accessibility to the water, and uses of the shoreline have been noted and photographed on color slides. Methods of determining visibility, both from and to the water, will also be investigated with the aim of defining the "visual zone" of the coast, an important part of coastal zone definition for management purposes.

To enhance the usefulness of the slide collection, a cross-referencing system has been devised which identifies each slide by location, landform features, land use, and other aspects shown. This collection will be augmented with similarly referenced slides of coastal features and development in other parts of the world.

An outline has been prepared for an illustrated publication which will describe the distinctive visual characteristics of New York's Long Island and Great Lakes shoreline, with respect to the nineteen distinctive regions which have been defined. This publication will include appropriate photography, landform and land use analyses, and other field observations. Its purpose will be not as a tour guide to specific scenic sites, but as a document to increase public awareness of the State's varied visual coastal environments.

Another thrust of the research program is in the direction of identifying the perceptions and preferences of New York's coastal users and decision-makers toward the visual character of the coast and how it is being treated. A pilot version of a survey questionnaire has been tested and is being refined and revised for application to various coastal users. In the long range, the purpose of this survey is to categorize the various attitudes toward the coast, to identify dominant agreements and conflicts, and eventually to seek satisfactory responses which most equitably meet the visual resource demands and potentials of New York's shores.

A major undertaking in the first year was the organization of a "Conference/Workshop on Visual Quality and the Coastal Zone," held in Syracuse on 29-30 May, with 100 registrants. Three keynote speakers and eighteen other panelists gave presentations in three conference sessions: visual attitudes and perceptions, visual quality assessment methods, and visual quality planning on the coast. Panelists represented university researchers in landscape architecture, geography, geology, recreation, and other disciplines, as well as private consultants and public planning and regulatory agencies. Presentations covered a wide range of approaches from literary to statistical, from theoretical to politically pragmatic. This concentrated package successfully represented the current status of understanding visual landscape quality, and particularly that of the coastal zone. The need for integration of diverse efforts, particularly the adaptation of objective visual evaluation methods to immediate coastal needs, was clearly demonstrated.

The workshop sessions involved registrants in small group discussions focusing on specific case studies of typical visual quality conflict situations found along the coast. These sessions provided an opportunity for expression of personal attitudes, exposure to others' conflicting attitudes, and an incentive to seek compromise and understanding in reaching for resolution to these conflicts, drawing on ideas generated by the conference papers. One of the most useful outcomes of the Conference/Workshop was the opportunity it provided for a diverse mixture of researchers, public agents, private practitioners, and coastal residents to get acquainted, rub elbows, and exchange views (18).

The above activities are part of a program leading, over the next two or three years, to the preparation of several handbooks designed for use by coastal planners and managers. These handbooks will attempt to provide primarily three types of assistance: (1) methodology allowing them, with a minimum of professional assistance, to identify and evaluate the visual quality of coastal areas; (2) guidelines for aesthetic design of coastal developments; and (3) implementation techniques and methods applicable to protection and enhancement of visual resources of the coastline. Towards those ends, the research will focus on further coordination with the findings and needs of other Sea Grant activities, such as recreational facilities, engineering, power plant siting, and land/water use policies and controls.

References and Notes

1. This research was sponsored by New York Sea Grant Institute under a grant from the Office of Sea Grant, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce. The US Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation appearing hereon.

2. National Environmental Policy Act of 1969, 42 USC Section 4321 et seq. (1970), Sec. 101.
3. Coastal Zone Management Act of 1972, 16 USC Section 1451 et seq. (Supp. III, 1974), Secs. 302, 303.
4. *Ibid.*, Sec. 30.
5. M.A. Ross, *Visual Quality in Land Use Control,* Sea Grant Project Working Paper No. 1, (School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse, 1975).
6. For more detailed discussion of legal aspects of aesthetics in land use control see M.J. Redding, *Aesthetics in Environmental Planning* (US Government Printing Office, Washington, DC, 1973), pp. 31-38; J.W. Cerny, *Esthetics and Jurisprudence: A Bibliographic Primer,* Exchange Bibliography #408 (Council of Planning Librarians, Monticello, Ill., 1973; and M.A. Ross, *op. cit.* 1975).
7. R. Viohl, Jr. *Landscape Evaluation: A Review of Current Techniques and Methodologies,* Sea Grant Project Working Paper No. 3 (School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse, 1975).
8. C. Steinitz, et al., *A Comparative Study of Resource Analysis Methods* (Harvard University Graduate School of Design, Cambridge, Mass., 1969); J. Fabos, *Recreation Symposium Proceedings* (USDA Forest Service, Upper Darby, Pa., 1971), pp. 40-55; M.J. Redding, *op. cit.* (1973), pp. 39-104; P. Jacobs, *Town Planning Review* 46(2) (1975), pp. 127-150; R. Viohl, Jr., *op. cit.* (1975).
9. M.J. Redding, *op. cit.* (1973), p. 155.
10. R.B. Litton, et al. *Water and Landscape* (Water Information Center, Port Washington, New York, 1974).
11. Roy Mann Associates, *Aesthetic Resources of the Coastal Zone.* Report prepared for OCZM, NOAA. Cambridge, Mass., July 1975.
12. Roy Mann Associates, *People and the Sound: Shoreline Appearance and Design, A Planning Handbook* (National Technical Information Service, Springfield, Va., 1975).
13. Research Foundation of State University of New York, *New York Sea Grant Program, '74-'75* (RFSUNY, Albany, 1974), pp. 24-28.
14. S. Haskett, *Evaluating Visual Quality of the Coastline: Some Significant Issues,* Sea Grant Project Working Paper No. 2 (School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse, 1975).
15. M.A. Ross, *op. cit.* (1975).
16. R. Viohl, Jr., *op. cit.* (1975).
17. J.P. Felleman, *Coastal Landforms and Scenic Analysis: A Review of the Literature, with a Preliminary Examination of New York's Shoreline,* Sea Grant Project Working Paper No. 4 (School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse, 1975).
18. D.B. Harper and J.D. Warbach, (eds.) *Proceedings of Conference/Workshop on Visual Quality and the Coastal Zone, Syracuse, New York, May 29-30, 1975* (in preparation).

Reprinted from *The Present and Future of Coasts,* Proceedings of First Annual Conference, The Coastal Society, Arlington, VA, November 1975. Published by The Coastal Society, PO Box 34405, Bethesda, MD 20034.

ASSESSING THE VISUAL QUALITY OF THE COASTAL ZONE[1]

Thomas J. Nieman
State University of New York
College of Environmental Science and Forestry
School of Landscape Architecture
Syracuse, New York 13210

Abstract: The visual quality of the coastal zone is an important aspect of coastal management. However, mechanisms for objectively analyzing visual resources in relation to the perceptions and attitudes of coastal users are not well developed. The problem is further complicated by the diverse nature of the groups utilizing various coastal resources.

The consideration of visual quality as an important element in the planning process is rapidly gaining support among planning agencies, consulting firms, and research institutions. While there has been considerable documentation of efforts to appreciate, in a literary sense, the visual aspects of the environment, visual quality has not been a major consideration in policy planning. Nonetheless, under the term "aesthetics," federal and local guidelines refer to visual quality as a required consideration on an equal basis with economic, social, and environmental issues. The problem lies in that understanding visual quality, much less objectively quantifying it, is at a much lower level of sophistication than the other issues. As a result, policy planning is, at best, inconsistent and leads to conflicts that further frustrate attempts to deal with visual quality as a tangible element in the planning process.

One of the upshots of the confusion is the adoption, through misunderstanding, of cosmetic policies and implementation procedures, e.g., putting fences around junk yards and cleaning trash out of streams, etc., that, while better than nothing, are expensive and relatively short-termed. Concomitantly, public opinion has demanded more and Congress has responded with the National Environmental Policy Act (Public Law 91-190, NEPA 1969), which requires the Environmental Protection Agency to define a workable procedure for assessing visual quality impact. Because of the paucity of available information and research, no way presently exists for establishing objective guidelines for application on a uniform basis to visual quality planning.

In recent years, basically since NEPA, serious attempts have been made to quantify and qualify various aspects of visual quality so that they could be utilized feasibly with economic, social, and environmental planning proposals. While these have primarily been directed toward forestry, water resources, highway programs, conservation and preservation areas, and land use planning, the few studies dealing with coastal environments have been developed for the California coastline. Unfortunately, the very dramatic natural landscapes and visual quality variables which bless the California coast and the west coast, in general, are not found on most of the other coasts of the country. Thus, researchers are faced with the problem of developing workable objective analytical methodologies that can relate to relatively less exciting coastal landscapes.

Research interests need to be directed toward the development of methodologies that relate to application, rather than basic research. They may be thought of as tools to aid planners and decision makers in their attempts to identify and maintain the visual quality of the coastal area of their immediate concern. These would hopefully allow their use on a level comparable with the better known and more frequently utilized variables common to planning decisions. In this vein, methodologies for quantifying visual quality may be considered from two perspectives: visual assessment and user preferences. Visual assessment is the approach that planners or decision makers would utilize to evaluate visual quality so that the implications of environmental impacts or changes may be better understood. User preference methodologies involve the evaluation of user responses to certain landscapes and landscape settings. The goal of both approaches, however, is to allow a more objective evaluation of visual quality so that planners and decision makers will be in a better position to respond positively to alternative planning proposals that deal with the visual quality of an area.

Some of the problems inherent in visual assessment and user preferences involve the bias of the administrator or designer of the methods by which the experience of the public is somewhat guided by the perception and attitudes of the individual test and the individuals administering the test. Bias also comes into play in defining the physical attributes of visual quality. What one designer may consider important, another may disregard. The range of criteria offered to the evaluator for preference ranking may not be indicative of his actual preference. His sophistication in this situation may be overestimated or underestimated, thus forcing a middle-of-the-road response. As a result, the evaluation becomes indicative of an average landscape with average likes and dislikes being identified as areas of high or low visual preference.

An integral aspect in the attempt to develop workable assessment methodologies of the coastal zone is the identification of the users of the visual resource in question. Recognizing that each group of users will have differing motives for engaging the coastal environment, it seems consistent to assume that their perception and thus their attitude toward its visual content will vary from group to group and situation to situation. In general, coastal users can be broadly classified as permanent dwellers, part-time dwellers, and visitors. While it is recognized that this classification is much too broad for discrete characterizations, it will serve to point up one of the problems inherent in any attempt to gain consensus regarding the visual quality of the coastal zone.

Permanent dwellers are those who live in close proximity to the coastline and are employed there, as in any inland community, or who have retired there because of the amenities and life style offered by the existence of the coastal resources. In this respect, conflicts of perception and attitudes as to what is the proper visual quality stance to take may continually be at odds. Those earning a living in the area may desire to see further economic development at the expense of visual quality because of the potential for an increase in socio-economic status. On the other hand, retirees who hope to spend their remaining years in relative peace and quiet would be loath to see further development of the coastal areas from the perspective that it would negatively affect the visual environment of their retirement aspirations.

Part-time dwellers may be classified as those who own or rent cottages or mobile homes along the coast for extended periods of use—mostly the summer months. In essence, this corresponds to the second home concept where the family may spend the greater portion of the vacation period on the coast while actually residing permanently in an inland community. These individuals' desires appear to fall somewhere between the adverse positions of the permanent residents. This position may be described as sufficient economic and social facilities to make the transition from inland dwelling to coastal dwelling convenient while maintaining a natural environment of sufficient quality for the enjoyment of the more active outdoor recreational aspects, e.g., boating, fishing, and swimming, without a large degree of controls or other people. Of all the groups, they appear to be the most elite in their desires

and they are the most difficult to satisfy. Because of their desire to maintain both the socio-economic situation of their permanent dwelling and the high visual quality of the unspoiled coastal environment, they often place planners in the difficult situation of deciding whether to trade off comfort for environmental quality or vice versa.

The third group of users is the visitors. These are mostly recreationists who can be separated into individuals who rent a camping space for a period of a week or two, to those who camp only on week-ends, to day trippers. Each has different requirements and thus places different demands on the visual quality of the coastal area. Those camping the longest require more facilities in terms of creature comforts, yet they tend to desire a close proximity to the more natural areas of the coastline. The week-end camper needs fewer facilities in terms of creature comforts but requires more action-oriented recreation activities, e.g., swimming, boating, and play areas. Finally, there are the day trippers who come to the coastal area to recreate for the day, with the intention of returning to the place of residence in the evening. The concern here is almost totally centered around heavy use facilities like picnic areas, bathing beaches, playgrounds, and the like. While their visual quality requirements may not be as demanding in the sense of natural areas as other users, they require far more variety. Because of this demand for variety and their large numbers, relative to other groups, they potentially will be the most difficult to deal with in a mutually satisfactory manner.

Varying socio-economic situations and use intention would then seem to be major influential factors in any attempt to successfully assess the visual quality of the coastal zone. While the groups discussed above can be identified and attempts made to identify their stance regarding the value of the visual resource of the coastal zone, the problem is further accentuated by the fact that they do not utilize the coastal areas as separate entities. Rather, there is much interaction among groups in terms of dwelling location, shopping facilities, social services, and recreation facilities. The most apparent difference is the intensity or lack of intensity a certain coastal element will receive from any one group at any moment in time. This leads to problems for coastal planners in that they are forced to react to political pressures similar to those any community planning agency would face. In this situation, the problem is magnified because of heavy seasonal use and the relatively fragile physical ecological characters of the coastal area. Once destroyed, it is not likely that remedial reactions to correct the situation will have much effect. At a minimum, the cost of such actions would be extremely high, both in monetary terms and social reactions.

One observation in relation to the development of methods to assess the visual quality of coastal areas is that, for all practical purposes, they are still theory. While many have been tested and have been replicated, the results have not been applied to real life planning situations. They have been suggested as approaches to take and results to consider, but they have not been processed into the comprehensive planning procedures. In cases where this attempt has been made, the results have not been processed through the implementation procedure nor have they stood the scrutiny of numerous review procedures. While almost everyone agrees that visual quality is an important aspect of the planning process, few have been successful in gaining its acceptance on a par with economic, social, and environmental concerns. The implication of these and other similar problems is that more objective and rigorous techniques should be developed so that effective evaluation becomes the rule rather than the exception.

References

1. This work is a result of research sponsored by NOAA Office of Sea Grant, Department of Commerce, under Grant #04-3-158-39 and by the New York Sea Grant Institute. The US Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

Reprinted from *The Present and Future of Coasts,* Proceedings of First Annual Conference, The Coastal Society, Arlington, VA, November 1975. Published by The Coastal Society, PO Box 34405, Bethesda, MD 20034.

COASTAL LANDFORMS AND SCENIC ANALYSIS: A REVIEW (1)

John P. Felleman
State University of New York
College of Environmental Science and Forestry
School of Landscape Architecture
Syracuse, New York 13210

illustrations by Grayson Jones

Abstract. Scenic quality is related to man's perception of natural and built form. A review is made of three visually related landform description approaches: numerical, geometric, and geomorphic. Diversity and complexity of coastal features are examined. Desirable analysis approaches are found to be sensitive to varying scales, offshore, beach, bluff and upland elements.

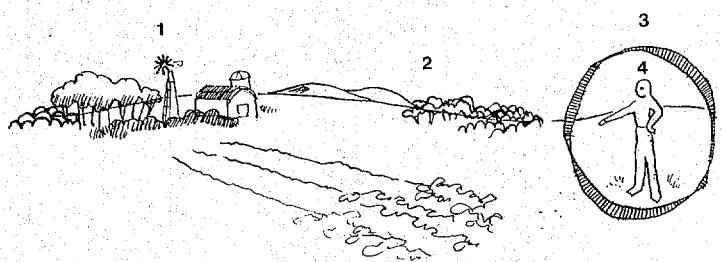
Landform Description

Linton has described scenery as "the form of the ground," and "the mantle of forests and moorlands, farms and factories, natural vegetation and human artifacts by which the hard rock body of the landscape is clothed" (2).

Scenic perception of a landscape involves the generation, transmission, and interpretation of a visual message. This process is illustrated in Figure 1.

Of these four perception elements, both landscape and visibility are strongly influenced by the form of the earth's surface. Therefore, landscape visual quality analyses need a foundation of terrain description. A major difficulty in the field of visual quality assessment arises from the inherently personal character of view interpretations coupled with the absence of a common descriptive vocabulary. Many aesthetic terms may apply to the character of the earth's surface, for example, unity, variety, contrast, uniqueness, grain, and texture. These

Figure 1. Scenic perception process



[1]Landscape—a composition of natural and man-made forms

[2]Visibility—the physical view zone, and distance relationships between viewer and landscape

[3]Viewer Environment—the local surroundings, viewer mobility, and sequence of views

[4]Interpretation—the viewer's psychological analysis of a view's content and meaning

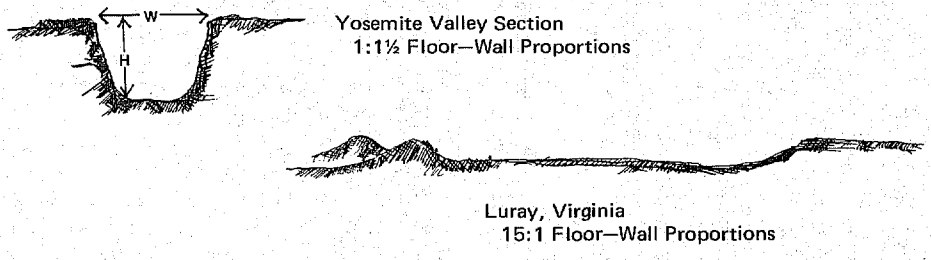
terms, by themselves, are relative abstractions that do not convey a discrete image. It is therefore highly desirable to develop terminology which conveys images of the various forms that comprise landscape scenes.

A literature review in the fields of physical geography and landscape assessment reveals a wide variety of analytical approaches to describing surface terrain. One way to categorize these techniques is from the standpoint of abstraction. Three general groupings based on degrees of abstraction can be differentiated: numerical indices, geometrical forms, and geomorphic origins.

Numerical techniques are the most abstract methods utilized. Use of these techniques to describe terrain characteristics has gained widespread support in recent years because of their relative ease of application to extensive areas, and compatibility with computerized data analysis. Military researchers have developed parametric approaches to terrain evaluation for planning large scale troop movements. The QREC (US Army Quartermaster Research and Engineering Center), in a large regional study, utilized simple topographic map measurements such as elevation, slope, and number of divides to quickly group areas into twenty-five distinct terrain regions which contain similar surface characteristics (3).

Numerical measures have recently been used in scenic analyses. "Landform has consistently been evaluated on the basis of relative relief—the greater the relative relief, the higher the scenic value" (4). Leopold, in his aesthetic comparison of river valleys, translated a wide spectrum of descriptions into a composite rating system. One of his prime measures was "landscape scale," which relates the height of adjacent mountains to the width of the valley floor. Numeric measurements thus are used as an indicator of topographic enclosure and contrast (5). Figure 2 illustrates this basic scale relationship.

Figure 2. Valley proportions



(after Litton, p. 271)

Several researchers have undertaken statistical correlations between scenery dimensions and viewer reactions. Shafer took measurements from ground level photographs which portrayed actual views. Factors measured on the photographs included perimeters and areas of vegetation, nonvegetation and water. Study results included linear equations relating photographic dimensions to scenic preference (6).

Zube, Pitt and Anderson have related measurements from topographic maps to viewer reactions, both in the field and to photographs of the field scenes. Of the twenty-three scenic factors studied, seven were directly related to landform: relative relief ratio, absolute-relative relief, mean slope distribution, topographic texture, ruggedness number, spatial definition index and mean elevation (7).

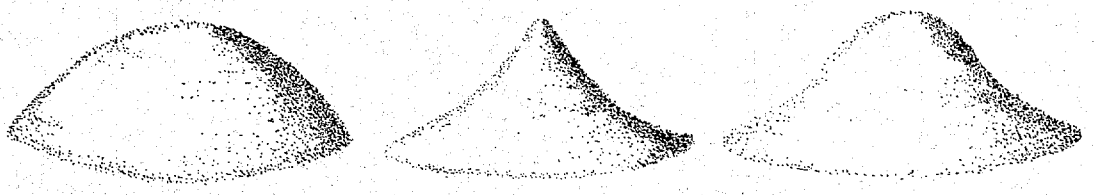
These and related numerical methods hold great promise for advancing the rigor of scenic evaluation. However, by themselves, they inherently contain several difficulties.

> "The fundamental objection is a belief that landscape cannot be effectively valued by simply measuring and weighing components from a map or aerial photograph . . . problems arise in deciding on weighting . . . the landscape contributions of components do not increase in direct proportion to the amount of that component . . ." (8).

A second problem is the difficulty in conveying a clear mental image of the landscape via mathematical measures. Such an image is critical for communications, planning and design. The process of numerical abstraction is at least partially irreversible. Geometric-based landscape descriptions help overcome this latter difficulty.

Geometric descriptions of terrain are widely used by physical geographers. Earthforms include both hill projections and valley depressions. Three-dimensional hill form shapes can be classified as being a hemi-spheroid (round), elipsoid (linear), or complex. It is often convenient, analytically and graphically, to project complex three-dimensional forms into two dimensions, plan view and cross section. In cross section, hills can be classified as being concave, convex, or concave-convex. These generalized forms are shown in Figure 3.

Figure 3. Generalized hill forms



(after Grietzer, 1944, p. 96)

Valleys have also been classified on the basis of geometric cross section and plan view configuration. An evolutionary generalization of valley cross section hypothesizes that initially "young" valleys are steep and "V" shaped. After an equilibrium stream profile is achieved, lateral erosion continues and the section shape is transformed to a rounded, and finally a broad "U". Valley sections can be symmetrical or asymmetrical. (Glaciation can also carve "U" valleys).

The plan view configuration of drainage patterns is an evolutionary function of geology, climate, and stage of development. Way has illustrated sixteen basic patterns such as dendritic, rectangular, parallel, and radial (9). Horton applied numerical analysis to stream patterns, deriving such parameters as "drainage density" and "stream frequency" (10). An extensive exposition of this subject has been written by Haggett and Chorley.

Cressey's Landform Map of New York State is typical of macro-descriptions based on prevalent topographic relief. Cressey's landform categories include: level plains, rolling plains, hills, rounded mountains, rugged mountains, and lakes (11). The geometric terms are clarified by using numerical values for slope and local relief ranges. A similar mapping system has been completed for the entire North Atlantic watershed for the Corps of Engineers at a scale of one inch = 40 miles (12).

In contrast to purely geometric descriptions, geomorphic classifications of terrain features combine form, evolution, and physical properties. Geomorphology is the "science of landform" (13). It is a branch of geology dealing with the many processes of erosion and deposition and how they have shaped the earth's surface throughout geologic time.

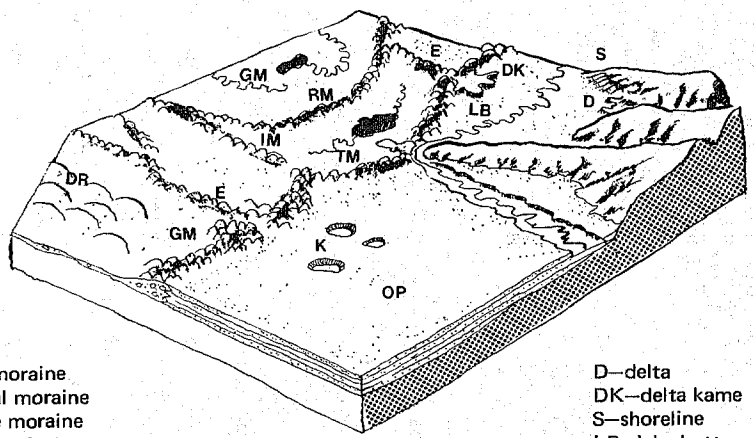
Belcher and Lueder pioneered in the use of aerial photographs to classify landforms for engineering and land planning decisions. Way has focused these methods on site development. He defines landform as follows:

> ". . . landforms are terrain features formed by natural processes which have a definable composition and range of physical and visual characteristics that occur wherever the landform is found. Thus, specific distinctions can be made among landform units, by which to describe unique topography, composition or structure, or capabilities." (14)

To illustrate geomorphic processes, the block diagram of Figure 4 depicts some of the landforms shaped at the margins of continental glaciers.

Way identifies geomorphic forms on the basis of bedrock, climate, topography, drainage, vegetation, and land use patterns. For each type of bedrock, such as sedimentary, he

Figure 4. Glacial moraine landforms



TM—terminal moraine
RM—recessional moraine
IM—interlobate moraine
GM—ground moraine
E—esker
DR—drumlins

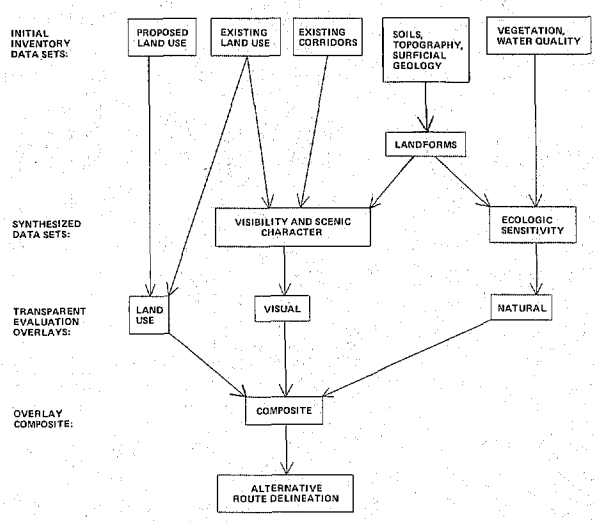
D—delta
DK—delta kame
S—shoreline
LB—lake bottom
OP—outwash plain
K—kettle

(after Strahler and Strahler, 1973, p. 444)

reviews the type of soil associated with the various terrain features. General interpretations for development of landforms can then be made, including: sewage disposal, solid wastes, trenching, excavating and grading, construction materials, landslide susceptibility, ground water supply, pond construction, foundations, and highway construction.

Howlett and Felleman have incorporated the mapping of local landforms in the analysis of high voltage transmission line routing and impact. As shown in Figure 5, the landforms served as a multipurpose basis for ranking local visual quality (contrast, uniqueness), for delineating the proposed facility's potential visibility (skyline, water crossing . . .), and for anticipating construction and ecological difficulties (steep slopes, marshes . . .) (15).

Figure 5. Environmental route location



The geomorphic approach has the advantage of bridging the gap between description of visual forms and the behavioral characteristics of the terrain which is a necessary basis for land development decisions. Methods utilized in geomorphic classifications are more complex than those needed for numerical or geometric descriptions. Due to the uniqueness of local landform evolution the resultant analyses appear to pose problems for large scale planning generalizations.

It is apparent that the scale of a visual analysis study area will, in part, influence the selection of a terrain description approach. For example, it would be very costly to delineate Way's detailed geomorphic landforms for an entire statewide study. The issue of scale is important because resource and planning studies often entail decisions, such as facility location and site design requiring varying levels of informational detail.

Researchers in geography and geomorphology have addressed this problem by developing nested hierarchies of terminology. These are analogous to the systems used in botanical taxonomy. One of the most comprehensive of such systems was proposed by Brink, et al. for Australia. Table 1 summarizes his definition of "land units" (16).

Table 1. Land unit hierarchy

Name	Description	Scale
Land Zone	major climatic region	unspecified
Land Division	continental structure	1:15,000,000 (15m)
Land Province	large assembly of forms	1:5–1:15m
Land Region	small range of surface forms having undergone comparable geomorphic evolution	1:1m–1:5m
Land Systems	recurrent pattern of land facets	1:250,000–1:1m
Land Facet	one or more land element, part of a homogeneous landscape	1:10,000–1:80,000
Land Element	simplest part of a landscape, uniform soil, form, vegetation	1:10,000

(after Mitchell, 1973, p. 48)

By comparison, Cressey's "land form categories" of New York State (1:3,168,000) are roughly equivalent to Brink's "land regions", and the Strahlers' glacial landforms are similar to "land facets". Project design is usually carried out using detailed terrain information. An element can relate to areal, linear, or point features. The concept of "land element" is illustrated in Figure 6 with a longitudinal cross section through a drumlin landform.

Most aesthetic resource studies appear to utilize one to three scales of landform analysis. The N.A.R. work, cited above, incorporated two levels:

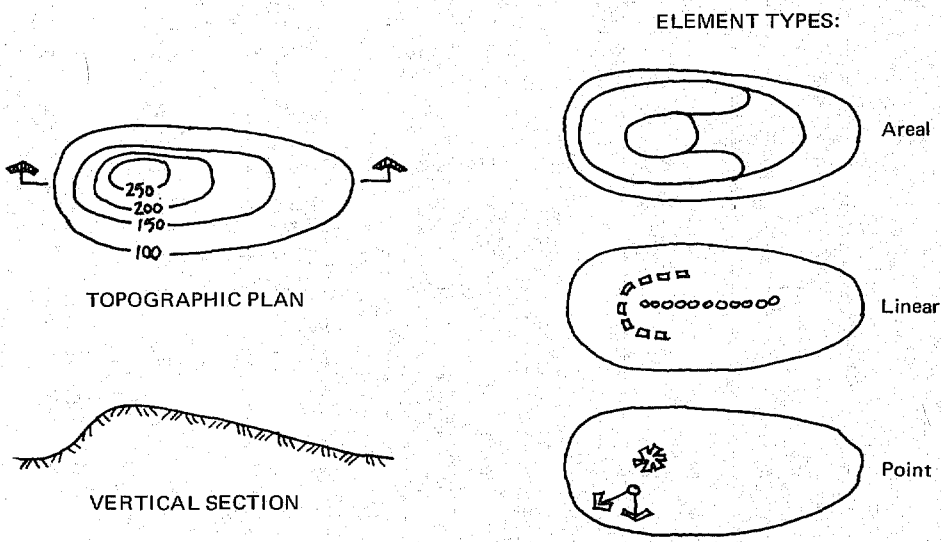
"landscape series" – large area, general impression;
"landscape systems" – series subdivision, dominant earth forms. (17)

The N.A.R. earthform analysis at the "systems" level concentrated on: areal extent, contrast created by vertical relief, water-land interfaces, and character of spatial enclosure. The character of a prototypical coastal "landscape system" consisting of a horizontal sandbar and/or marsh on the mid-Atlantic coastline is a "landscape systems" example.

A second example of scale hierarchy is contained in the National Forest Service's Visual Management System. At a gross scale, the study defines 16 major physiographic areas in the Pacific Northwest. These areas are called "character types" with common vegetation and land, rock, and water forms. At a finer scale, a further differentiation is made. For example, in the

Western Cascades type, four "character subtypes" have been mapped: gorge lands, steep mountain lands, foothill lands, rolling plateau lands. Individual landforms and landform elements are the third scale of analysis. These local forms and elements comprise the actual landscape scenes which are perceived (18).

Figure 6. Landscape elements



A clear approach to describing terrain features is a valuable step in developing a visual assessment method. There is no consensus on methods for articulating surface characteristics or terminology for describing them. Tests of all three approaches: numerical, geometric, and geomorphic will be necessary to determine a practical means or combination of methods for defining visual terrain features of New York's coastline.

A visual assessment approach ideally is suitable for both area-wide activity allocation planning and local site design decisions. Therefore, it is necessary to establish a multitiered framework which aggregates characteristic groupings of similar features at the macro scale and utilizes individual landforms or sets of landforms at the local scale. The latter would be applicable to analysis of actual planning and design relating to landscape scenes.

Coastal Features

Physical geographers and geologists have long studied shore zone processes. This interest is due both to the importance of shores to man and to the complexity of coastal dynamics. Three sets of factors interact to generate natural coastal forms. These determinants include energy (changing sea levels, wind, waves . . .), shore zone material (stationary and moving), and the geometry of submerged and upland landforms (19). In this century, the impact of man (filling, structures, dredging . . .) has constituted a fourth major shaping force.

The complexity of coastal geomorphology arises, in large part, from the relatively rapid (geological time) response to active forces. For example, Shepard and Wanless (20) have illustrated the dramatic changes in barrier island form and location following major tropical storms.

Numerous classification approaches for coastal forms have been developed since Johnson's benchmark efforts in 1919. Some of these systems distinguish between shoreside

uplands that are growing and those that are being diminished. Bird has illustrated prototypical coastal landform elements for two diverse sets of geomorphic situations: cliffed erosional, and depositional. These are shown in the cross sections of Figures 7A, B.

Figure 7 depicts the general relationship of the water-land interface. However, it is in the plan view (aerial or map) that the great variety of coastal forms is revealed. Figure 8 illustrates one approach to the geomorphic classification of depositional features. These features affect our perception of shore areas by providing variety and spatial enclosure. Shepard and Wanless (21) have developed an extensive glossary of shoreline terms.

Figure 7A. Erosional shoreline

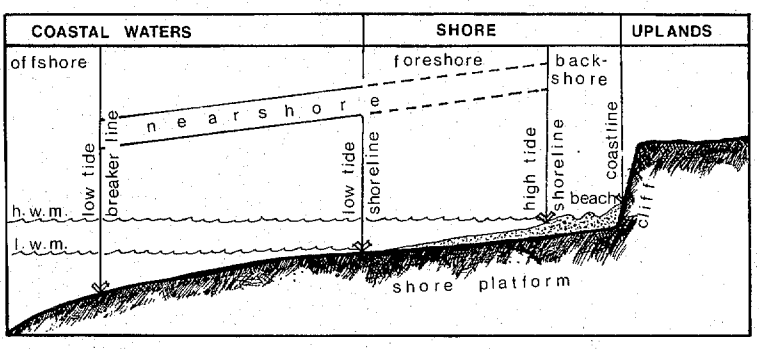
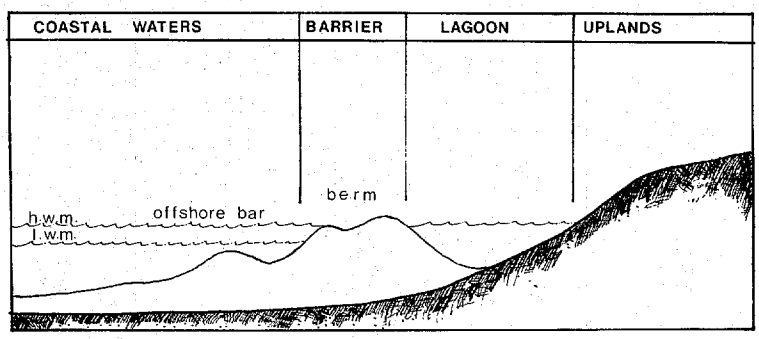
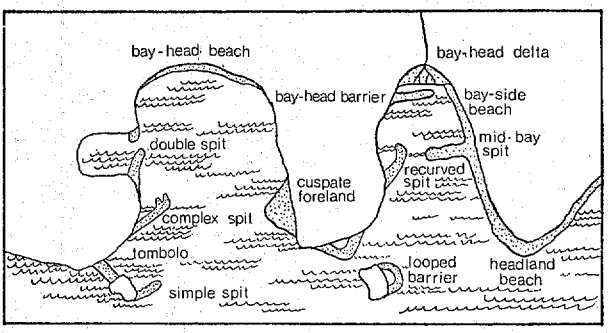


Figure 7B. Depositional shoreline



(after Bird, 1969, p. 1)

Figure 8. Depositional features



(after King, 1972, p. 503)

The shoretypes of the Great Lakes in Michigan and Wisconsin have been analyzed in small scale cross section to assist local governments and property owners in making efficient, environmentally sound development decisions (22). Rather then typing landforms, these studies merely identify changes in section configuration and shoreline materials. Figure 9 illustrates the Wisconsin Study output.

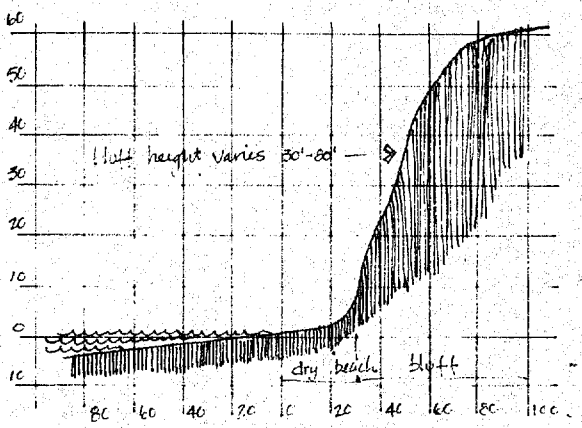
Pincus has researched the erosional characteristics of the Ohio shore of Lake Erie. His analysis, based on geology, soils, and air photo interpretations begins with classifying dominant shore features. Although not intended as a visual analysis, the Pincus study demonstrates the multipurpose usefulness of a rigorous geomorphic landform data base.

Studies of coastal aesthetics are only recently emerging as important inputs to land use decisions. Litton's "Visual Landscape Units of the Lake Tahoe Region," in *Scenic Analysis of the Lake Tahoe Region* (23); *Looking at the Vineyard: A Visual Study for a Changing Island;* and the *Environmental Report for the Arizona Station Transmission System* are recent examples of visual inputs to land use planning and decision-making.

The N.A.R. study, referred to previously, included visual contrast as a major determinant of visual quality. Table 2 contains the study's relative generalizations of the large scale scenic shorefront regions.

Figure 9. Wisconsin shoreline study

Shore edge section



Shore element description matrix

	WET BEACH	DRY BEACH	BLUFF	UPLAND
MATERIAL	sand to 50' then gravel/boulders to shoreline	sand / gravel with stretches of sand	clay	clay
WIDTH	100 ft out to 6 ft depth	30-60 feet		
SLOPE		4-6%	80-100%	rolling to steep at drainage areas
VEGETATION		none	birch, aspen, hazel white spruce, in erosion free areas	birch, aspen, hazel white spruce maple
WATER	clear		erosion-serious where vegetation and small sand-stone pockets are absent. vegetation temporary	
EROSION				
HEIGHT			varies from 30 to 80 ft	
USE				

(After Zube and Dega Associates, 1964)

Table 2. N.A.R. coastal scenery evaluations

Location	Character	Internal Contrast	Spatial Variety, Enclosure
Eastern Maine	Embayed, Rocky	High	High
Central New England	Linear, Rocky	Medium	Medium
Southern New England	Sand Beach-Bluff	Low	Low
Mid-Atlantic	Horizontal Sand Bar-Marsh	Low	Low
Urban	—	—	—

One of the most comprehensive scenic analyses of a US coast has recently been completed for Long Island Sound by Roy Mann Associates, Inc. The study was undertaken for the National Park Service and the New England River Basins Commission (N.E.R.B.C.).

In an interim report, the commission identified three shore zone cross sectional types: flatland, rise, bluff; and three plan view shoreline configurations: straight, projecting seaward, and projecting inland. These simple shapes result in nine possible three-dimensional combinations (24).

The Mann report deals with the subject in much greater depth. Topographic complexity, shoreline complexity, and uniqueness are just three of eighteen natural and manmade criteria that were assessed (methodology unspecified) (25). Utilizing the fact that much of the Sound's coast consists of submerged upland hills, the study uses "headlands" (shoreline high points) to delineate "shorescape units" between protruding headlands. The scale of these units, averaging one to two miles (1.6-3.3 km), coincides well with an individual's fore and midground visual perception zone. Adjacent shorescape units of similar character or between major headlands are aggregated into 40 "coastal reaches" (26).

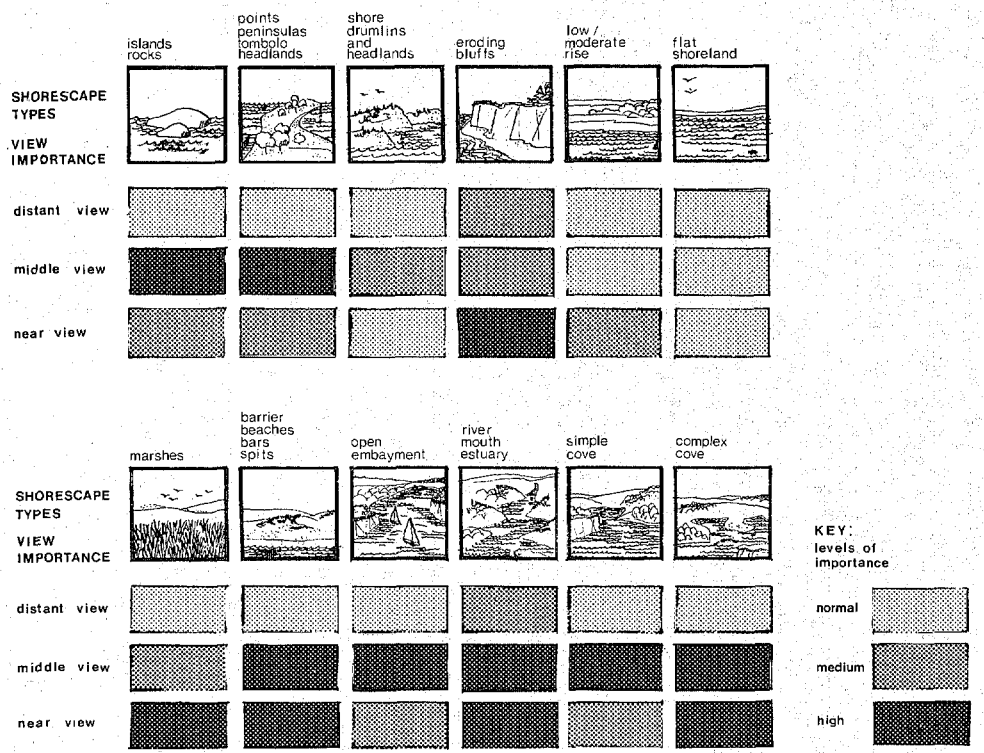
The Mann study does not 'identify' individual landforms. The study utilizes twelve prototypical "shorescape types" which consist of adjacent, visually reinforcing landforms and landform elements. These are illustrated in Figure 10. Also depicted are the study's conclusions regarding the visual distance at which each type is aesthetically important. Shore views were analyzed primarily from a boater's position (methodology unspecified).

The complexity of natural shoreline development processes has led to a wide variety of dynamic coastal land and water features. In developing a visual assessment approach for New York's shorelines, a nested hierarchy of scales will be necessary. Initial large scale groupings can be made on the basis of dominant topographic features and shoreline configurations. Sampling and testing of methods described previously will be necessary to ensure that shore zone features are clearly differentiated and communicated. The use of geomorphic terms is desirable where feasible to provide a linkage to related erosional and land development analyses. A comprehensive system must include offshore, beach, bluff, and upland components. In addition embayment-enclosure relationships must be analyzed.

New York's Sea Grant Shoreline

New York is unique among Sea Grant States in the diversity of its Great Lakes and Atlantic Shoreline. The coastal aesthetic research being conducted by the School of Landscape Architecture is designed to develop assessment and planning methods for state, regional and local utilization. The State's shoreline has been divided into nineteen shorescape provinces based on geomorphic features. Ground and aerial photographic studies have been made of local features. Analyses are underway for selected sites in each province to test landform units, landscape dimensions, visibility and viewer preference approaches to landscape description and assessment.

Figure 10. Shorescape types



(after Mann)

References and Notes

1. This work is a result of research sponsored by NOAA Office of Sea Grant, Department of Commerce, under Grant #04-3-158-39, and by the New York Sea Grant Institute. The US Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

2. E.H. Zube, *Scenic Resources and the Landscape Continuum: Identification and Measurement* (Clark University, 1973), p. 35.

3. Colin Mitchell, *Terrain Evaluation–The World's Landscape* (Longman Group LTD., London, 1973), p. 81.

4. E.H. Zube, *Scenic Resources and the Landscape Continuum: Identification and Measurement* (Clark University, 1973), p. 39.

5. Luna B. Leopold, *Natural History* 78(8) (1969).

6. E.L. Shafer, Jr., et al., *Journal of Leisure Research* 1(1) (1969).

7. E.H. Zube, D.G. Pitt and T.W. Anderson, *Perception and Measurement of Scenic Resources in the Southern Connecticut River Valley* (Institute for Man and His Environment, 1974), p. 39.

8. B.C. Wallace, *Regional Studies* 8 (1974), p. 302.
9. Douglas S. Way, *Terrain Analysis* (Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pa., 1973), p.8.
10. W.D. Thornbury, *Principles of Geomorphology* (John Wiley and Sons, Inc., New York, 1969), p. 123.
11. John H. Thompson, *Geography of New York State* (Syracuse University Press, Syracuse, New York, 1966), p. 49.
12. Research Planning and Design Associates, Inc., *North Atlantic Regional Water Resource Study Appendix N: Visual and Cultural Environment,* 1970 (reprinted May, 1972).
13. W.D. Thornbury, *Principles of Geomorphology* (John Wiley and Sons, Inc., New York, 1969), p. 1.
14. Douglas S. Way, *Terrain Analysis* (Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pa., 1973), p. 2.
15. B. Howlett and J. Felleman, *Application to the State of New York Public Service Commission for Certificate of Environmental Compatibility and Public Need, Exhibit 4 Environmental Impact* (Niagara Mohawk Power Corporation, Albany, New York, 1973), p. 4-2.
16. Colin Mitchell, *Terrain Evaluation–The World's Landscape* (Longman Group, LTD., London, 1973), p. 48.
17. Research Planning and Design Associates, Inc., *North Atlantic Regional Water Resource Study Appendix N: Visual and Cultural Environment,* 1970 (reprinted May, 1972).
18. U.S.D.A. Forest Service, *National Forest Landscape Management,* 2(462) (US Government Printing Office, Washington, DC, April, 1974), Chapter 1, pp. 5-9.
19. H.J. Pincus, *Great Lakes Basin* (A.A.A.S., Washington, 1962), p. 123.
20. F.P. Shepard and H.R. Wanless, *Our Changing Coastlines* (McGraw-Hill, New York, 1971), p. 64.
21. Ibid.,pp. 551-561.
22. Zube and Dega Associates, *Wisconsin's Lake Superior Shoreline* (Madison, 1964).
23. Tahoe Regional Planning Agency and US Forest Service, South Lake Tahoe, California, 1971.
24. New England River Basins Commission, *Scenic and Cultural Resources* (N.E.R.B.C., New Haven, Feb. 1974), p. 8-9.
25. Roy Mann, *People and the Sound: Shoreline Appearance and Design* (National Technical Information Service, Springfield, Virginia, April, 1975), p. 42.
26. Ibid., pp. 45,46.

Reprinted from *Proceedings of the Workshop on the Role of Vegetation in Stabilization of the Great Lakes Shoreline,* Great Lakes Basin Commission Standing Committee on Coastal Zone Management and US Department of Agriculture, Soil Conservation Service, Chicago, IL, December 1976. Published by the Great Lakes Basin Commission, PO Box 999, Ann Arbor, MI 48106. 1977.

VIEWING NEW YORK'S COAST: RESOURCES, RESEARCH ISSUES, AND "PREVIEW" A COMPUTER MODELING TECHNIQUE

John P. Felleman
State University of New York
College of Environmental Science and Forestry
School of Landscape Architecture
Syracuse, New York 13210

Scenic Considerations of New York's Coast

New York's coast, with the exception of Niagara Falls, contains few areas of spectacularly unique scenery. Rather, its extensive shores contain a wide variety of subtle, smaller scale, natural features which are primarily a product of glaciation and related sea level changes. A quick overview illustrates the diversity of coastal character.

Beginning on the Pennsylvania border, the Erie lake plain has gentle upland slopes terminating in a low, linear rock bluff on the shore edge. The Niagara River, with its dramatic gorge and falls leads to the western Lake Ontario Plain, which is very similar in landform to Lake Erie. Local variety occurs at the mouth of tributary streams. In the Rochester metropolitan area the rock bluff gives way to a series of lake-edge wetlands and bays which are separated from the lake by a series of baymouth bars and spits. Continuing eastward, the lake edge intersects a region of drumlins, resulting in embayments and highly dissected sedimentary bluffs. As the lake edge turns northward, a large crescent-shaped barrier bar has formed enclosing inland wetlands. The lake terminates at the St. Lawrence River, its entrance containing the famous Thousand Islands.

Southern New York's Westchester and Bronx shore is a submerged rock coast of numerous small bays and offshore rock features. The present Manhattan shoreline is entirely man defined. Long Island, the largest island adjoining the continental United States, has four distinct physical zones. On the Sound side, western Long Island consists of a series of large bays. Proceeding eastward, the shore becomes more linear and its edge is sharply defined by a sand bluff. The Atlantic side is characterized by the eastern seaboard barrier island. Its western end separates the ocean and the extensive Jamaica Bay wetlands.[1]

New York's population centers have always clustered along its shoreline. Water supply, transportation, climate, recreation, and amenities have served as strong attractions for a broad spectrum of land uses. In recent years, growing mobility and recreation demands, increasing concern for environmental protection, and the need for fuel transport and water edge energy generation have led to a series of conflicts over land use management in the coastal zone. An additional concern in New York has been the protection of unique shore edge agricultural systems, vineyards along the Great Lakes, and potato, truck and duck farms on Long Island.

The pioneering Hudson River Valley Commission established the significance and legitimacy of scenic issues in governmental management of the water edge. The Commission was charged with master planning and project review functions for all activities within a visual corridor up to one-half mile from the River's edge. Similar efforts were undertaken for Lake Tahoe and the San Francisco Bay.

As environmental concerns became a popular issue, the National Environmental Policy Act reiterated the importance of aesthetic concerns:

> ". . . it is the continuing policy of the Federal Government to . . . (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings." (S10162)

The Coastal Zone Management Act of 1972 requires that aesthetic values be considered along with ecological, cultural, and economic factors in land use decisions.

Recognition of the importance of scenery identifies a complex problem area. N.E.P.A. calls for the development of methods and procedures,

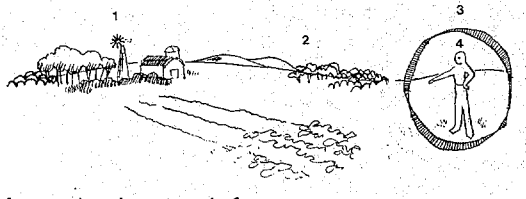
> ". . . which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations" (S102B).

The paucity of scenery description and evaluation techniques available to state and local decision makers has led to the establishment of the School of Landscape Architecture's research program as an integral component of New York's Sea Grant planning effort.

A Model of Scenic Perception

A simple model of scenic perception has been developed to help structure a comprehensive research program. The model draws heavily on recent research efforts in environmental psychology.[2] Figure 1 illustrates the model's components.

Figure 1. Scenic perception process



[1]Landscape—a composition of natural and man-made forms

[2]Visibility—the physical view zone, and distance relationships between viewer and landscape

[3]Viewer Environment—the local surroundings, viewer mobility, and sequence of views

[4]Interpretation—the viewer's psychological analysis of a view's content and meaning

The landscape composition consists of natural and manmade elements. Although individually these elements are readily defined and quantified, they occur in an almost infinite number of combinations of patterns, textures, and colors. Research by Shafer, Zube, and others has begun to clarify the significance of some of the fundamental landscape types with respect to viewer response.[3,4]

The term visibility generally encompasses both potential and actual viewsheds. The former is solely a function of surface topography, while the latter incorporates the reductions in sight distance caused by local surface features and climatic conditions.

Litton, in his pioneering work *Forest Landscape Descriptions,* postulated three general landscape perception zones.[5] As distance from the observer increases from foreground to midground to background, viewer attention shifts from detail to forms to edges. Thus, viewer position has a significant effect on how any landscape is perceived.

Viewer environment includes those local factors which provide the viewer with supporting or complicating inputs. These may include visual, sound, olfactory or social conditions such as crowding on a scenic beach. In addition, whether the viewer is stationary, a pedestrian, or in a boat or car may have an important impact on landscape perception.

The final interpretation of the observed scene's content and meaning is a psychological function of the individual. Each of us is unique; however, research by Zube and Boster and others has shown that there are some strong similarities of landscape preference among sample groups.[6]

The first two elements of the model, landscape composition and visibility, are determined by topography, land use, and vegetation. In general, Americans prefer scenes that are natural and include water. Analysts are only beginning to examine response differences between vegetative patterns, and among various shore configurations. Of particular concern in coastal areas is the impact of clearing, construction, and resultant erosion of water edge bluffs.

One of the central issues in many scenic quality controversies is visibility. Visual access to the water is a prime consideration of residential, commercial, and recreation developments. In contrast, a growing segment of the public is concerned with preserving or enhancing the natural character of the shore edge. Planning and design proposals frequently incorporate selected clearing, screening, and vegetative buffers.

The state of the art of scenery analysis has not progressed to the point where either quantitative methods or expert opinion satisfy the recent mandates for full consideration of aesthetic considerations. Recent legislation, including the Coastal Zone Management Act, requires citizen participation in all phases of coastal decision making. The situation is particularly acute for major development proposals affecting large scale scenes, viewed from multiple locations by a variety of publics. In these situations it is highly desirable for environmental managers to have the capability of simulating existing and proposed views for the evaluation of alternative courses of action.

PREVIEW—Computer Generated Landscape Perspectives

The US Forest Service has been a leader in the development of landscape assessment techniques for the multipurpose management of millions of acres of National Forest lands. In response to recent controversies regarding the visual impact of clearcutting and other timber harvest techniques, Erik Myklestad and Alan Wagar developed PREVIEW, a program for plotting large scale landscape scenes.[7]

During the past year, the School of Landscape Architecture's Sea Grant program has been adapting this technique for use in coastal applications. The following is a brief description of the program's capabilities.

> Input data is coded by means of a coordinate grid of square intersection points. Three sets of information may be incorporated: topography, utilizing elevations of grid intersections; surface character (vegetation type, density, etc.); and linear features such as roads, shoreline, and property boundaries. Each data set can be translated by the program into a mathematically correct, computer line plot perspective drawing from a given position looking at a selected point. Figure 2 illustrates the topography output, while Figure 3 is an example of surface character. A simple change in a "command card" can generate a different view of the study and permits analysis from multiple viewing positions. A typical application would be a sequence along a waterfront road.
>
> Dynamic modelling is possible via subroutines which compute the growth of coniferous and deciduous trees. Again, a user-defined "command card" can generate a time sequence of plots showing anticipated effects of forest management practices.
>
> Additional analysis flexibility is provided through user control of plot scale and vertical exaggeration. The latter is a powerful tool for clarifying subtle aspects of scenes.

To make the program more useful in coastal areas, a series of modifications and improvements is being explored. These include:

1. Development of map measurement techniques to aid in optimal selection of grid scale (particularly critical at the shore edge);
2. Coupling PREVIEW with other visual modelling techniques such as VIEWIT[8] to aid in selection of visual control points;
3. Modification of surface character and growth subroutines to model local conditions, and the addition of architectural elements; and
4. Enhancement of plotted output through the use of color rendering, photo montages and other techniques to improve communication of existing and proposed conditions.

Figure 2. Topography output

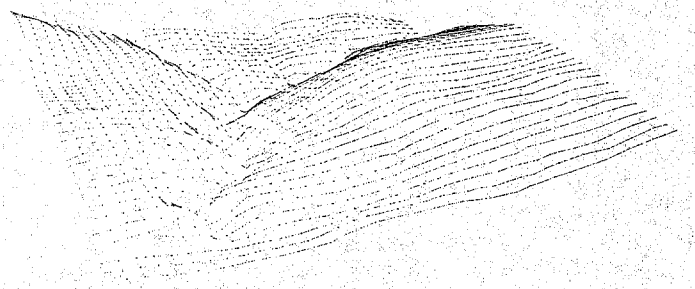
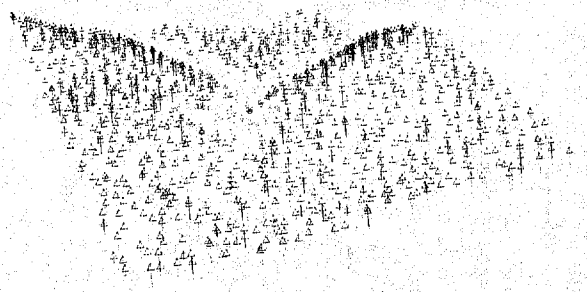


Figure 3. Surface character



The major thrust of our research efforts is to develop scenic assessment methods and techniques directly applicable to regional and local situations. It is our hope that researchers and managers concerned with visual quality issues in the coastal zone will join with us in developing and testing this promising approach to understanding a complex problem area.

References

1. Felleman, J. *Coastal Landforms and Scenic Analysis: A Review of the Literature with a Preliminary Examination of New York's Shoreline.* Syracuse: New York Sea Grant Program, SUNY College of Environmental Science and Forestry, Working Paper No. 4, 1975.
2. For reference to this growing research field see Nieman, T.J. and Viohl, R. *The Description, Classification and Assessment of Visual Landscape Quality.* Monticello, Ill: Council of Planning Librarians Exchange Bibliography, 1975.
3. Shafer, E.W. Jr. "Perception of Natural Environments," In *Environment and Behavior,* Vol. 1, No. 1, June 1969, pp. 71-82.
4. Zube, E.H., Pitt, P.G., and Anderson, T.W. *Perception and Measurement of Scenic Resources in the Southern Connecticut River Valley.* Pub. # R74-1. Amherst: Institute for Man and the Environment, 1974.
5. Litton, R.B. *Forest Landscape Description and Inventories: A Basis for Land Planning and Design.* Berkeley: US Forest Service Pacific Southwest Forest and Range Experiment Station, P.S.W.-49, 1968.

6. Boster, R.S. "Methodologies for Scenic Assessment," In *Visual Quality and the Coastal Zone–Conference Proceedings.* Syracuse: School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Sea Grant, pp. 78-102.
7. Myklestad E. and Wagar, J.A. Jr. *Instructions for PREVIEW–A Computer Aid for Visual Management of Forested Landscapes.* (Available from US Forest Service, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210.)
8. Travis, M.R. et al. *VIEWIT: A Computation of Seen Areas, Slope, and Aspect for Land Use Planning.* Berkeley: US Forest Service Pacific Southwest Forest and Range Experiment Station, P.S.W.-11, 1975.

Reprinted from *Barrier Islands and Beaches, Technical Proceedings of the 1976 Barrier Islands Workshop,* The Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, Annapolis, MD, May 1976. Published by the Conservation Foundation, 1717 Massachusetts Ave., Washington, DC 20036.

AESTHETIC AND RECREATIONAL FACTORS IN BARRIER ISLAND PLANNING

John P. Felleman
State University of New York
College of Environmental Science and Forestry
School of Landscape Architecture
Syracuse, New York 13210

> "Here is the battleground between the ocean and the land. Here is the surf, which varies from gentle and playful to awesomely violent. Here the tides move forward and back, stranding the shells of clams and sand dollars and horseshoe crabs. Here is a rich assembly of easily visible life, the fascinating and beautiful creatures, from the darkness-loving ghost crab to the voracious herring gull, that has learned to survive on the battlefield."
>
> (Jonathan Norton Leonard, "Atlantic Beaches")

This quote deals with an experience of the shore. If you reflect on your own experience, you can call to mind lucid images of the shore, both first hand and vicarious as interpreted by artists, poets, and naturalists. The latter were trying to capture a total essence of the dynamic power, magnitude, beauty and complexity of the ocean's edge. An elusive goal.

I will concentrate on two areas of major interest. First, I hypothesize that aesthetic and recreation concerns are two inseparable, desirable and necessary facets of human experience. Second, I would like to briefly highlight those current aspects of aesthetic and recreation research which are significant to barrier island analysis and management.

An initial linkage between aesthetics and recreation can be made directly from working concepts of each:

> "Recreation refers primarily to creative leisure-time activities . . . 'since the chief value of recreation is that it balances the human organism physically and psychologically, . . . (it) must be based on self choice, initiative, and spontaneity.' "
>
> (Wagar, 1964)

In contrast, there are no widely accepted definitions of aesthetics (USEPA, 1973). If we ignore philosophical discussions of art, and deal only with natural settings,

> "The importance of aesthetic quality has revolved around the idea that people receive psychological benefit from viewing, inhabiting, or otherwise experiencing attractive areas."
>
> (Haskett, 1975)

Beauty, a central factor in aesthetics, has been defined as the,

> ". . . aggregate of qualities in a thing which gives pleasure to the senses or pleasurably exalts the mind or spirit."
>
> (Webster's New Collegiate Dictionary, 1960)

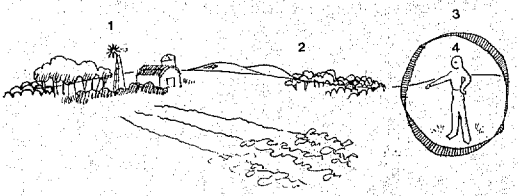
In natural settings, both psychological "balance" and physical exercise can be obtained by pleasurably interacting with a stimulating environment.

Aesthetic Research

The majority of aesthetic research is primarily concerned with scenery evaluation. Because of the dearth of clear definitions and widely accepted standards of quality, there is much popular confusion related to issues of scenery evaluation. Researchers have found it useful to develop models of the scenery perception process, an example of which is illustrated

in Figure 1 (Felleman, 1976). Such models permit efforts to be focused on clarifying specific components, such as description of natural forms or dynamic relationships between components. An example of the latter would be the effect of local noise on a viewer's judgment of a scene. As components and interrelationships are clarified, diagnostic and predictive processes should emerge.

Figure 1. Scenic perception process



[1]Landscape—a composition of natural and man-made forms

[2]Visibility—the physical view zone, and distance relationships between viewer and landscape

[3]Viewer Environment—the local surroundings, viewer mobility, and sequence of views

[4]Interpretation—the viewer's psychological analysis of a view's content and meaning

Beginning with the 1962 ORRRC (US Outdoor Recreation Resources Review Commission) report, *Water for Recreation Values and Opportunities,* and accelerating with passage of the National Environmental Policy Act and its charge to federal agencies to,

> "... identify and develop methods and procedures ... which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making,"

considerable attention has been given in the public and private sectors to describing, measuring, and predicting the "quality" which user groups associate with their surroundings. These studies have been oriented to aiding decision makers in the management of large land areas, and the siting and designing of recreation and development projects.

Within the past five years visual analyses have become a standard element of regional resource planning. The pioneering North Atlantic Regional Water Resources Study (May, 1972) by the Corps of Engineers utilized regional physiographic characteristics and the scale and pattern of urbanization to differentiate discrete visual units throughout the North Atlantic Watershed. These descriptions were subsequently arrayed by naturalness, relief, variety, and water edge to rank visual quality (Research Planning and Design Associates, 1967).

At a smaller regional scale, the Lake Tahoe study (Litton, 1971) combined measurable features with an extensive analysis of the view from the basin's roads to spatially categorize a range of visual management concerns ranging from preservation to rehabilitation.

The National Forest Service and Bureau of Land Management have fully integrated scenic analyses into their multipurpose management programs. The Forest Service has been an international leader in developing a vocabulary and study tools (such as its computerized VIEWIT program) to describe and analyze existing scenery, and to evaluate (and modify) development proposals (Forest Services, 1974). The Office of Coastal Zone Management has recently published a handbook on *Aesthetic Resources of the Coastal Zone* (Mann, 1975). These techniques and procedures are adaptable to both agency personnel, and citizens who can participate through a variety of formats. For example, the Martha's Vineyard study (Vineyard Open Land Foundation, 1973) utilized "mental maps" drawn by residents and visitors to clarify perceptions of coastal and inland features. Extensive use has been made of user-preference studies incorporating field visits, photographs, and color slides (Zube, 1974; Viohl, 1975).

Some general conclusions regarding this research are:

1. The aesthetic experience is a complex phenomenon involving the stimuli to the observer (physical setting), the transmission of these stimuli to the observer, and psychological perception and processing by the observer (Craik, 1970).
2. A good deal of aesthetic research has dealt solely with the visual component of aesthetics (Mann, 1975). This is due in part to the visual *usually* being our dominant sense, and in part to its being the easiest to document, and model (Litton et al., 1974, p. 13).
3. It is now possible to fairly accurately predict a *passive* viewer's response to a static moderate to large scale landscape based on the composition of the scene. The middle ground is established as the key visual line between foreground details and background form (Forest Service, Vol. I, p. 16, 1972). In particular, water edge, topographic relief, physical enclosure, degree of naturalness and other measurable dimensions are strongly correlated to viewer response (Zube, 1974; Shafer, 1969).
4. Quantification of scenic quality for use in environmental decision making would be possible only if all interested user groups share the same attitudes and values, and the decision process includes extensive participant interaction (Landscapes Limited, 1974).

I have been able to locate no extensive application of these approaches to barrier islands. This is due to the lack of recent governmental attention. The N.A.R. study classified them as exhibiting a low scenic potential because the rating factors used—internal contrast, spatial variety, and sense of enclosure—as in other systems, are based on geomorphic features, and the shallow relief and linear form of barrier islands and beaches frustrate the application of such existing techniques.

The difficulty is threefold: The fine grained features of barrier islands are often not clearly exhibited in the secondary data sources (maps, air photos) typically used in such regional studies (Felleman, 1976). Terrestrial analysis is slow and expensive. The usual substitution of scenery for aesthetics does not account for the strong multisensory inputs available on barrier islands. In addition, barrier islands are experienced by active pedestrian recreationists, not auto or tour based viewers as in many parks and forests. Leonard (1972, p. 107) expresses the experience as follows:

> "Now the beach was all my own, utterly virgin, not a print on it except the delicate embroidery made by the feet of little shore birds. Nothing looked different from the day before, but in my solitude, the beach felt different. The air smelled pure. The shore on which the waves were breaking seemed as deserted as in the far-off time before even the first Indians settled along the Atlantic coast. I looked around for signs of man; there were none. No planes marred the sky, no boats the ocean. The emptiness of the beach made me feel all the more intimately tied to it. Everything I observed seemed focused with an extra intensity, as if I were looking through a microscope and a telescope at the same time."

Rather than to passively observe, as we might at Old Faithful, Niagara Falls, or on the Maine or Oregon coasts, a barrier island compels us to interact with the fine grained environment. The noises, smells, winds, and spray create a total experience in which all the senses are orchestrated. The lack of a distinct middle ground in the visual continuum exaggerates the immediate local surroundings (hot sands and cold foam on our bare feet) while the ocean-sky horizon creates a humble feeling of finiteness.

The challenge is to develop efficient local-scale methods for utilizing available visual analysis techniques, and to supplement these analyses with other sensory data.

Recreation

The previous discussion has dealt mainly with aesthetic concerns of a hypothetical single person in a totally natural setting. Such a model is, of course, not representative of our present and future experiences on barrier islands. Two modifications are necessary to fully comprehend the recreational problem. First, the vast majority of outdoor recreation is done in groups. Thus, people are not only interacting with the environment but with each other.

Second, the human presence necessarily modifies the experience of one's physical environment.

Barrier islands can potentially host a variety of recreational activities. In light of the policy of the Coastal Zone Management Act of 1972 to:

> "... preserve, protect, develop and where possible, to restore or enhance the resources ...",

we can group these activities by their level of development intensity. Intensive activities generated by or near residential and resort areas involve long term structures which must be carefully located and designed, such as tennis courts and clubhouses. Extensive activities, on the other hand, are uniquely suited to barrier islands. Camping, swimming and outdoor education require relatively few structures with the latter utilizing many elements of the dynamic resource base (Conservation Foundation, 1975). The National Seashores afford many opportunities for such appropriate low-intensity uses.

Finally, the recreational opportunity for which barrier islands have no peer is the oceanfront "wilderness" experience. The environmental and psychological need for preserving remote natural settings *was* recognized early in this century with the creation of the National Parks. The Wilderness Act of 1964 has clarified both the experiential concept and the leadership role of the Federal Government in providing such opportunities to our citizens:

> "A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untravelled by man; where man himself is a visitor who does not remain ... which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation ..."
>
> (Wilderness Act of 1964)

There are substantial problems involved in managing recreation in sensitive, dynamic environments. These interrelated issues can be categorized as subsets of "carrying capacity"—"the ability of something to absorb outside influence and still retain its essence" (Penfold, 1972). The issue subsets include:

- Physical Carrying Capacity—for example, effects of trail erosion;
- Ecological Carrying Capacity—the condition of food chains, habitats, and species behavior;
- Psychological Carrying Capacity—the effect of visitors on the capacity of the wilderness to yield satisfying experience to others.

Much research has been undertaken in each of these areas. Briefly summarizing, physical carrying capacity, although quite complex, can be systematically studied and lends itself to quantification and management practices (Nerikar, et al., 1976; Ketchledge and Leonard, 1970). Ecological carrying capacity analyses are in relatively primitive states due to the difficulties in establishing base level information and constructing dynamic models. This situation may be further complicated in barrier islands where the natural terrain is in a constant state of flux.

Environmentally based development plans represent major advances but are open to criticism on the basis of their static nature (Ris, 1974). Psychological carrying capacities involve all the senses as well as the cultural and educational background of the users. Significant progress is being made in establishing visual, noise, and user-density criteria for various quality levels of wilderness experience (Wagar, 1974; Stankey and Lime, 1973).

If carrying capacity, in all its dimensions, is to become an operational approach to management, processes will be needed to control the amount (and possibly type) of users. The erosion of quality in our National Parks is directly a function of overuse. Approaches currently being tested include: first come-first served, permits, lotteries, and "risk zoning" (Echelberger, et al., 1974; Greist, 1975).

Conclusions

Aesthetic and recreational considerations can play a central role in the wise management of our nation's barrier islands. Existing methods of analysis must be adapted to the unique features of these fragile systems. Experience in resource management has demonstrated the need for a comprehensive approach. This will entail both the integration of various analytical inputs as well as the administrative mechanisms necessary to manage the entire set of islands as a whole.

References

Bureau of Land Management, U.S.D.I. 1975. *Visual Resource Management,* Manual Sections 6300, 6310, 6320, November.

Kenneth H. Craik. 1970. "Environmental Psychology." In *New Directions in Psychology IV,* New York, Holt, Rinehart and Winston.

H.E. Echelberger, D. Deiss, and D.A. Morrison. 1974. "Overuse of Unique Recreational Areas." *Journal of Soil and Water Conservation,* 29(4), July-August, pp. 173-176.

J. Felleman. 1976. "Coastal Landforms and Scenic Analysis: A Review of the Literature, With a Preliminary Examination of New York's Shoreline." Syracuse, School of Landscape Architecture, SUNY-ESF, Sea Grant Project, Working Paper No. 4.

Forest Service, USDA. 1972. *Forest Landscape Management.* Forest Service, Northern Region, Vol. I.

Forest Service, USDA. 1974. *National Forest Landscape Management, The Visual Management System.* Washington, USGPO, Vol. 2, Ch. 1.

Forest Service, USDA. 1975. VIEWIT: Computation of seen areas, slope and aspect of Land Use Planning. Berkeley, Pacific Southwest Forest and Range Experiment Station.

D.A. Greist. 1975. "Risk Zoning–A Recreation Area Management System and Method of Measuring Carrying Capacity." *Journal of Forestry,* 73(11), pp. 711-714.

S. Haskett. 1975. "Evaluating Visual Quality of the Coastline: Some Significant Issues." Syracuse, School of Landscape Architecture, SUNY-ESF, Sea Grant Project, Working Paper No. 2, p. 2.

E.H. Ketchledge and R.E. Leonard. 1970. "The Impact of Man on the Adirondak High Country." *NY Conservationist,* pp. 14-18.

Landscapes Limited. 1974. *PERMITS Methodology–Phase II.* Portland, Bonneville Power Administration.

Jonathan Norton Leonard. 1972. *Atlantic Beaches.* Time-Life, The American Wilderness Series.

R.B. Litton. 1971. *Scenic Analysis of the Lake Tahoe Region.* South Lake Tahoe, Tahoe Regional Planning Agency and US Forest Service.

R.B. Litton, R.J. Tetlow, J. Sorensen, and R. Beatty. 1974. *Water and Landscape–An Aesthetic Overview of the Role of Water in the Landscape.* Port Washington, NY, Water Information Center, Inc.

Roy Mann Associates, Inc. 1975. *Aesthetic Resources of the Coastal Zone.* Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, p. 13.

The Nature Conservancy. 1975. *The Preservation of Natural Diversity: A Survey and Recommendations.* Prepared for US Department of the Interior, Washington.

V.N. Nerikar, et al. 1976. "Gauging Florida's Carrying Capacities." *Landscape Architecture,* March, pp. 133-137.

T.J. Nieman and R.C. Viohl. In Press. *The Description, Classification, and Assessment of Visual Landscape Quality.* Monticello, Ill., Council of Planning Librarians, Exchange Bibliography.

Joseph W. Penfold, et al. 1972. *National Parks for the Future.* Washington, Conservation Foundation, p. 35.

Research Planning and Design Associates, Inc. 1967. *North Atlantic Regional Water Resource Study, Visual and Cultural Environment.* Amherst, Mass.

H.C. Ris. 1974. *A Development-Management Model for Barrier Islands.* Syracuse, School of Landscape Architecture, SUNY-ESF, Master's Thesis.

E.L. Shafer, Jr., J.F. Hamilton, Jr., and E.A. Schmidt. 1969. "Natural Landscape Preferences: A Predictive Model." *Journal of Leisure Research,* 1(1), pp. 1-19.

G.H. Stankey and D. Lime. 1973. *Recreational Carrying Capacity: An Annotated Bibliography.* Ogden, USDA Forest Service, General Technical Report INT-3.

R. Viohl, Jr. 1975. "Landscape Evaluation: A Review of Current Techniques and Methodologies." Syracuse, School of Landscape Architecture, SUNY-ESF, Sea Grant Project, Working Paper No. 3.

J. Alan Wagar. 1964. *The Carrying Capacity of Wild Lands for Recreation.* Society of American Foresters, Forest Science Monograph No. 7, p. 3.

J. Alan Wagar. 1974. "Recreational Carrying Capacity Reconsidered." *Journal of Forestry,* 72(5), May, pp. 274-278.

US Environmental Protection Agency, Office of Research and Development. 1973. *Aesthetics in Environmental Planning.* Washington, USGPO, Chap. 1.

US Outdoor Recreation Resources Review Commission. 1962. *Outdoor Recreation for America.* Washington, USGPO.

The Vineyard Open Land Foundation. 1973. *Looking at the Vineyard: A Visual Study for a Changing Island.* West Tinsbury, Mass.

E.H. Zube, E.G. Pitt, and T.W. Anderson. 1974. *Perception and Measurement of Scenic Resources in the Southern Connecticut River Valley.* Pub. No. R74-1. Amherst, Mass., Institute for Man and His Environment.

Reprinted from *Council of Planning Librarians, Exchange Bibliography #1064.* Published by Council of Planning Librarians, PO Box 229, Monticello, IL 61856. June 1976.

BIBLIOGRAPHY: THE DESCRIPTION, CLASSIFICATION, AND ASSESSMENT OF VISUAL LANDSCAPE QUALITY

Thomas J. Nieman
Richard C. Viohl
State University of New York
College of Environmental Science and Forestry
School of Landscape Architecture
Syracuse, New York 13210

With the relatively recent upsurge in research related to man-environment relations numerous journals, bibliographies, research papers, etc. have been published. These represent a range of attempts to describe, classify and assess various aspects of the natural and man-made environment, singularly and as they interface in the "real world." While the study of man and his concomitant environment is often confusing and difficult to understand, much less to effectively deal with, the entrance of multiple disciplines, designers on the one hand and social scientists on the other, has served to spawn an enormous potential for interdisciplinary research and information exchange.

A related, but distinct, characteristic of man-environment relations is the growing importance of aesthetics and visual quality. The entire question of assessing and experiencing intrinsic visual quality, while largely neglected by most environmental researchers, is now viewed as an integral part of environmental research. As a result, the consideration of visual quality as an important element in the planning process is rapidly gaining support among planning agencies, consulting firms, and research institutions. While there has been considerable documentation of efforts to appreciate, in a literary sense, the visual aspects of the environment, visual quality has not been a major consideration in policy planning. Nonetheless, under the term "aesthetics," federal and local guidelines refer to visual quality as a required consideration on an equal basis with economic, social and environmental issues. The problem lies in that understanding visual quality, much less objectively quantifying it, is at a much lower level of sophistication than the other issues. As a result, policy planning is, at best, inconsistent and leads to conflicts that further frustrate attempts to deal with visual quality as a tangible element in the planning process.

This bibliography is intended to give a comprehensive list of materials that represent the present "state-of-the-art" of the description, classification, and assessment of visual quality. In an attempt to be systematic and to give the reader a clue to what references represent which area of visual quality concern, the bibliography has been divided into three components and key words or descriptors have been utilized to further clarify the component. There may be disagreement as to the proper placement of a reference in a component, and, a reference may belong in more than one component. However, the intent is to give the reader a place to begin the pursuit of research in one of three areas of visual quality:

1. Theoretical and Research Approaches to Aesthetics, Visual Quality, and Human Behavior.
2. Landscape Classification: Description, Discussion and Methodology.
3. Assessment of Landscape Preference: Methodologies, Factors and Considerations.

Theoretical and Research Approaches to Aesthetics, Visual Quality, and Human Behavior

Aesthetic Appraisal
Aesthetic Appreciation
Aesthetic Experiences
Aesthetic Objectivity
Ambiguity
Assessment
Attitude Measuring Instruments
Behavior
Behavior Setting
Cognition
Complexity
Computers
Content Analysis
Creating Landscape Quality
Differential Response
Economic Trade-offs
Environmental Appraisal
Environmental Appreciation
Environmental Awareness
Environmental Disposition
Environmental Intangibles
Environmental Perception
Evaluation
External Benefits
Human Response
Landscape Quality
Non-price Variables
Personality Differences (Role of)
Preferences
Public Attitudes
Quality (Definition of)
Quantitative Measurement
Response
Social Amenities
Stimulus
Urban Complexity
Values
Visual Resource

Acking, Carl-Axel and Rikard Kullar. "Presentation and Judgement of Planned Environment and the Hypothesis of Arousal." In *Environmental Design Research.* Vol. 2, W.F.E. Preiser, ed. Dowden, Hutchinson and Ross, 1973, pp. 72-83.

Acking, Carl-Axel and Gannar Jarle Sorte. "How Do We Verbalize What We See?" In *Landscape Architecture.* October 1973, pp. 470-475.

Appleyard, Donald, Kevin Lynch and J. Myer. *The View from the Road.* Cambridge, Massachusetts: The MIT Press, 1965.

Beckett, P.H.T. "The Interaction Between Knowledge and Aesthetic Appreciation." In *Landscape Research News,* Vol. 1, No. 8. Landscape Research Group, University of Manchester, Summer 1974, pp. 5-7 (British).

Buttimer, Sister Annette. *Values in Geography.* Resource Paper #24. Washington, D.C.: Association of American Geographers, 1974.

Child, Irvin. "Personal Preferences as an Expression of Aesthetic Sensitivity." In *Journal of Personality,* Vol. 30, No. 4. December 1962, pp. 496-512.

_____. "Esthetics." In *Handbook of Social Psychology 3.* G. Lindzey and E. Aronson, eds. Vol. 3, Chapt. 28. Addison-Wesley, 1969, pp. 853-916.

Clark, Roger N., John C. Hendee and Frederick L. Campbell. "Values, Behavior, and Conflict in Modern Camping Culture." In *Journal of Leisure Research,* Vol. 3, No. 3, Summer 1971, pp. 142-159.

Coomber, Nicholas H. and Asit K. Biswas. *Evaluation of Environmental Intangibles.* Bronxville, New York: Genera Press, 1973.

Craik, Kenneth H. "The Comprehension of the Everyday Environment." In *American Institute of Planners Journal,* January 1968.

_____. "Human Responsiveness to Landscape: An Environmental Psychological Perspective." In *Response to Environment.* Coates and Moffett, eds. Student Publication of the School of Design. Raleigh, North Carolina: North Carolina State University, Vol. 18. 1969, pp. 169-193.

_____. "The Environmental Dispositions of Environmental Decision-Makers." In *The Annals of the American Academy of Political and Social Science,* Vol. 389. May 1970, pp. 87-94.

_____. "The Assessment of Places." In *Advances in Psychological Assessment.* P. McReynolds, ed. Palo Alto: Science and Behavior Books, Vol. II. 1971, pp. 40-63.

David, Elizabeth L. "Lakeshore Property Values: A Guide to Public Investment in Recreation." In *Water Resources Research,* Vol. 4, No. 4. August 1968, pp. 697-707.

_____. "Effects of Nonprice Variables Upon Participation in Water-Oriented Outdoor Recreation: Comment." In *American Journal of Agricultural Economics,* Vol. 51, No. 4. November 1969, pp. 942-945.

Dearinger, John A. *Measuring the Intangible Values of Natural Streams, Part I: Application of the Uniqueness Concept.* Kentucky Water Resources Institutes, Lexington, Kentucky. Distributed by NTIS, Springfield, Virginia. June 1971.

DeLact, Christian. "The Relationship of Government and the Public in the Provision of Social Amenities." In *Proceedings of the 11th Biennial Congress, International Federation of Landscape Architecture,* Montreal. W. Douglas Harper, ed. June 1968, pp. 107-119.

Diffy, T.J. "Evaluation and Aesthetic Appraisals." In *British Journal of Aesthetics,* Vol. 7, No. 4. pp. 358-373.

Ditwiler, C. Dirck. "Environmental Perceptions and Policy Misconceptions." In *American Journal of Agricultural Economics,* Vol. 55, No. 3. August 1973, pp. 477-483.

Ferris, Kimball H. and Julius Gy Fabos. *The Utility of Computers in Landscape Planning: The Selection and Application of a Computer Mapping and Assessment System for the Metropolitan Landscape Planning Model (METLAND).* Bulletin No. 617, December 1974. (Massachusetts Agricultural Exp. Sta., University of Massachusetts).

Gratzer, Miklos S. and Robert D. McDowell. *Adaptation of an Eye Movement Recorder to Aesthetic Environmental Mensuration.* Storrs Agriculture Exp. Sta., University of Connecticut, Research Report No. 36, 1971.

Gump, Paul V. "The Behavior Setting: A Promising Unit in Environmental Designers." In *Landscape Architecture.* January 1971, pp. 130-133.

_____. "Milieu, Environment and Behavior." In *Design and Environment,* Vol. 2, No. 4. Winter 1971, pp. 49-50 and 60.

Harper, David B. and John D. Warbach, eds. *Proceedings of Conference/Workshop on Visual Quality and the Coastal Zone.* Syracuse, New York, May 29-30, 1975. Albany: New York Sea Grant Institute. (In preparation.)

Haskett, Sarah. *Evaluating Visual Quality of the Coastline: Some Significant Issues.* Sea Grant Project Working Paper No. 2. School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse, New York, 1975.

Heberlein, Thomas A. "Social Psychological Assumptions of User Attitude Surveys: The Case of the Wildernism Scale." In *Journal of Leisure Research,* Vol. 5, No. 3. Summer 1973, pp. 18-33.

Hess, E.H. "Attitude and Pupil Size." In *Scientific American,* Vol. 212, No. 4. 1965, pp. 46-54.

Hornbeck, Peter L. (Project Director). *Highway Esthetics: Functional Criteria for Planning and Design.* Cambridge, Massachusetts: Landscape Architecture Research Office, Graduate School of Design, Harvard University. June 1968. Available through NTIS PB 180 022.

Ittelson, William H. "Perception of the Large-Scale Environment." In *Transactions New York Academy of Sciences,* Series II, Vol. 32, No. 7. November 1970, pp. 807-815.

Jensen, Jerome W. and Lorelei J. Fritz. *State Environmental Plan: Prototype Program for the Visual Environment.* School of Landscape Architecture, SUNY College of Environmental Science and Forestry, 1972.

Johnson, Hugh A. and Judith M. Huff. *Toward Measuring the Intangible Values of Natural Beauty.* Washington, DC: U.S.D.A., Economic Research Service, National Resource Economics Division, August 1966. (Mimeograph).

Kaplan, Stephen. "The Challenge of Environmental Psychology: A Proposal for a New Functionalism." *American Psychologist.* February 1972, pp. 140-143.

_____. "Cognitive Maps, Human Needs and the Designed Environment." In *Environmental Design Research.* Vol. 1. W.F.E. Preiser, ed. Stroudsburg, Pennsylvania: Dowden, Hutchinson, and Ross, Inc. 1973, pp. 275-283.

_____. "Cognitive Maps in Perception and Thought." In *Cognitive Mapping: Images of Spatial Environments.* Downs and Stea, eds. Chicago, Illinois.

Kates, Robert W. "Stimulus and Symbol: The View from the Bridge." In *Journal of Social Issues,* Vol. 22, No. 4. 1966, pp. 21-28.

_____. "The Pursuit of Beauty in the Environment." In *Landscape,* Vol. 16, No. 2. Winter 1966-67, pp. 21-25.

Kates, Robert and J.F. Wohlwill. "Man's Response to the Physical Environment." In *Journal of Social Issues,* Vol. 22, No. 4. 1966, pp. 15-20.

Kooyoomjian, K. Jack and Nicholas L. Clesceri. "Perception of Water Quality by Select Respondent Groupings in Inland Water-Based Recreational Environments." In *Water Resources Bulletin,* Vol. 10, No. 4. August 1974, pp. 728-744.

Leff, Herbert L., Lawrence R. Gordon and James G. Ferguson. "Cognitive Set and Environmental Awareness." In *Environment and Behavior,* Vol. 6, No. 4. December 1974, pp. 395-447.

Lowenthal, David. "Assumptions Behind the Public Attitudes." In *Environmental Quality in a Growing Economy.* Henry Jarrett, ed. Baltimore: The Johns Hopkins Press, 1966, pp. 128-137.

_____. "Recreation Habits and Values: Implications for Landscape Quality." In *Proceedings of the 11th Biennial Congress, International Federation of Landscape Architecture,* Montreal. W. Douglas Harper, ed. June 1968, pp. 221-230.

Lowenthal, David, et al. *Publications in Environmental Perception.* New York, New York: American Geographical Society, Nos. 1-8. 1972.

Lowenthal, D. and M. Riel. "The Nature of Perceived and Imagined Environments." In *Environment and Behavior,* Vol. 4. 1973, pp. 189-207.

Maas, Ira F.M. "Approaches to Maintaining and Creating Landscape Qualities." In *Proceedings of the 11th Biennial Congress, International Federation of Landscape Architecture,* Montreal. W. Douglas Harper, ed. June 1968, pp. 239-243.

Mackworth, Norman H. and Anthony J. Morandi. "The Gaze Selects Informative Details Within Pictures." In *Perception and Psychophysics,* Vol. 2, No. 11. 1967, pp. 547-552.

Meinig, D.W. "Environmental Appreciation: Localities as a Humane Art." In *The Western Humanities Review,* Vol. 25, No. 1. Winter 1971, pp. 1-11.

Melhorn, W.N. *Photogrammetric Analysis of Urban and Rural Environments.* Washington, DC: Highway Research Board, 1973. (HRB Record 452).

Minshall, C.W., N. Dee and J.M. Griffin. "Development of the Arizona Environmental Economic Trade-off Model." In *American Industrial Development Council Journal,* Vol. 9, No. 2. April 1974.

Mitchell, James P. "A Study of Aesthetic Preferences." Masters Thesis, University of Wyoming. December 1974. (Available NTIS).

Morawski, Stefan. "On the Objectivity of Aesthetic Judgement." In *British Journal of Aesthetics,* Vol. 6, No. 4. October 1966, pp. 315-327.

National Park Service and New England River Basins Commission. *Shoreline Appearance and Design: A Planning Handbook.* Prepared by Roy Mann Assoc., Inc. April 1975.

Newby, Floyd. "Understanding the Visual Resource." Proceedings of the *Forest Recreation Symposium.* Upper Darby, Pennsylvania: U.S.D.A. Forest Service. 1971, pp. 68-72.

Northrop, F.S.C. "Man's Relation to the Earth in its Bearing on His Aesthetic, Ethical, and Legal Values." In *Man's Role in Changing the Face of the Earth.* Thomas, et al., eds. Chicago: University of Chicago Press. pp. 1052-1067.

Ostrander, Edward R. *The Environmental Analyst's Tool Kit: Options and Caution.* Department of Design and Environmental Analysis, SUNY College of Human Ecology, Cornell University, Ithaca, New York. Spring 1971. (Draft Mimeograph).

Penning-Rowsell, E.C. and D.I. Hardy. "Landscape Evaluation and Planning Policy: A Comparative Survey in the Wye Valley Area of Outstanding Beauty." In *Regional Studies,* Vol. 7. 1973, pp. 153-160.

Pennsylvania State University. College of Agriculture Extension Service. *Aesthetics Related to Selected Forest Practices.* By T.D. Rader and L.S. Hamilton, Special Circular 183, University Park, Pennsylvania.

Peterson, George L. "Measuring Visual Preferences of Residential Neighborhoods." In *Ekistics.* Vol. 140. 1967, pp. 167-173.

Polakowski, Kenneth J. *An Aesthetic Basis for Visual Resource Analysis.* Seminar paper, Impact Assessment in Water Resources Planning Seminar, sponsored by US Corps of Army Engineers Institute, held at School of Natural Resources, University of Michigan, Ann Arbor, Michigan, June 1973.

Rabinowitz, Carla B. and Robert E. Coughlin. *Analysis of Landscape Characteristics Relevant to Preference.* Regional Science Research Institute. Discussion Paper Series No. 38. Philadelphia, Pennsylvania, 1970.

_____. *Some Experiments in Quantitative Measurement of Landscape Quality.* Regional Science Research Institute, Discussion Paper Series No. 43. Philadelphia, Pennsylvania, March 1973.

Rader, Terry D. and Lawrence S. Hamilton. *Aesthetics Related to Selected Forest Practices.* Special Circular 183. University Park, Pennsylvania: Penn. State University, College of Agriculture Ext. Service.

Randall, Alan, Berry Ives and Clyde Eastman. "Bidding Games for Valuation of Aesthetic Environmental Improvements." In *Journal of Environmental Economics and Management,* Vol. 1, No. 2. August 1974, pp. 132-149.

Rapoport, Amos and Robert E. Kantor. "Complexity and Ambiguity in Environmental Design." In *AIP Journal,* Vol. 33, No. 4. July 1967, pp. 210-220.

_____ and Ron Hawkes. "The Perception of Urban Complexity." In *AIP Journal,* Vol. 36, No. 2. March 1970, pp. 106-111.

Redding, Martin J. *Aesthetics in Environmental Planning.* Washington, DC: Office of Research and Development, US Environmental Protection Agency. November 1973.

Rokeach, Milton. "The Role of Values in Public Opinion Research." In *Public Opinion Quarterly,* Vol. 32, No. 4. Winter 1968-69, pp. 554-559.

Saarinen, Thomas A. *Perception of Environment,* Resource Paper No. 5. Washington, DC: Association of American Geographers. 1969.

Sanoff, Henry. "Visual Attributes of the Physical Environment." In *Response to Environment.* Coates and Moffett, eds. Student Publication of the School of Design. Raleigh, North Carolina: North Carolina State University, Vol. 18. 1969, pp. 37-60.

Sawyer, R.N. and T.E. Harbaugh. "A Methodology for the Construction of Attitude Measuring Instruments." In *Water Resources Bulletin,* Vol. 6, No. 3. May-June 1970, pp. 401-407.

Sewell, W.R. Derrick and Brian R. Little. "Specialists, Laymen and the Process of Environmental Appraisal." In *Regional Studies,* Vol. 6. 1972. (British).

Shafer, Elwood L., Jr. "Perception of Natural Environments." In *Environment and Behavior,* Vol. 1, No. 1. June 1969, pp. 71-82.

Shechter, M. and M. Barnea. "The Expenditures in Nature and Landscape Conservation: The Case of Israel." In *Journal of Environmental Management,* Vol. 1. 1973, pp. 393-404.

Sinden, J.A. "A Utility Approach to the Valuation of Recreational and Aesthetic Experiences." In *American Journal of Agricultural Economics,* Vol. 56, No. 1. February 1974, pp. 61-72.

Singh, Raghu N. and Kenneth P. Wilkinson. "On the Measurement of Environmental Impacts of Public Projects from a Sociological Perspective." In *Water Resources Bulletin,* Vol. 10, No. 3. June 1974, pp. 415-425.

Sonnefeld, Joseph. "Variable Values in Space and Landscape: An Inquiry into the Nature of Environmental Necessity." In *Journal of Social Issues,* Vol. 22, No. 4. 1966, pp. 71-82.

_____. "Equivalence and Distortion of the Perceptual Environment." In *Environment and Behavior,* Vol. 1, No. 1. June 1969, pp. 83-99.

Staff. "The Cognitive Dissonance Model as a Predictor of Customer Satisfaction Among Camper Owners." (plus a rejoinder by authors). In *Journal of Leisure Research,* Vol. 6, No. 2. Spring 1972, pp. 163-167.

Stankey, George H. "The Use of Content Analysis in Resource Decision Making." In *Journal of Forestry,* Vol. 70, No. 3. March 1972, pp. 148-151.

_____. "A Strategy for the Definition and Management of Wilderness Quality." Chapter 3 in *Natural Environments.* John V. Krutilla, ed. Baltimore: The Johns Hopkins Press. 1972, pp. 88-114.

Stea, David. "Environmental Perception and Cognition: Toward a Model for 'Mental Maps'." In *Response to Environment.* Gary Coates and Kenneth Moffett, eds. Raleigh, North Carolina: Student Publication of the School of Design, North Carolina State University, Vol. 18. 1969, pp. 63-75.

Swanson, Diane. *Public Hearings and Attitude-Perception Studies: An Evaluation of Their Role in the Planning Process,* paper 70-1. Ottawa, Canada: Policy and Planning Branch, Department of Energy, Mines and Resources. March 17, 1969.

Tombaugh, Larry W. "External Benefits of Natural Environments." Proceedings of the *Forest Recreation Symposium.* Upper Darby, Pennsylvania: U.S.D.A. Forest Service. 1971, pp. 73-77.

Tuan, Yi-Fu. "Ambiguity in Attitudes Toward Environment." In *Annals of the Association of American Geographers,* Vol. 63, No. 4. December 1973, pp. 411-423.

US Environmental Protection Agency. *Aesthetics in Environmental Planning.* Report prepared by Martin J. Redding, Project Director, Environmental Research Center, Washington, DC (EPA-600/5-73-009), November 1973.

U.S.D.A. Forest Service. Pacific Northwest Forest and Range Experiment Station. *An Introduction to CODINVOLVE: A System for Analyzing, Storing, and Retrieving*

Public Input to Response Decisions, by R.N. Clark, G.H. Stankey, and J.C. Hendee, Research note PNW-223, Seattle, Washington. April ?

_____. Pacific Southwest Forest and Range Experiment Station. *VIEWIT: Computation of Seen Areas, Slope, and Aspect for Land Use Planning,* by M.R. Travis, G.H. Eisner, W.D. Iverson, and C.G. Johnson, General Technical Report PSW-11, Berkeley, California. 1975.

Valentine, *The Experimental Psychology of Beauty.* London: Methuen and Co., Ltd., 1962.

Vitz, Paul C. "Preference for Different Amounts of Visual Complexity." In *Behavioral Science,* Vol. 11. 1966, pp. 105-114.

Weddle, A.E. "The Region as a Unit for Planning an Environment for Leisure Time." In *Proceedings of the 11th Biennial Congress. International Federation of Landscape Architecture,* Montreal. W. Douglas Harper, ed. June 1968, pp. 75-79.

Wenger, Wiley D. "Pupillometrics and Aesthetics." In *Proceedings: Recreation Researchers' Conference.* Syracuse, New York. May 3-4, 1967.

Westland, G. "The Psychologist's Search for Scientific Objectivity in Aesthetics." In *British Journal of Aesthetics,* Vol. 7, No. 4. October 1967, pp. 350-357.

White, Gilbert. "Formation and Role of Public Attitudes." In *Environmental Quality in a Growing Economy.* Henry Jarett, ed. Baltimore: The Johns Hopkins Press, 1966, pp. 105-127.

Winkel, Gary H., Roger Malek and Philip Theil. "The Role of Personality Differences in Judgements of Roadside Quality." In *Environment and Behavior."* December 1969, pp. 199-223.

Wohlwill, Joachim F. "The Physical Environment: A Problem for a Psychology of Stimulation." In *Journal of Social Issues,* Vol. 22, No. 4. 1966, pp. 29-38.

_____. "Amount of Stimulus Exploration and Preferences as Differential Functions of Stimulus Complexity." In *Perception and Psychophysics,* Vol. 4, No. 5. 1968, pp. 307-312.

_____. "The Emerging Discipline of Environment Psychology." In *American Psychologist,* Vol. 25. 1970, pp. 303-312.

_____. *Factors in the Differential Response to the Natural and the Man-Made Environment.* Paper presented at: Symposium of Affective Response to the Outdoor Environment, American Psychological Association, Montreal. August 1973. (Mimeograph).

_____. *The Place of Aesthetics in Studies of the Environment.* Paper prepared for the Symposium on Experimental Aesthetics and Psychology of the Environment, International Congress of Applied Psychology, Montreal. July 1974. (Mimeograph).

Yeomans, William C. "Leisure Potential of the Mountain-Coastal Landscape." *Proceedings of the 11th Biennial Congress, International Federation of Landscape Architecture,* Montreal. W. Douglas Harper, ed. June 1968, pp. 199-206.

Landscape Classification: Description, Discussion and Methodology

Aesthetic Dimensions
Assessment of Scenery
Classification of Forest Land
Elements of Visual Analysis
Environmental Quality Ranking Systems
Evaluation
Evaluation of Natural Components
Land Classification
Measurement of Environmental Quality
Measuring Scenic Beauty
Numbers on Qualities
Quantitative Inventory, Analysis
Rate and Rank Landscapes
Scenery Classification System
Techniques for Inventorying

Brancher, D.M. "Critique of K.D. Fines: Landscape Evaluation. A Research Project in East Sussex." In *Regional Studies,* Vol. 3. 1969, pp. 91-92.

Burke, Hubert, et al. "A Method for Classifying Scenery from a Roadway." In *Park Practice Guideline.* Development 3/68. Washington, DC: National Recreation and Parks Association, 1968, pp. 125-141.

Cook, Walter L. "An Evaluation of the Aesthetic Quality of Forest Trees." In *Journal of Leisure Research,* Vol. 4. Fall 1972, pp. 293-302.

Cooke, R.U. and J.C. Doornkamp. "Landforms and Techniques of Scenic Evaluation." Chapter 12 in *Geomorphology in Environmental Management: An Introduction.* Oxford: Clarendon Press. 1974, pp. 308-325.

Craik, Kenneth H. *The Landscape Adjective Check List.* Institute of Personality Assessment and Research, University of California, Los Angeles, California. 1969.

Crofts, R.S. and R.U. Cooke. *Landscape Evaluation: A Comparison of Techniques.* Occasional Paper No. 25, Department of Geography, University College London, England, October 1974.

Elsner, Gary H. *Visual Impact Assessment of Alternative Land Use–A Computer Method to Assist in Planning.* Paper submitted for presentation at Confer-In 74. 1974.

Fabos, Julius Gy. "An Analysis of Environmental Quality Ranking Systems." Proceedings of the *Forest Recreation Symposium.* Upper Darby, Pennsylvania: U.S.D.A. Forest Service. 1971, pp. 40-55.

_____. "Putting Numbers on Qualities: The Rising Landscape Assessors." In *Landscape Architecture,* Vol. 64, No. 3. April 1974, pp. 164-165.

_____, et al. *Model for Landscape Resource Assessment, Part 1 of the Metropolitan Landscape Planning Model, (METLAND)* Research Bulletin #602. Amherst, Massachusetts: University of Massachusetts, College of Food and Natural Resources Agricultural Experiment Station, June 1973.

Fines, K.D. "Landscape Evaluation: A Research Project in East Sussex." In *Regional Studies,* (British), Vol. 2, No. 1. 1968, pp. 41-54.

"Further Discussion of the Australian Land Research Approach." From: U.N.E.S.C.O., *Methodology of Integrated Surveys.* 1967, pp. 51-61.

Hamill, Louis, "Classification of Forest Land for Recreation Potential and Scenery." In *The Forestry Chronicle,* Vol. 47, No. 3. 1970, pp. 149-153.

Hart, William and William J. Graham. "How to Rate and Rank Landscape." In *Landscape Architecture.* January 1967, pp. 121-122.

Hebblethwaite, R.L. "Landscape Assessment and Classification Techniques in Land Use and Landscape Planning." Derek Lovejoy, ed. 1973.

Hendrix, W.G. "The Visual Land Use Compatibility Component of the Model for Landscape Resource Assessment." Part of the Metropolitan Landscape Planning Model (METLAND). Thesis, University of Massachusetts, August 1973.

Jackson, Reiner. *Shoreline Recreation Planning: A Systems View.* Occasional Paper #7. Faculty of Environmental Studies, University of Waterloo, Ontario, Canada. July 1973.

Jacobs, Peter. "The Landscape Image: Current Approaches to the Visual Analysis of the Landscape." In *Town Planning Review,* Vol. 46, No. 2. April 1975, pp. 127-150.

Kiemstedt, Dr. Hans. "The Evaluation of the Natural Components of the Landscape for Leisure." In *Proceedings of the 11th Biennial Congress, International Federation of Landscape Architecture,* Montreal. E. Douglas Harper, ed. June 1968, pp. 121-129.

Leopold Luna B. "Landscape Aesthetics: How to Quantify the Scenics of a River Valley." In *Natural History,* Vol. 78, No. 8. October 1969, pp. 37-44.

_____ and Maura O'Brien Marchand. "On the Quantitative Inventory of the Riverscape." In *Water Resources Research,* Vol. 4, No. 4. August 1968, pp. 709-717.

Linton, D.L. "The Assessment of Scenery as a Natural Resource." In *Scottish Geographical Journal,* Vol. 84. 1968, pp. 219-238.

Litton, R. Burton, Jr. "Aesthetic Dimensions of the Landscape." Chap. 8 in *Natural Environments.* John V. Krutilla, ed. Baltimore: The Johns Hopkins Press, 1972, pp. 262-291.

_____. "Visual Vulnerability of Forest Landscapes." In *Outdoor Recreation Research.* St. Paul, Minnesota: U.S.D.A. Forest Service, North Central Experiment Station, General Technical Report NC-9, 1974, pp. 87-91. Also in *Journal of Forestry,* Vol. 72, No. 7. July 1974, pp. 392-397.

_____ and Robert H. Twiss. "The Forest Landscape: Some Elements of Visual Analysis." In *Proceedings of Society of American Foresters.* Seattle, Washington. 1966, pp. 212-214.

Roy Mann Associates. *Aesthetic Resources of the Coastal Zone.* Report prepared for Office of Coastal Zone Management, National Oceanic and Atmospheric Administration. Cambridge, Massachusetts, July 1975.

Martel, Gary F. *Environmental Assessment: A Comparison of Approaches and Methods.* Paper presented at the 53rd Annual Meeting, Virginia Academy of Science, Harrisonburg, Virginia, May 6-9, 1975.

Michalson, Dr. E.L. *Aesthetics of Wild and Scenic Rivers: A Methodological Approach.* Water Resources Research Institute, University of Idaho, Moscow, Idaho, October 1974.

Potter, Dale R. and J. Alan Wagar. *Techniques for Inventorying Manmade Impacts in Roadway Environments.* U.S.D.A. Forest Service Research Paper PNW-121. 1971.

Research, Planning and Design Associates (Zube). *Study of the Visual and Cultural Environment Vol. 1 and 2.* Amherst, Massachusetts: US Army Corps of Engineers. 1970.

Rowe, J.S. "Why Classify Forest Lands?" In *The Forestry Chronicle,* Vol. 47, No. 3. June 1971, pp. 144-148.

Sargent, Frederic O. "A Scenery Classification System." In *Journal of Soil and Water Conservation,* Vol. 21, No. 1. January-February 1966, pp. 26-27.

_____. *Scenery Classification.* Vermont Resources Research Center, Burlington Agriculture Experiment Station, University of Vermont Report #18. 1967 (reprinted 1971).

Twiss, Robert H. and R. Burton Litton. "Resources in the Landscape." In *Natural Resources Journal,* Vol. 6, No. 1. 1966, pp. 76-81.

U.S.D.A. Cooperative Extension Service and the University of Massachusetts. *An Inventory and Interpretation: Selected Resources of the Island of Nantucket,* Pub. 4. Ervin H. Zube and Carl A. Carlozzi, eds.

U.S.D.A. Forest Service. *National Forest Landscape Management Volume 1.* Agriculture Handbook Number 434. Washington, DC: US Government Printing Office, February 1973.

_____. *National Forest Landscape Management Volume 2–Chapter 1: The Visual Management System.* Agriculture Handbook Number 462. Washington, DC: US Government Printing Office, April 1974.

_____. California Region. *Mineral King Visual Analysis,* by Christine G. Johnson. San Francisco, California, July 1974.

_____. Northern Region. *Quantitative Analysis of the Visual Resource.* Landscape Architecture Branch, Division of Recreation and Lands.

_____. Northern Region. *Forest Landscape Management.* Landscape Architecure Branch, Division of Recreation and Lands, Vol. 1. February 1972.

_____. Northern Region. *Recreation Opportunity Inventory and Evaluation.* Recreation and Lands, Division of Natural Resource, R-I 74 006. June 1974.

_____. Pacific Southwest Forest and Range Experiment Station. *Forest Landscape Description and Inventories: A Basis for Land Planning and Design.* By R. Burton Litton, Jr. Research Paper PSW-49. Berkeley, California, 1968.

_____. Pacific Southwest Forest and Range Experiment Station. *Computing Visible Areas from Proposed Recreation Developments... A Case Study.* By Gary H. Elsner. Research Note PSW-246. Berkeley, California, 1971.

_____. Pacific Southwest Forest and Range Experiment Station. *Landscape Control Points: A Procedure for Predicting and Monitoring Visual Impacts.* By R. Burton Litton, Jr. Research Paper PSW-91. Berkeley, California, 1973.

_____. Rocky Mountain Forest and Range Experiment Station. "Measuring Scenic Beauty: The Scenic Beauty Estimation Method." By T.C. Daniel and R.S. Boster, Research Paper, Tucson, Arizona. 1975. (REVIEW DRAFT).

US Environmental Protection Agency. *Environmental Assessment for Effective Water Quality Management Planning.* A report prepared by Battelle Columbus Laboratories, Columbus, Ohio. April 1972.

US Geologic Survey. *Quantitative Comparison of Some Aesthetic Factors Among Rivers.* Circular 620. By Luna B. Leopold. 1969.

Vedenin, Yu A. and N.N. Miroshmichenko. "Evaluation of the Natural Environment for Recreation Purposes." In *Ekisitcs,* Vol. 31, No. 184. March 1971, pp. 223-226.

Walker, Donald L., Jr. *A Handbook of Landscape Analysis Techniques.* Report sponsored by the Bureau of Community Planning, University of Illinois, Department of Landscape Architecture. December 1966.

Waller, R.A. "Environmental Quality, Its Measurement and Control." In *Regional Studies,* Vol. 4. 1970, pp. 177-191. (British).

Williams, Henry G., Jr. and William M. Belden. *Appalachia Recreation and Cultural Resources Study.* Report prepared for Office of Planning Coordination, State of New York, by State University College of Environmental Science and Forestry at Syracuse University, Syracuse, New York. May 1969, pp. 89-105.

Zonnevald, Ir I.S. *Resources Evaluation, Pragmatic Land Classification and Integrated Surveys of the Natural Environments.* Delft, Holland: ITC-UNESCO CENTRE. February 1968. (Mimeograph).

Zube, Ervin H. and H.A. Dega. *Wisconsin's Lake Superior Shoreline, Vol. 3.* Madison, Wisconsin: Wisconsin State Department of Resource Development. 1964.

Assessment of Landscape Preference: Methodologies, Factors and Considerations

Aesthetic and Emotional Experience
Aesthetic Preference
Agreement
Appraising the Objectivity
Assessing Preferences
Environmental Preference: Identifying
Environmental Preference: Predictors of
Environmental Preference: Problems of Identifying
Evaluating Quality
Intermode Agreement
Landscape Appraisal
Landscape Preferences
Measuring: Environmental Dispositions
Measuring: Perception of Elements
Measuring: Scenic Resources
Objective Assessment
Predicting Qualitative and Quantitative Values
Quantifying Aesthetic Quality
Quantitative Evaluation
Rated Preference and Complexity
Rating Landscapes
Sensation-Seeking
Viewer Reactions
Visual Quality Considerations

Arthur, Louise M. "Testing the Predictive Utility of Scenic Beauty Prediction Models." Doctoral Dissertation, The University of Arizona, 1975. (Draft Copy).

Brush, Robert O. "Recent Developments in Landscape Assessment Research with Implications for Managing Forest Land for Recreation." In *Outdoor Recreation Research: Applying the Results.* St. Paul, Minnesota: U.S.D.A. Forest Service, North Central Experiment Station, General Technical Report NC-9. 1974, pp. 83-86.

Burns, William T. and Deane D. Rundell. *A Test of Visual Preferences in a Rural New England Landscape.* Terminal Project, Department of Landscape Architecture, University of Massachusetts. May 1969.

Calvin, James S., John A. Dearinger and Mary Ellen Curtin. "An Attempt at Assessing Preferences for Natural Landscapes." In *Environment and Behavior,* Vol. 4, No. 4. December 1972, pp. 447-470.

Carls, E. Glenn. "The Effects of People and Man-Induced Conditions in Preferences for Outdoor Recreation Landscapes." In *Journal of Leisure Research,* Vol. 6, No. 2. Spring 1974, pp. 113-124.

Coughlin, Robert E. and Karen A. Goldstein. *The Extent of Agreement Among Observers on Environmental Attractiveness.* Paper #37. Philadelphia: Regional Science Research Institute. February 1970.

Cox, P. Thomas, Adrian L. Haught and Ervin H. Zube. "Visual Quality Considerations in Regional Land Use Changes." In *Growth and Change: A Journal of Regional Development,* Vol. 3, No. 2. April 1972, pp. 9-15.

Craik, Kenneth H. "Appraising the Objectivity of Landscape Dimensions." Chapter 9 in *Natural Environments: Studies in Theoretical and Applied Analysis.* John V. Krutilla, ed. Baltimore: The Johns Hopkins Press, 1972, pp. 292-346.

_____. "Psychological Factors in Landscape Appraisal." In *Environment and Behavior,* Vol. 4, No. 3. September 1972, pp. 255-266.

Daniel, Terry C., Lawrence Wheeler, Ron S. Boster and Paul R. Best, Jr. "Quantitative Evaluation of Landscapes: An Application of Signal Detection Analysis to Forest Management Alternatives." In *Man-Environment Systems,* Vol. 3, No. 5. September 1973, pp. 330-344.

Feste, Jan and Alf-Ivan Oterholm. "Estimation of Imageability and Aesthetic Quality of Natural Landscape." In *Landscape Research News.* University of Manchester, Landscape Research Group. March 1974. (British).

Gauger, Stephen E. and J.B. Wyckoff. "Aesthetic Preference for Water Resource Projects: An Application of Q Methodology." In *Water Resources Bulletin,* Vol. 9, No. 3. June 1973, pp. 522-528.

Hancock, "H" K. "Recreation Preference: Its Relation to User Behavior." In *Journal of Forestry,* Vol. 71, No. 6. June 1973, pp. 336-337.

Hecock, Richard D. "Recreation Behavior Patterns as Related to Site Characteristics of Beaches." In *Journal of Leisure Research,* Vol. 2, No. 4. 1970, pp. 237-250.

Hendee, John C. and Robert W. Harris. "Foresters' Perception of Wilderness-User Attitudes and Preferences." In *Journal of Forestry,* Vol. 68, No. 12. December 1970, pp. 759-762.

Kaplan, Rachel. "Predictors of Environmental Preferences: Designers and 'Clients'." In *Environmental Design Research,* Vol. 1. W.F.E. Preiser, ed. Stroudsburg, Pennsylvania: Dowden, Hutchinson, and Ross, Inc. 1973, pp. 265-274.

Kaplan, Stephen, Rachel Kaplan and John S. Wendt. "Rated Preference and Complexity for Natural and Urban Visual Material." In *Perception and Psychophysics,* Vol. 12, No. 4. 1972, pp. 354-356.

_____ and John S. Wendt. "Preference and the Visual Environment: Complexity and Some Alternatives." In *Environmental Design: Research and Practice, Proceedings of the EDRA*^{3}*/ar 8 Conference.* William E. Mitchell, ed. Los Angeles: University of California. 1972, pp. 6-8-1 to 6-8-5.

Litton, R. Burton, Jr., R.J. Tetlow, J. Sorensen and R.A. Beatty. *Water and Landscape.* Port Washington, New York: Water Information Center, Inc., 1974.

McKechnie, George E. "Measuring Environmental Dispositions with the Environmental Response Inventory." In *EDRA 2, Proceedings of the Second Annual Environmental Design Research Association Conference.* John Archea and Charles Eastman, eds. Pittsburgh: Carnegie-Mellon University, Office Service Department. October 1970, pp. 320-326.

Markman, Robert. "Sensation-Seeking and Environmental Preference." In *EDRA 2, Proceedings of the Second Annual Environmental Design Research Association Conference.* John Archea and Charles Eastman, eds. Pittsburgh: Carnegie-Mellon University, Office Service Department, October 1970. pp. 311-315.

Melillo, Samuel T. "Visual Preference of Landscape Features." Masters Thesis. Department of Landscape Architecture, University of Massachusetts, Amherst. May 1970.

Morisawa, Marie. "Evaluating Riverscapes." In *Environmental Geomorphology.* Donald R. Coates, ed. A Proceedings Volume of the First Annual Geomorphology Symposia Series, State University of New York at Binghamton, Binghamton, New York. August 1971, pp. 91-106.

Neumann, Edward S. and George L. Peterson. "Evaluating Subjective Response to the Recreation Environment: A Quantitative Analysis of Dissimilar Preference for the Visual Characteristics of Beaches." A report prepared for the Urban and Regional Planning Program, Illinois, Northwestern University, in *Outdoor Recreation Opportunity: Needs and Desires,* Technical Report #1, February 1970.

_____ and George L. Peterson. "Perception and Use of Urban Beaches." In *EDRA 2, Proceedings of the Second Annual Environmental Design Research Association Conference.* John Archea and Charles Eastman, eds. Pittsburgh: Carnegie-Mellon University, Office Service Department. October 1970, pp. 327-333.

Newby, Floyd LaVon. *Perceptual Assessment of Forested Roadside Landscapes.* Ph.D. Dissertation. The University of Michigan, Ann Arbor, Michigan, 1971.

O'Riordan, Timothy. "The Problems of Identifying Environmental Preferences." In *Progress in Geography,* Vol. 3. Chris Board, Richard Chorley, Peter Haggeth and David Stoddart, eds. London: Edward Arnold Press. 1971, pp. 194-208.

Peterson, George L. "A Model of Preference: Quantitative Analysis of the Visual Appearance of Residential Neighborhoods." In *Journal of Regional Science,* Vol. 7, No. 1. 1967, pp. 19-31.

_____. "Evaluating the Quality of the Wilderness Environment: Congruence Between Perception and Aspiration." In *Environment and Behavior,* Vol. 6, No. 2. June 1974, pp. 169-193.

_____ and Edward S. Neumann. "Modeling and Predicting Human Response to the Visual Recreation Environment." In *Journal of Leisure Research,* Vol. 1. 1969, pp. 219-237.

Shafer, Elwood L., Jr. and James Mietz. "Aesthetic and Emotional Experiences Rate High with Northeast Wilderness Hikers." In *Environment and Behavior,* Vol. 1, No. 2. December 1969, pp. 187-197.

_____, John F. Hamilton and Elizabeth A. Schmidt. "Natural Landscape Preferences: A Predictive Model." In *Journal of Leisure Research,* Vol. 1, No. 1. Winter 1969, pp. 1-19.

_____ and George H. Moeller. "Predicting Quantitative and Qualitative Values of Recreation Participation." In *Proceedings of the Forest Recreation Symposium.* Upper Darby, Pennsylvania: U.S.D.A. Forest Service. 1971, pp. 5-22.

_____ and Michael Tooby. "Landscape Preferences: An International Replication." In *Journal of Leisure Research,* Vol. 5, No. 3. Summer 1973, pp. 60-65.

Stevens, Edward R. *Toward the Objective Assessment and Design of the Visual Environment: A Comprehensive Perceptual Approach.* Submitted for presentation at Confer-In 74. 1974.

US Army Engineer Institute for Water Resources. *Toward a Technique for Quantifying Aesthetic Quality of Water Resources.* Perry J. Brown, ed. Logan, Utah: Utah State University. October 1974.

U.S.D.A. Forest Service. Northeast Forest Experiment Station. *It Seems Possible to Quantify Scenic Beauty in Photographs.* By E.L. Shafer, Jr. and J. Mietz, Research Paper NE-202, Upper Darby, Pennsylvania. 1970.

_____. Northeast Forest Experiment Station. *Measuring Perception of Elements in Outdoor Environments.* By G.H. Moeller, R. MacLachlan and D.A. Morrison, Research Paper NE-289, Upper Darby, Pennsylvania. 1974.

_____. Northeast Forest Experiment Station. *A Comparison of Viewer Reactions to Outdoor Scenes and Photographs of Those Scenes.* By E.L. Shafer, Jr. and T.A. Richards, Research Paper NE-302, Upper Darby, Pennsylvania. 1974.

_____. Rocky Mountain Forest and Range Experiment Station. "Scenic Beauty Assessment: A Literature Review." By L.M. Arthur, T.C. Daniel and R.S. Boster. Station Paper, Tucson, Arizona. 1974. (REVIEW DRAFT).

_____. Rocky Mountain Forest and Range Experiment Station. "Scenic Assessment: An Overview." By L.M. Arthur, T.C. Daniel and R.S. Boster. Research Paper, Tucson, Arizona. September 1, 1975. (REVIEW DRAFT).

Viohl, Richard C., Jr. *Landscape Evaluation: A Review of Current Techniques and Methodologies.* Sea Grant Project Working Paper No. 3. School of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse, New York. 1975.

Wagar, Alan J. "Recreational and Esthetic Considerations." In *Environmental Effects of Forest Residues Management in the Pacific Northwest: A State of Knowledge*

Compendium. Owen P. Cramer, ed. U.S.D.A. Forest Service General Technical Report PNW-24. Portland, Oregon: Pacific Northwest Forest and Range Experiment Station. 1974.

Wenger, Wiley D., Jr. and Richard Videback. "Eye Pupillary Measurement of Aesthetic Responses to Forest Scenes." In *Journal of Leisure Research,* Vol. 1, No. 2. Spring 1969, pp. 149-161.

Zube, Ervin H. "Rating Everyday Rural Landscapes in the Northern US." In *Landscape Architecture,* Vol. 64, No. 2. July 1973, pp. 371-375.

_____. "Cross-Disciplinary and Intermode Agreement on the Description and Evaluation of Landscape Resources." In *Environment and Behavior,* Vol. 6, No. 1. March 1974, pp. 69-89.

_____. "Scenic Resources and the Landscape Continuum: Identification." Ph.D. Dissertation, Graduate School of Geography, Clark University, Worcester, Massachusetts. 1974.

_____, David G. Pitt and Thomas W. Anderson. *Perception and Measurement of Scenic Resources in the Southern Connecticut River Valley.* Pub. #R-74-1. Amherst, Massachusetts: Institute for Man and His Environment, January 1974. NB: Reviewed in *Man-Environment Systems,* Vol. 4, No. 4. July 1974, pp. 245-246.

_____, R.O. Brush and J. Gy Fabos, eds. *Landscape Assessment: Values, Perceptions and Resources.* Dowden, Hutchinson and Ross, 1975.

Bibliographies

Bell, G. and P. MacGreevey. *Behavior and Environment: A Bibliography of Social Activities in Urban Space.* Council of Planning Librarians, Exchange Bibliography #123, 1970.

Gerney, James. *Landscape Amenity Assessment Bibliography.* Council of Planning Librarians, Exchange Bibliography #287, 1972.

_____. *Esthetics and Jurisprudence: A Bibliographic Primer.* Council of Planning Librarians, Exchange Bibliography #408, May 1973.

Harrison, James D. *The Perception and Cognition of the Environment.* Council of Planning Librarians, Exchange Bibliography #516, 1973.

Marsh, John. *Scenery Evaluation and Landscape Perception.* Council of Planning Librarians, Exchange Bibliography #304, August 1972.

May, Hayden B. *Improving Quality of Environment Through Environment-Behavior Studies: An Annotated Bibliography.* Council of Planning Librarians, Exchange Bibliography #526, 1973.

Murtha, P.A. and M. Greco. *Appraisal of Forest Aesthetic Values: An Annotated Bibliography.* Forest Management Institute Information Report FMR-X-79, Canadian Forestry Service, Ottawa, Canada, June 1975.

Ottar, Tom. *Kenneth Craik's Environmental Psychology: An Overview and Bibliography.* Council of Planning Librarians, Exchange Bibliography #677, November 1974.

Schauman, Sally. *Landscape Visual Resources.* Council of Planning Librarians, Exchange Bibliography #938, July 30, 1975.

U.S.D.A. Forest Service. Rocky Mountain Forest and Range Experiment Station. "Measuring Scenic Beauty: An Annotated Bibliography." By Ron S. Boster and Louise M. Arthur. Station Paper, Tucson, Arizona, 1975. (REVIEW DRAFT).

APPENDIX: UPDATE OF RECENT RESEARCH ACTIVITIES

1. Test of 233 college students' preferences for 60 slides of Jamaica Bay, LI. (Viohl, 1977).
2. Comparison of above with 19 landscape dimensions measured for each scene (Viohl, 1977).
3. Test of 220 campers and residents of New York's coastal zone for 50 slides of state's shoreline landscape types (report in preparation).
4. Landscape visibility determination techniques tested and compared in coastal study area: PREVIEW computer landscape simulation model; map analysis; photography; and field mapping (report in preparation).
5. Pilot survey of attitudes of 183 coastal users toward visual quality of coast and its management (Doell, 1977).
6. Extended attitudes survey of 1000 coastal users [Nieman (forthcoming); more in preparation].
7. Survey of attitudes of 100 coastal decision makers toward visual quality of coast and its management (report in preparation).

References

Doell, G.A. 1977. *An aid to the formulation of comprehensive planning approaches for the Eastern Ontario coastal region.* Syracuse: SUNY College of Environmental Science and Forestry, MLA thesis.

Nieman, T.J., J.P. Felleman, and D.B. Harper. 1977. Book review: aesthetic resources of the coastal zone, by Roy Mann Associates, Inc. *Coastal Zone Mgmt. Jour.,* Vol. 3, No. 2.

Nieman, T.J. (Forthcoming). Visual quality: the attitude and perception of coastal zone user groups. Paper presented at Environmental Design Research Association (EDRA) Conference, April 1977.

Viohl, R.G. Jr. 1977. *Jamaica Bay: Assessing the visual quality of a coastal area.* Syracuse, SUNY CESF, MLA thesis.

Sea Grant Reprint Series