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9. Assessing the Reliability, Validity and Generalizability of Observer-Based Visual Impact Assessment Methods for the Western United States

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INTRODUCTION

Incorporation of VIA in Decision-Making

The development and use of visual impact assessment (VIA) methods has proceeded rapidly in the last decade. Arising largely from a confluence of legal mandates, governmental administrative policies (Smardon 1979), and the progressive accumulation of a significant body of research on landscape perception (Craik and Feimer 1979; Elsner and Smardon 1979; Zube 1976), these methods are generally intended to provide land use managers with objective information concerning the impact of land use activities upon the aesthetic quality of the landscape. That information can then be incorporated into the decision-making process, with aesthetic factors taking their place alongside the other environmental, economic, and social factors which are inevitably of importance where land use options are concerned.

An important assumption underlying the inclusion of aesthetic factors through VIA systems in the decision-making process is that they will foster more effective, judicious decisions. That goal can only be attained if the information provided by VIA methods is accurate and systematic. This issue is critically significant, where land management is concerned, since decisions involving land use often have long-term consequences. Thus, the underestimation of the visual impact of a land use might result in unneces-

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sary degradation of the visual quality of the landscape, whilst an overestimation of the visual impact of the same activity might result in modification, curtailment or disallowance of the activity which, in turn, could cause considerable social and economic disruption. To avoid these pitfalls, VIA methods of sufficient technical quality should be employed (Craik and Feimer 1979). Minimally, the technical performance of VIA systems must be evaluated so that decision makers know of the margin of error inherent in the information upon which their decisions are based.

Closely related are the legal issues of (1) the adequacy of visual analysis given the context of existing laws and policy and (2) the soundness and defensible rationale of the basic methodology. Many existing federal statutes and some state statutes call for explicit consideration and treatment of aesthetic or visual resources for certain federal/state actions or within certain land areas administered by federal/state agencies (Smardon 1978). Visual resource methodologies are being more closely scrutinized in courtrooms and administrative hearings as to their basic adequacy and soundness. The ability of any VIA methodology to stand up to such legal tests is strongly related to the methodological properties of reliability, validity, and generalizability.

Issues of Reliability, Validity, and Generalizability

The quality and utility of a measurement method is largely a function of three properties: reliability, validity, and generalizability. Reliability refers to the consistency and precision of measurement; it reflects the degree to which the obtained measures are replicable in the same or highly similar circumstances, as well as the attainable level of discrimination among the objects of interest. In the context of VIA, reliability represents the degree to which a measure accurately reflects variations among landscape and land use conditions. Validity refers to the degree to which a measure represents the construct or variable of interest. In VIA, validity provides an estimate of the degree to which a method is able to capture meaningful variations in the aesthetic quality of the landscape and to predict the impact of land use activities upon it. It should also be noted that the reliability of a measure limits its attainable validity. Finally, generalizability refers to the range of the conditions for which the attained levels of a reliability and validity are representative. In VIA, factors which could constrain generalizability might include variation in the physiographic landscape and land use conditions, background characteristics of observers used in the VIA procedure, media of presentation of landscape and land use conditions, and the extent of pertinent landscape and land use information available to VIA users confronted with specific problems.

The research reported here is directed at an evaluation of the reliability, validity and some aspects of the generalizability of selected observer-based VIA methods. The emphasis has been on VIA methods with a potentially wide range of application to a broad array of landscape and land use contexts. Related findings on the reliability of VIA methods were reported by Feimer et al. (1979).

Two components of observer-based VIA methods were under examination: first, the descriptive and evaluative dimensions which serve as the basis for landscape ratings; and second, the rating procedure. Selection of landscape dimensions and rating procedures was based primarily upon their prominence in the research literature and their potential utility for application. The landscape dimensions selected for study included ambiguity, color, compatability, complexity, congruity, form, importance (of an element), intactness, line, novelty, scenic beauty, severity (of visual impact), texture, unity, and vividness. The rating procedures selected for study are direct and contrast ratings. Direct ratings entail a simple rating of landscape dimensions for a landscape scene. Contrast ratings require a comparison of landscape scenes both before and after the imposition of new land-use activities to obtain a rating of the degree of change in the dimensions of interest. The aforementioned variables as well as direct and contrast VIA ratings were utilized in our experimental design to find a VIA method that had acceptable levels of reliability, validity and generalizability for field application. The following sections outline our study and progress phase by phase to obtain this goal.

PHASE 1: LANDSCAPE CLASSIFICATION AND VISUAL SAMPLE

The following sections describe (1) the development of a landscape classification and (2) the selection of scenes and preparation of visual simulations for use in the psychometric analysis.

Landscape Classification of the Western United States

The objective of this part of the research project is to identify and map characteristic regional landscapes of the Western states. A classification of this type, based on visual characteristics of the land, is necessary in order to obtain photographs of scenes representative of the range of landscapes managed by BLM for use in analyses and research participants responses to typical scenes and activities.

Approach. The landscape classification is based on the system developed by Litton et al. (1978) for the Northern Great Plains. The system identifies a hierarchy of landscape scales:

1. continuity: an extensive area (thousands of square miles over which a broadly similar or repetitive type of landscape prevails).
2. province: a tract of land (hundreds to a few thousands of square miles) occurring within a landscape continuity but distinguished by a combination of features which contrast with its surroundings.
3. unit: a unified spatial enclosure (tens to hundreds of square miles) which forms one of many distinct local subdivisions within the continuity or province.
4. setting: the immediate surroundings (tens of square miles) of a site or scenic feature.

The approach taken for the Western U.S.A. is to identify the continuities which dictate regional patterns of landscape, delineate their boundaries, and map the distinct provinces within them. Because of the vast area involved (eleven states and parts of five others) and because of the broad nature of the classification, smaller scale landscapes (units and settings) are not mapped, although these scales may be useful for analysis of specific sites and views used in the sample of visual simulations.

Data Sources. The basis for the landscape inventory is the set of fifteen 1:1,000,000 scale topographic maps used to integrate data at a regional level from sources of smaller and greater scale. Inconsistencies between 1:1,000,000 maps in presentation of contour information made it essential to locate landscape boundaries first on 1:250,000 topographic maps, then transfer to 1:1,000,000 scale. The more detailed maps are also useful in displaying forested, non-forested, and agricultural areas.

Three land classification systems for the U.S.A. were used to identify preliminary landscape continuities. They are Fenneman's (1931) classification of the Western U.S.A. into physiographic provinces and sections; Hammond's (1964) classification of land-surface form; and Kuchler's (1969) classification of potential natural vegetation. Also at the national scale, supplementary data were obtained from classifications of regional geomorphology (Thornbury 1965) and natural regions (Hunt 1974), and from the National Atlas of the U.S.A. (Hammond 1970). Where further analysis and clarification were needed, smaller scale classifications were used. Sources of more detail on physiography included Hinds (1937) for California, and Franklin and Dryness (1973) for the Northwest. Additional information on vegetation was found to be particularly important and came principally from the Department of Landscape Architecture, U.C. Berkeley (1976), Franklin and Dryness (1973), Tidestrom (1925), Benson and Darron (1945), and the Arizona chapter of the Soil Conservation Society of America (1973). Landscape descriptions in various visual analysis reports by BLM and others were drawn upon where available; the mapping already carried out by Litton et al. (1978) in the Northern Great Plains was incorporated directly, although refined for consistency with the rest of the study area.

Since no special field inventory was carried out, heavy reliance has been placed upon in-house (PSW, BLM, and U.C. Berkeley) color slides and upon illustrations in the sources listed above. It would not have been feasible to check map boundaries in the field or by aerial photograph stereoscopy within the time limits of the study. The landscape classification represents a general division into regions; emphasis is laid on reliable identification of distinctly different regions which internally are broadly consistent, rather than on precise location of region boundaries.

Procedure. From the sources noted above, landscape continuities were identified in terms of their prevailing topographic and vegetative character. Together, these elements determine much of the visual character typical of large tracts of landscape.

For each continuity considered to be a discrete landscape entity, topographic, vegetative, and visual characteristics were noted on a standard form. Prevailing aspects of spatial character, water forms, vegetative mosaics, scenic features, human modifications, and temporal effects were recorded. Major and extensive variations in either vegetation or topography were treated as separate continuities, while isolated or limited areas of contrasting character were treated as provinces and described on a separate form.

Boundary location was delineated on 1:250,000 maps, with reference to 1:1,000,000 maps. Wherever possible, distinct physical features, with significance to viewers on the ground, have been used as boundaries. They include the slope-toe where plain and mountain continuities meet; the tree line between forested and unforested continuities; the plateau rim of a subdued tableland surface above dissected terrain; the line of a water course separating different terrain types; the ridge-crest dividing one landscape pattern from another; and the imaginary but comprehensive line across valley mouths where open plains extend as narrow basins between ridges.

In many locations, though, adjacent continuities merge gradually over a distance of miles, or a definite edge becomes highly digitate or complex. Where no single conspicuous feature can be correlated with the boundary, an arbitrary line (dashed to indicate an indistinct or transitional boundary) has been drawn through the midpoint or along the approximate edge of the area in question.

Boundaries of provinces were also delineated and marked by a separate symbol. (See Table 9.1 and Figure 9.1).

Visual Sample: Criteria for Its Selection

In order to analyze research participants' responses to visual impact, a sample of color photographs is needed, representing scenes before and after imposition of a development or management activity. The criteria for selection of the sample included:

1. representation of landscape continuities and types.
2. representation of typical land use activities within BLM holdings.
3. suitable photographic availability and quality.

The sample size is limited to approximately twenty sets of photographs, about the maximum number on which judges may be tested at one time. Hence, it is not possible to represent every landscape continuity. To ensure that both major activities and major landscapes under BLM jurisdiction are represented, a broad classification of both is required.

The landscape types are groupings of landscape continuities not by region, but by basic visual similarities in topography and vegetation. On the basis of visual analysis and Hammond's (1964) land-surface form classification, topographic character has been crudely subdivided into four types:

1.	RUGGED:	hill and mountains
2.	SUBDUED:	plains and gently sloping low hill
3.	PLAIN AND MOUNTAIN:	repeated and extensive rugged landforms interspersed with expanses of subdued terrain
4.	TABLELANDS:	expanses of subdued topography separated by very steep slopes and canyons

Employing land use information, visual analysis, and Kuchler's (1969) vegetation maps, vegetative character of continuities has been crudely subdivided into three visually significant types:

1.	FOREST:	largely continuous woodland prevail over most of the continuity
2.	OPEN:	shrub and/or grass vegetation and/or agriculture dominates the land surface
3.	MOSAIC:	a conspicuous mixture of open and forested vegetation prevails or is repeated over large areas of the continuity

Most of the thirty-six landscape continuities fall neatly into one or another of the twelve possible combinations of topography and vegetation. Two of these combinations (rugged/open and subdued/mosaic) do not occur over a whole continuity and may be omitted for simplicity. It is not suggested that visual management solutions for one continuity automatically apply to another of the same landscape type, since regional differences in climate, plant species, soils, etc. are dramatic. It is argued, however, that

FIGURE 9.1
Map of Landscape Continuity and Provinces

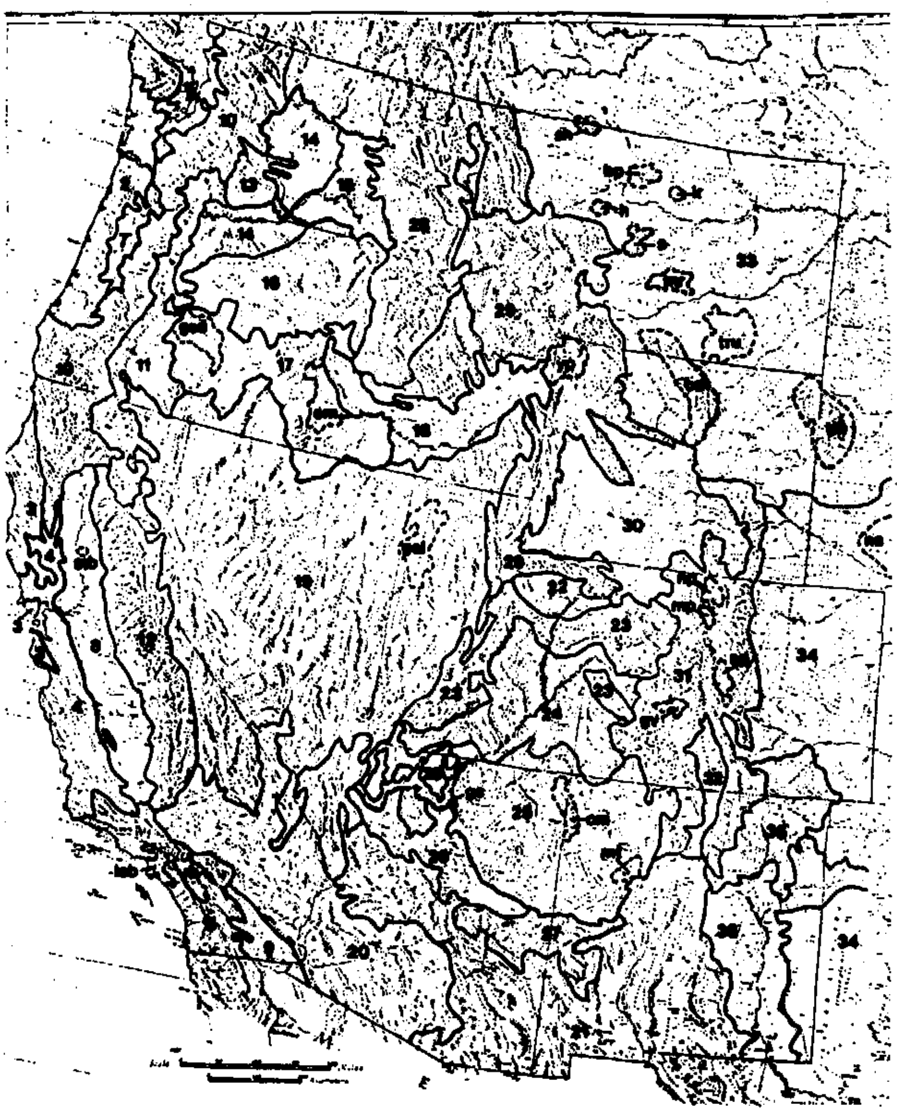


TABLE 9.1
Landscape Classification of Western United States

	Landscape Continuity	Landscape Provinces
1	Olympic Mountain (OM)	
2	Oregon Coast Ranges	
3	Redwood/Evergreen Forest	
4	California Coast Ranges	
5	Los Angeles Ranges	Los Angeles Basin (lab) Riverside Basin (rb)
6	Puget Trough	
7	Williamette Valley (WV)	
8	Great Valley	Marysville Buttes (mb)
9	Salton Trough (ST)	
10	West Cascades	
11	High Cascades	
12	Sierra Nevada	
13	Yakima Ranges (YR)	
14	Columbia Canyonlands	
15	Palouse	
16	Blue Mountains	
17	Payette Plains	Great Sandy Desert (gsd) Owyhee Mountains (om)
18	Snake River Plain	
19	Great Basin	Great Salt Lake Desert (gsl)
20	Sonoran Desert	
21	Mexican Highland	
22	Uinta Basin	
23	High Plateaus	
24	Canyonlands	
25	Navajo Plateau	Grand Canyon (gc) Chuska Mountain (cm) Mt. Taylor Plateau (mt)
26	Mogollon Plateau	
27	Mogollon Mountains	
28	Northern Rockies	
29	Middle Rockies	Yellowstone Plateau (yp)
30	Wyoming Basin	
31	Southern Rockies	North Park (np) Middle Park (mp) South Park (sp) Gunnison Valley (gv)
32	San Luis Valley (SLV)	
33	Northern Great Plains	Sweetgrass Hills (sh) Bearspaw (bp) Little Rocky (lr) Highwood (h) Snowy Mtns. (s) Musselshell Rise (mr) Tongue River Uplands (tru) Bighorn Mountains (bm) Black Hills (bh)

TABLE 9.1 (continued)
Landscape Classification of Western United States

	Landscape Continuity	Landscape Provinces
34	Southern Great Plains..............	Nebraska Sand Hills (ns)
35	Raton Plateau	
36	Pecos Trough	

in a limited visual sample, basic visual similarities and differences must be considered in addition to criteria of physiographic or administrative regions.

The photographs used in the sample were placed within the matrix of major selection criteria. Eleven of the landscape continuities are represented, and six of the seven important landscape types are covered. Timber harvesting and recreational impacts are the only major activities not represented. The most important activities (e.g., surface mining) and landscape types (e.g. plain and mountain country) under BLM jurisdiction are represented by a range of photographs. In addition, three off-shore energy developments are included to represent BLM's jurisdiction over the continental shelf.

A particularly limiting constraint was the availability of suitable photographs. High quality original photographs were not available for some landscape continuities and activities. Most surprising of all, virtually no sets of before and after photographs were obtainable from BLM district offices. A system of landscape control points was proposed by Litton (1973) for proposed development sites which could have provided photographs for routine monitoring of visual impacts. Instead, because of the lack of photographs, "before" and "after" sets were created by simulation.

Simulation Procedures. For most of the sample sets, a photograph of a site after a facility or activity had been developed ("after" photo) was selected and a "before" view simulated by retouching the photograph to "remove" all traces of the activity. In a few cases, a proposed project was added to a "before" photograph to create the "after" image. In general, the process was found to give good quality, convincing images when one of two 7" by 10" high quality color prints was made from the original "after" slide and is retouched to remove the activity. Both the altered and unaltered prints are rephotographed to produce slide sets, thus ensuring that the only difference between them is due to the presence or absence of the activity, not the artifacts of film processing (See Feimer et al. 1979 for details).

PHASE 2: INITIAL PSYCHOMETRIC ANALYSIS OF VIA RELIABILITY AND VALIDITY

The following sections summarize the results of psychometric analysis, using the visual simulations described above, reprinted more fully in Feimer et al. (1981).

Landscape - Land Use Stimuli

Nineteen pairs of landscape scenes were employed to assure the effectiveness of the rating procedures. One member of each pair depicted the landscape before the imposition of a given land use activity and the other after the imposition of that activity. Either the before or after version of each pair had been simulated.

Research Participants

Research participants were drawn from three populations: (1) graduate and undergraduate students (n = 54) from the Berkeley and Davis campuses of the University of California; (2) U.S. federal agency administrative personnel not trained in visual landscape analysis (n = 87) and (3) landscape architects (n = 41) from the U.S. Department of Agriculture's Forest Service.

Procedures

Ratings were obtained through three quasi-experimental treatment conditions. In one (PREPOST condition), thirty-nine members of the student subsample were first presented with the before version of each scene, and completed direct ratings for all of the landscape dimensions previously enumerated except importance and severity (which implicitly apply to impacts) immediately after viewing each scene. Next, they were presented with the after version of the scene and completed contrast ratings as well as the importance and severity ratings.[1] In a second treatment (POST condition), the remaining fifteen participant students were presented with only the after version of each scene, and subsequently completed direct ratings on all landscape dimensions except importance and severity.

A two-hour training period preceded both the PREPOST and POST conditions to familiarize judges with the rating procedures, and with the contrast rating method in particular. In addition, a subsample of participants was given feedback on their reliability levels periodically during the data collection period. However, no differential effects were found in conjunction with feedback and, hence, the subsamples were collapsed into one group for subsequent data analysis.

In the third treatment (GLOBAL condition), the entire U.S. federal agency and BLM/Forest Service samples were simultaneously presented with both the before and after version of each scene, with the order of presentation counterbalanced for subgroups within the condition. Immediately after viewing each version of the scene, scenic beauty ratings were completed; and after viewing both versions of each scene, severity (of visual impact) ratings were completed. After all ratings were completed, participants in this condition were asked to reflect on and then rank order the criteria they employed for judgments of both scenic beauty and severity of visual impact. Due to time constraints, they completed only fourteen of the nineteen pairs of scenes.

The PREPOST and POST conditions were employed to provide visual impact ratings and independent before and after direct ratings. The GLOBAL conditions served primarily to provide an independent set of criterion data on evaluations of aesthetic quality. This allowed assessment of how generalizable the direct and contrast ratings were to observer groups who were either untrained in VIA (U.S. federal agency sample) or trained but with differential training and experience (BLM/Forest Service sample).

Results

Reliability. Intraclass correlation (Ebel 1951) was employed to assess the reliability of ratings. The intraclass correlation is the average reliability of a single rater. It is derived from a one-way analysis of variance where scenes (n = 19) are a random variable which constitute the main effect and the residential variance is the error term. Due to missing observations for some research participants on various scenes and rating dimensions, it was also necessary to use an average value for the number of raters when calculating the reliability estimates. The appropriate value (n) was obtained by an application of Snedecor's (1946) formula. The results of these analyses are given in Table 9.2. It is apparent that the reliability coefficients vary substantially within each rating condition. The average reliabilities for before direct and after direct are 0.26 and 0.21 respectively. Nonetheless, even for direct ratings, the obtained coefficients are clearly below acceptable standards (generally coefficients of 0.70 and higher are desirable). However, it must be stressed that these coefficients represent reliabilities for a single rater, and while single raters are often used in applied settings, higher reliability is generally obtained when composite ratings from panels of independent judges are employed (Craik and Feimer 1979; Feimer et al. 1981; Zube 1976). In the current context, for example, applying the Spearman-Brown prophecy formula (Guilford 1954) to the average reliabilities of the respective rating procedures reveals that a panel of ten independent judges would increase the average reliability to above 0.70 for both sets of direct ratings.

Validity. Change in scenic beauty was employed as a criterion measure to represent change in aesthetic quality resulting from the imposition of land use activities. It was obtained by subtracting the average after direct rating of scenic beauty from the corresponding average before direct ratings. This criterion measure for each subsample was then intercorrelated with change scores for each of the direct ratings of other landscape dimensions (again subtracting the average after from the average before ratings). Since the average score for each rating dimension was used, the reliabilities of the dimensions employed in the analysis were at an acceptable level (an average reliability above 0.70 for all rating procedures). The intercorrelation of change in scenic beauty with direct rating change scores is given in Table 9.3. Four direct rating dimensions (compatibility, congruity, intactness and form) are significantly correlated with change in scenic beauty for two of the three samples. These variables indicate that changes in the character and coherence of the landscape seem to be associated with perceived changes in aesthetic quality. Changes in land mass features (form) appear to be an important component of the resulting incongruity.

Criterion Rankings. In order to gain more insight about which variables may be important for explaining change in visual quality or severity of visual impact, a separate qualitative criterion analysis was done. After subjects had finished their quantitative ratings, they were asked to list and rank criteria that they had used in rating before scenes for scenic quality. Second, they were asked to list criteria in the same fashion for assessing severity of visual impact as seen in both the before and after scenes. It was assumed that after the subjects had judged some nineteen sets of before and after scenes, they would have had some criteria in mind when judging the slides.

TABLE 9.2
Average Single Rater Reliabilities for Direct Ratings

Dimension	Rating Procedure	
	Before (n = 29)	After (n = 17)
Ambiguity	.19	.07
Color	.13	.25
Compatibility	.07	.28
Complexity	.49	.13
Congruity	.17	.25
Form	.45	.14
Importance	-	.27
Intactness	.34	.31
Line	.19	.05
Novelty	.31	.22
Scenic Beauty	.18	.20
Severity	-	.21
Texture	.41	.24
Unity	.21	.25
Vividness	.26	.24
Mean	.26	.21

NOTE: n is the average number of raters used in computation of reliabilities and follows Snedecor (1946).

Some 143 sets of rank ordered criteria were obtained from sixty-six federal agency personnel (not trained in VIA), thirty-eight students (primarily in landscape architecture), and thirty-nine architects (U.S. Forest Service and BLM). These criteria were then sorted into categories of physical, aesthetic, and global criteria for assessing scenic quality; and into categories or visual impact. Within these categories, criteria were listed with their mean rank order and number of times mentioned. Criteria were only grouped together if, by content analysis, they were very similar. A number of subcategories were then collapsed into the major categories. Only the major criteria, with their number of times mentioned and mean rank order, were judged to be significant criteria.

The major finding from this criteria analysis is that there are major variables which are not presently included in BLM's visual contrast rating system. Some of these variables are those that can be related to the observed physical properties of landscapes and some are not. Global non-physically-related variables do not have utility for visual impact assessment purposes because the effect cannot be identified on the physical site and, therefore, cannot be mitigated. Most often mentioned as aesthetic factors related to severity of visual impact were the naturalness, fittingness, compatibility, and appropriateness of the intrusion. The most

TABLE 9.3
Scenic Beauty Change Scores Correlated with Direct Rating Change Score

Direct Rating Dimensions (Student Sample)	Change in Scenic Beauty		
	Student Sample (n=19)	U.S. Federal Agency Sample (n=14)	BLM/Forest Service Sample (n=14)
Ambiguity	.38	.27	.08
Color	.04	.04	-.13
Compatibility	.67**	.38	.72*
Complexity	-.06	.19	.15
Congruity	.56*	.53	.67**
Form	.59**	.47	.78**
Intactness	.31	.62*	.71**
Line	.47*	-.07	.23
Novelty	.25	.30	.34
Texture	.06	.26	.20
Unity	.66**	.09	.52
Vividness	.06	.08	.23

NOTE: Correlations are based on average ratings of respective samples completing ratings. n is the number of scenes.
* p 0.05
** p 0.01

prominent physical criteria cited were changes in color and form qualities and magnitude of the intrusion.

Thus, as in the correlation analysis, continuity in the general form of the landscape and the resultant compatibility of the land use activity seem to be the most salient factors in the psychological appraisal of visual impacts. It must be stressed again, however, that this analysis of rankings is only tentative. The reliability of the categories employed in this latter analysis and the consequent tallies has not yet been fully appraised.

Prototypical Manual Development

By way of responding to the quantitative testing results, the qualitative criterion results previously discussed, legal considerations, the concerns of BLM landscape architects in the field and VRM administrative program coordinators, the visual contrast rating procedure was changed and a new manual was developed to explain the changed system (Sheppard and Newman 1979). Figure 9.2 illustrates the old rating sheet and Figure 9.3 illustrates the new. The approach taken in the manual was to present the concepts and procedure in as much detail as possible using graphics to aid understanding.

FIGURE 9.2
Old BLM Rating Sheet

VISUAL CONTRAST RATING WORKSHEET

1. PROJECT INFORMATION

District ______________ Planning Unit ______________

PROJECT NAME ____________________ Date ______________

Activity __________ Location: T___ R___ sec___________

Describe Operation: ______________________________

Critical Viewpoint: #___ x___ y___ z___ VRM Class_____

Name of Evaluator: ______________________________

2. CHARACTERISTIC LANDSCAPE DESCRIPTION

FORM ______________________________
LINE ______________________________
COLOR ______________________________
TEXTURE ______________________________
FORM ______________________________
LINE ______________________________
COLOR ______________________________
TEXTURE ______________________________
FORM ______________________________
LINE ______________________________
COLOR ______________________________
TEXTURE ______________________________

3. PROPOSED ACTIVITY DESCRIPTION

DESCRIBE IN TERMS OF FORM, LINE, COLOR, AND TEXTURE INTRODUCED OR MODIFIED. REFER TO BLM MANUAL 1791 AND 6320 FOR PROPOSED DESCRIPTIONS AND REQUIREMENTS.

FORM ______________________________
LINE ______________________________
COLOR ______________________________
TEXTURE ______________________________
FORM ______________________________
LINE ______________________________
COLOR ______________________________
TEXTURE ______________________________
FORM ______________________________
LINE ______________________________
COLOR ______________________________
TEXTURE ______________________________

4. CONTRAST RATING ( ) SHORT TERM ( ) LONG TERM

INSTRUCTIONS: (1) RATE CONTRAST OF INTRODUCED OR MODIFIED LANDSCAPE ELEMENTS AND FEATURES AGAINST CHARACTERISTIC LANDSCAPE ELEMENTS AND FEATURES. (2) CIRCLE ONE SCORE ON EACH ELEMENT LINE FOR EACH FEATURE (LAND/WATER BODY, VEGETATION, STRUCTURES) TO INDICATE THE DEGREE OF CONTRAST FOR THAT FEATURE/ELEMENT COMBINATION. (3) ADD TOTAL SCORES IN EACH FEATURE AND ENTER IN TOTAL.

FEATURES:	LAND/WATER BODY				VEGETATION				STRUCTURES			
DEGREE OF CONTRAST:	STRONG (3x)	MODERATE (2x)	WEAK (1x)	NONE (0x)	STRONG (3x)	MODERATE (2x)	WEAK (1x)	NONE (0x)	STRONG (3x)	MODERATE (2x)	WEAK (1x)	NONE (0x)
ELEMENTS: FORM (4x)	12	8	4	0	12	8	4	0	12	8	4	0
LINE (3x)	9	6	3	0	9	6	3	0	9	6	3	0
COLOR (2x)	6	4	2	0	6	4	2	0	6	4	2	0
TEXTURE (1x)	3	2	1	0	3	2	1	0	3	2	1	0
	TOTAL___				TOTAL___				TOTAL___			

CIRCLE ELEMENTS OF GREATEST CONTRAST (FORM, LINE, COLOR, TEXTURE) EACH FEATURE

HIGHEST DEGREE OF CONTRAST	F	L	C	T	F	L	C	T	F	L	C	T

5. SUMMARY AND RECOMMENDATION

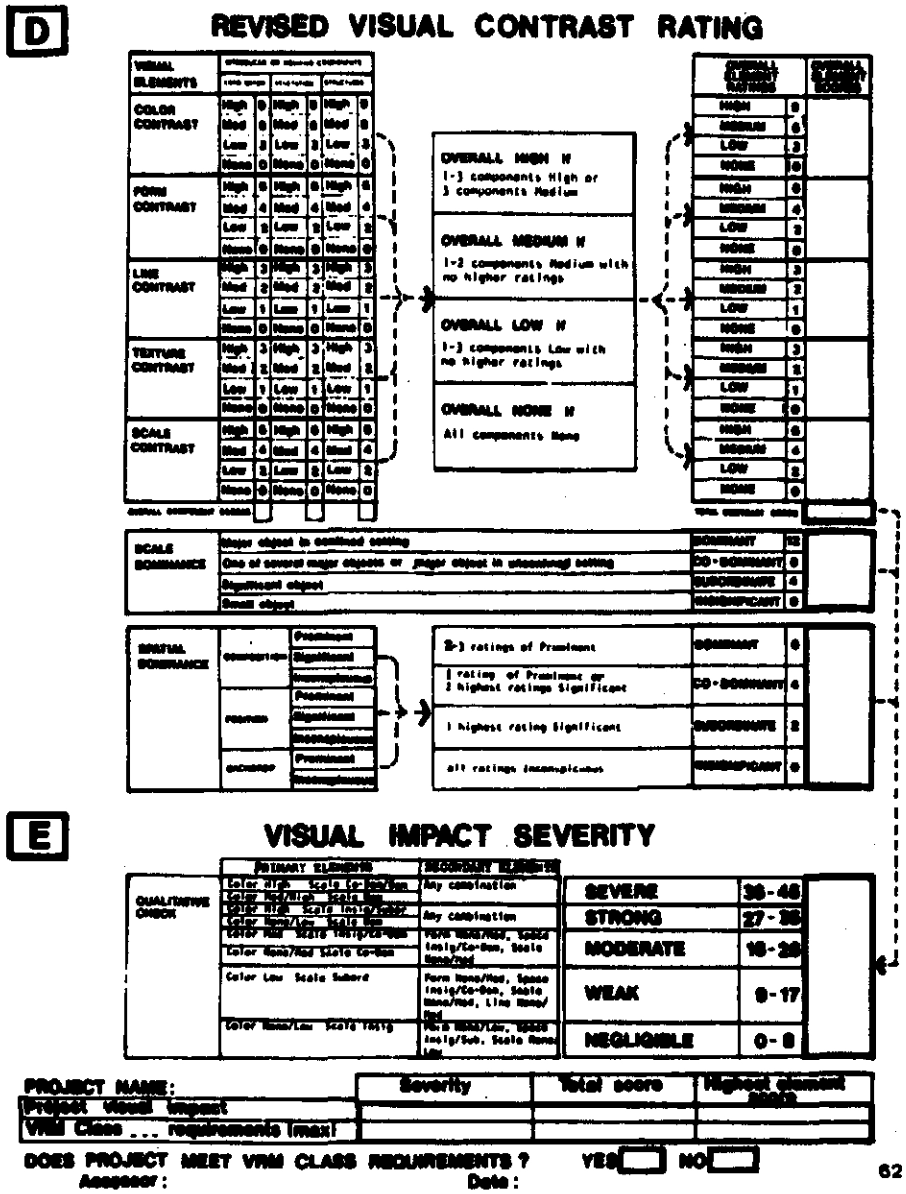
INSTRUCTIONS: INSERT BELOW THE MAXIMUM ALLOWABLE CONTRASTS FROM BLM MANUAL 6320.11 FOR THE VRM CLASS.

INSERT BELOW THE MAXIMUM FEATURE AND ELE- SCORES FROM SECTION 4 INDICATE FEATURE/ELEMENT CAUSING HIGHEST SCORES.

DOES PROJECT DESIGN MEET VRM REQUIREMENTS? ( )yes ( )no

IF CONTRACT RATING IS OVER MAXIMUM ALLOWABLE FOR ANY FEATURE OR ELEMENT, REDESIGN PROJECT CONCENTRATING ON FEATURE/ELEMENT OF GREATEST CONTRAST. IF CONTRAST RATING IS ACCEPTABLE, THIS DOES PRECLUDE ADDITIONAL MITIGATING MEASURES, PROPOSE AS STIPULATIONS

FIGURE 9.3
VIA Detailed Procedure



PHASE 3: FINAL ANALYSIS OF VIA RELIABILITY AND VALIDITY

The objectives of this last phase of research were to:

1. Determine whether validity and reliability levels could be significantly increased using a modified VIA training method and materials (Sheppard and Newman 1979);
2. To develop a generic checklist of visual impacts for different types of visually impacting land uses; and
3. Based on the results, attempt to improve the VIA method itself and training for use of the method.

Scenes, Research Participants, and Procedures

Twenty-five pairs of landscape scenes were employed to assess students' ability to use the modified VIA method. Thirty-five senior undergraduate and graduate students were trained to use the modified VIA method and used the manual developed by Sheppard and Newman (1979).

Similar to the testing in previous phases, the participants were shown the before photoslide, asked to describe the existing landscape, then shown the after scene together with the before scene and asked to describe and rate the visual impact, using the modified contrast rating forms (see Figure 9.3). Again, the visual stimuli were simulated. Simulation entailed either removing or imposing the land use activity by means of retouching and painting techniques (BLM 1980b). The added landscape scenes and land use activities were introduced to create a more representative crosssection of visual stimuli than before. To this end, the new scenes were taken primarily of Great Basin, Canyonland, Great Northern Plains and Interior California landscapes with surface mining, coal fired power plants, and geothermal energy development land use activities.

Results on Reliability. Use of detailed visual contrast rating variables still falls below acceptable levels (<.70) of reliability between individual raters. The consistency of rater behavior using these detailed contrast rating variables did improve significantly, if one compares results from previous testing. The additional guidance as provided in the prototype manual is useful, but multiple raters are needed if significant levels of reliability are to be obtained.

Results on Validity. Ratings taken from the same S.U.N.Y. Syracuse sample were correlated with change in scenic beauty ratings for the same visual stimuli. Those variables that react in the same way as scenic beauty change include texture contrast for structures, scale contrast for both land/water bodies and structures, and overall spatial dominance. Near significant correlations with change in scenic beauty include: color contrast for structures, form contrast for structures, scale contrast for vegetation, scale contrast overall, and spatial dominance. Scale and spatial dominance variables are highly intercorrelated with each other.

The results from the correlations and intercorrelations partially reinforce what has been found in other recent studies and our own previous testing. First, it is much easier for people to judge the visual impact of structures than land form/water bodies or vegetation. Second, the variables that most consistently behave similarly to changes in scenic beauty are scale contrast, spatial dominance, for all situations; and texture, form, line and color contrast for structures only.

FIGURE 9.4
Sample Rating Form

VIA BASIC PROCEDURE WORKSHEET

VISUAL ELEMENTS	VISUAL SUBELEMENTS	INDICATORS/CLUES	ELEMENT RATINGS		ELEMENT SCORES
LANDSCAPE COMPATIBILITY	COLOR	Significantly different color, hue, value, chroma	Severe	3	
			Moderate	2	
			Minimal	1	
			None	0	
	FORM	Incompatible 2/3 dimensional shape with landscape surroundings	Severe	3	
			Moderate	2	
			Minimal	1	
			None	0	
	LINE	Incompatible edges, bands, or silhouette lines introduced	Severe	3	
			Moderate	2	
			Minimal	1	
			None	0	
	TEXTURE	Incompatible textural grain, density, regularity or pattern	Severe	3	
			Moderate	2	
			Minimal	1	
			None	0	
			SUBTOTAL →		
SCALE CONTRAST		Major scale introduction/intrusion	Severe	12	
		One of several major scales or major objects in confined setting	Moderate	8	
		Significant object or scale	Minimal	4	
		Small object or scale of activity	None	0	
			SCORE		
SPATIAL DOMINANCE	LANDSCAPE COMPOSITION SITUATION BACKDROP	Object/activity dominates or is prominent in whole landscape composition; or is prominently situated within the landscape; or dominates landform, water, or sky backdrop	Dominant	12	
			Co-Dominate	8	
			Sub-ordinate	4	
			Insignificant	0	
			SCORE		

TOTAL VISUAL IMPACT SEVERITY →

Severe	27-36	
Strong	26-18	
Moderate	17-9	
Weak or Negligible	8-0	

CONCLUSIONS AND MANAGEMENT RECOMMENDATIONS

1. The sophistication of VIA should be comparable to the complexity, importance or controversy of the project in question. For most projects, a simple one-page rating form should suffice, especially if the project is typical and is structural in nature. Ideally, for all activities or structures, multiple independent (four to five) raters should be involved. If the acitivity involves extensive modification of land form, water bodies, or vegetation, then experienced VRM practitioner(s) should form these panels.

2. For all typical projects/activities, the variables of landscape compatibility (Benson and Darrow 1945), scale contrast,[2] and spatial dominance,[3] should be used as shown by the sample rating form in Figure 9.4. This one-page form should be supplemented by project description, location, and viewpoint delineation. Total weightings for all three variables should be equal in the absence of firm evidence to support any weighting system. A recommended revised form needs to be tested in actual VRM field work.

3. Diagnosis of more complicated projects/activities by qualified VRM practitioners could proceed in one of two ways: (a) use of the VIA checklist to identify specific aspects of the project which account for the unwanted severity of visual impact and which can be redesigned; or (b) use of a more detailed procedure as shown in the new VIA manual (Smardon 1982) for a "reanalysis" of the project or activity in question. Then a multiple independent panel could make VIA judgments and detailed mitigation solutions could be evolved.

4. All new or experienced VRM practitioners should use some type of visual documentation for each VIA rating and visual simulation method as outlined in the BLM Manual (1980b) whenever and wherever possible. Simulation should be used for any visually complex or controversial project or activity.

5. Photographs used in visual documenting before and after views and simulations can then be used as "marker" scenes for each region (Figure 9.1) and its own attendant families of activities. Use of marker scenes will facilitate training, create a similar base of judgment, and provide examples of visually compatible and incompatible activities for that landscape region.

6. All VRM practitioners engaged in VIA should strive to keep themselves abreast of the professional and academic literature (Smardon et al. 1982), in order to benefit from research results and techniques that are germaine to their respective landscape regions and types of projects which they have to assess.

NOTES

1. Subsequently, the U.S. Bureau of Land Management's Visual Contrast Rating Method (BLM 1980a) was also completed. Due to space limitations, it has not been included in this discussion. See Stanley Specht's discussion in Chapter 8.

2. Note that the scale contrast is a bi-polar variable. Scale contrast can increase both with extremely small or large activity introductions to the given landscape. This (we think) accounts for the negative correlation between scale structures and scale land/water bodies; spatial dominance and scale land/water bodies. This variable must be carefully handled by VRM practitioners.

3. General background of all these concepts and terminology are provided by the Prototype VIA Manual (Smardon 1982).

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