ENVIRONMENTAL PERCEPTION OF NIVEOUS LANDSCAPES

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Abstract

As outdoor winter sports become more popular with urban and suburban residents, greater competition for snow covered land near the population centres will occur. Spatial conflict occurs when ski tourers and snowmobilers recreate in the same area. To alleviate this condition and to obtain maximum satisfaction for different user groups, a methodology for delineating landscape preferences, based on picture perceptions of terrain, vegetation, and user crowding, is proposed. Significant differences between user groups' environmental perception of niveous landscapes are noted. Recreation land may be zoned according to recreationists' landscape preferences.

Introduction

It has become abundantly clear during the past few years that public lands are being subjected to a large increase in the number of users. Lands which were formerly the domain of only a few recreationists during the summer are now being subjected to intense year-round use. In several instances, this intensive use has caused environmental degradation, principally the destruction of surface vegetation, and soil erosion. But from recreationists, a prime user of public lands, a major complaint is the decrease in satisfaction when visiting an area. Because of the varied nature of recreation nowadays it is understandable that conflict will arise between recreationists whose mode of outdoor activity impinges upon others. This is especially true of mechanized and non-mechanized trail users. Several studies have addressed this problem during the summer months, either on foottrails (Hendee et al. 1968; Clay 1966; Baldwin and Stoddart 1973), or on water (Lucas 1964; Lucas and Priddle 1964). Forest management officials and recreation resource planners have paid scant attention to similar conflicts during the snow season, where the principal recreationists are snowmobilers, snowshoers and ski tourers.

The snowmobile, or motor sledge, has been the focus of a great amount of recent research, undoubtedly because of the rapidity of its acceptance as a technological innovation in our machine-oriented society. Some of the most pertinent studies relate to snowmobile use as a substitute for other forms of transportation during daily work (Linkola 1973; Pelto 1973), and the ecological and physical repercussions of recreational snowmobile use (Meitz 1974; Wanek 1974). A major lacuna exists in knowledge of spatial conflict between two principal winter recreation groups, snowmobilers and ski tourers. The situation is merely the winter equivalent of the summer problem that a United States Forest Service researcher has noted: "The conflict appears one-sided; the mechanized travelers do not mind the foot- or horse-travelers, but the latter dislike the machine-users with fervor" (Lucas 1971). Complaints have arisen from both of these groups about the other party, and few attempts have been made to assuage these conflicts.

Some effort at zoning public land for different winter users has already occurred (New York State 1974). In several cases skiers have been alloted less than one quarter of the available space, a decision evidently based on the illusion that since snowmobiles move faster, they therefore require more land. However, the ensuing analysis illustrates the fact that many skiers prefer untraveled areas and dislike meeting other persons while skiing, whereas snowmobilers appear more tolerant of crowding, preferring areas where other snowmobilers have traveled. The noise of snowmobiles is abhorrent to most skiers and although not examined in this study must certainly cause skiers to avoid snowmobiling areas; but the noise may stimulate the snowmobilers as it appears to affect other off-road motor vehicle users, despite the evidence of severe hearing loss to snowmobilers (Hewes 1975; Ikenberry 1972; Bess and Poyner 1972).

Unlike the downhill skier who requires place-specific facilities involving a large capital investment, usually at some distance from his residence, the snowmobiler and cross-country skier can utilize any area which has adequate snow cover. Consequently, these people bring considerable pressure on public and private land close to urban areas for winter recreational needs. Governmental land management officials and winter recreation proponents are attempting to accommodate the competing land-use demands of the new recreationists. This paper concerns a case of land-use conflict among winter recreational groups on U.S. Forest Service land in southeastern Wyoming (Figure 1).

Study Area

The Pole Mountain District of Wyoming is adjacent to Interstate 80, the principal east-west highway in the U.S. (Figure 1). The main entrance to the District is located at the Interstate's highest elevation, 2620 meters. A few campgrounds in the District provide seasonal overnight accommodations for transcontinental travelers and vacationers. In addition to this summer use the District provides space for winter recreationists primarily those from Cheyenne to the east and from Laramie to the west. The relatively flat, treeless eastern portion of the District can be reached by gravel roads in the summer but in the winter this area is usually covered by drifting snow. Most Cheyenne residents enter the District via the westside entrance, 53 kilometers from Cheyenne and 16 kilometers from Laramie. Aside from the campgrounds clustered near the main entrance, there are few other facilities in the area other than gravel and dirt roads. The cut-over forest area is laced with vehicle tracks along access trails created by the graziers who lease the land for summer pasture. One eight kilometer hiking trail has been marked by the Forest Service since 1972.

Study Design

During the past few years, several social and behavioral scientists, a group mainly drawn from architecture, geography, planning and psychology, have developed a field of inquiry generally referred to as environmental cognition or environmental perception. Much of this inquiry has focused on human interaction with the built environment, and less so in interaction with the natural environment. Traditionally, almost all psychological inquiry has been under controlled experimental laboratory conditions with little attention being paid to studies conducted outside the laboratory. As the situation being examined in the

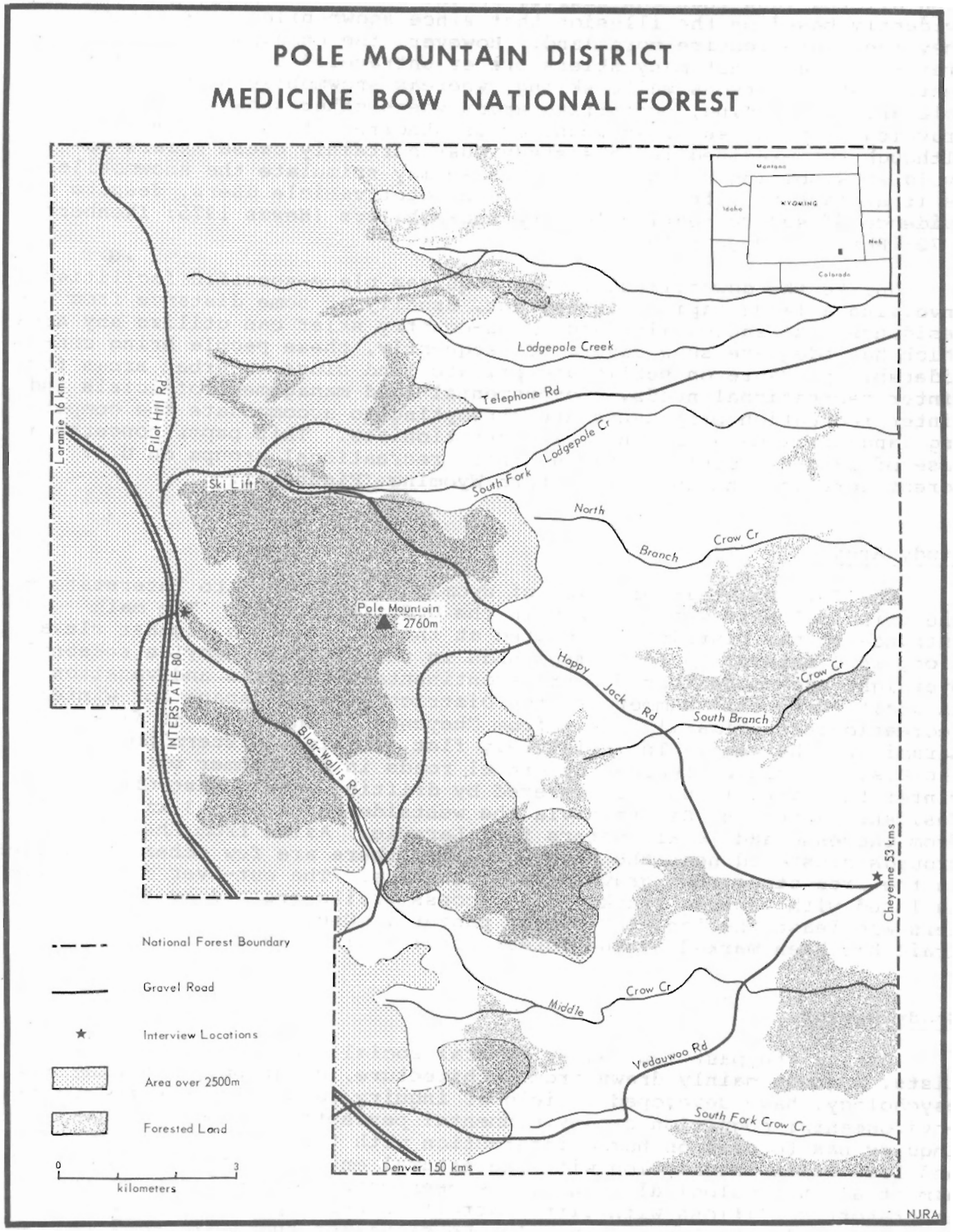
POLE MOUNTAIN DISTRICT
MEDICINE BOW NATIONAL FOREST
Montana
Idaho
WYOMING
Neb
Colorado
Lodgepole Creek
Telephone Rd
South Fork Lodgepole Cr
North Branch Crow Cr
Laramie 16 kms
Pilot Hill Rd
Ski Lift
Pole Mountain 2760m
INTERSTATE 80
Blair Wallis Rd
Happy Jack Rd
Crow Cr South Branch
Cheyenne 53 kms
Middle Crow Cr
Vedauwoo Rd
South Fork Crow Cr
Denver 150 kms
National Forest Boundary
Gravel Road
Interview Locations
Area over 2500m
Forested Land
0
3
kilometers
NJRA

Figure 1

study concerns human spatial behavior in the natural environment, the notions and concepts used in the literature on environmental cognition and perception are appropriate methods of investigation. The relevancy of assessing perception to the situation is spelled out by an environmental psychologist (Ittelson 1973, p. 7).

(1) Compare some identifiable aspect of the response to some identifiable physical characteristic of the situation.

(2) Compare the response of one individual to the response of others in the same situation.

(3) Evaluate the effectiveness of behavior in the situation.

Frequently the distinction between perception and cognition is not made clear when the terms are used in conjunction with "environment." "Cognition is the more general term and includes perception as well as thinking, problem solving, and the organization of information and ideas. Perception [refers to] the process that occurs because of an object, and that results in the immediate apprehension of that object by one or more of the senses. Temporally it is closely connected with events in the immediate surroundings and is (in general) linked with immediate behavior" (Downs and Stea 1973, p. 14).

If respondents in this study had been asked to view photographs in the relative isolation of a warm room, then cognition would be a more proper term to employ; however, the assessment of photographs of niveous landscapes took place in the immediate vicinity of the scenes depicted in the photographs, hence perception rather than cognition is the appropriate term for this visual assessment of the content of the photographs. The perceptions of the respondents are "prognostic directions for action" (Ittelson 1973), p. 6).

Owing to certain logistical problems, such as a small budget and urgent time schedule, it was not feasible to interview individuals while they were engaged in their recreational activity. Instead, interview posts (Figure 1) were set up at the principal entrance gates to the area during three weekend days, two Sundays and one Saturday, in February and March, 1975. Each vehicle entering the gate was stopped and the adults in the vehicle were asked to complete a questionnaire. Adequate parking space was available for recreationists to drive to the side of the road and complete the questionnaire in an unhurried manner. As the respondents were not isolated by the three-person survey team, it was possible for respondents in a car to consult with each other when completing the questionnaire. The respondents, unlike the survey personnel, did not have to expose themselves to the wind and subfreezing temperatures encountered on survey days since they remained in their vehicles and completed the questionnaire at their own leisure. A total of 36 snowmobilers and 98 cross-country skiers, roughly one-half of the visitors, completed the questionnaire. Many snowmobilers declined to complete the questionnaire while only one cross-country skier did so. Downhill skiers, sightseers and Sunday drivers, snowshoers, comprised the other half.

The interview schedule was designed to elicit responses which would indicate landscape preferences which could then be formulated into specific use by various recreation groups. An overall objective was to determine if winter recreation groups in general were compatible

in the same area or that their preferences clearly favored separate spaces in which they could indulge in their activity. A major portion of the study was devoted to the respondents' appraisal of twelve photographs which depicted niveous landscape scenes they would probably traverse during the interview day.

Selection of Photographs

Since several hundred interviews were projected for the survey, it was not feasible to present each respondent with a set of original prints from which to select preferences. The photographs (2-1/4" x 2-1/4") were reprinted by offset process on a single sheet of paper, 8-1/2" x 11", and inserted into the four-page questionnaire. Twelve photographs, representing three degrees of four dimensions (Figure 2 and Table 1), were selected from several dozen black and white photographs taken by three photographers within one mile of the vehicle entrance gate; hence mobile recreationists had to traverse the area depicted in the photographs at some period during the interview day. A committee of graduate students and faculty, natives and non-natives of Wyoming, established criteria for photograph selection; all photographs selected had total cloud cover, thereby eliminating Chamber of Commerce images of "sun and snow in the Rockies." Trees depicted in the photographs were free from snow-laden branches and pruinose trunks, which avoided the "Christmas Card" effect. Ground snow cover had to be complete in all photographs, for incomplete snow cover might indicate not a lack of snow but an area exposed to high winds which are common along the Rocky Mountains Front Range. The only perceptible man-made physical structure in the photographs was a sign identifying a snowmobile trail (Figure 2, Row 4, Col. 2).

Four dimensions selected for photo preference were terrain, vegetation density, skier crowding, and snowmobile crowding. The three degrees of each dimension were selected for their *in situ* characteristics. In Figure 2, Row 1, the three degrees of Terrain were Flat, Undulating, and Steep, and reflected local perceptions as determined in a pre-test. No exposed rock areas were depicted in the photographs, for snowmobilers and skiers avoid these areas. To insure dimensionality, the sparse vegetation in Figure 2, Row 1, portrayed a depth and steepness perspective. The various types of Vegetation present in the Pole Mountain District photographs used in this study include large areas of open sagebrush, grasses, cutover areas with interlucent trees, and patches of dense secondary growth. Wind and sun quickly eradicate snow from the open areas so these portions were eliminated from the photographs, since neither snowmobiler nor skier would be likely to traverse these areas. Pre-testing revealed that the presence of other recreationists' tracks was perceived of as representing some element of crowding, even though other users were not visible.

The preference for a single photograph in each row was obtained by requesting each respondent to mark his or her preference with an "X" in the appropriate position. The respondent was unaware of the dimensions that were being tested, as the photographs were not labeled.

Results

Chi-square analysis indicated photo-preference differences between snowmobilers and skiers. In Row 1, "Terrain," and Row 4, "Snowmobile Crowding" (see Table 1), both groups chose photos of rolling terrain as

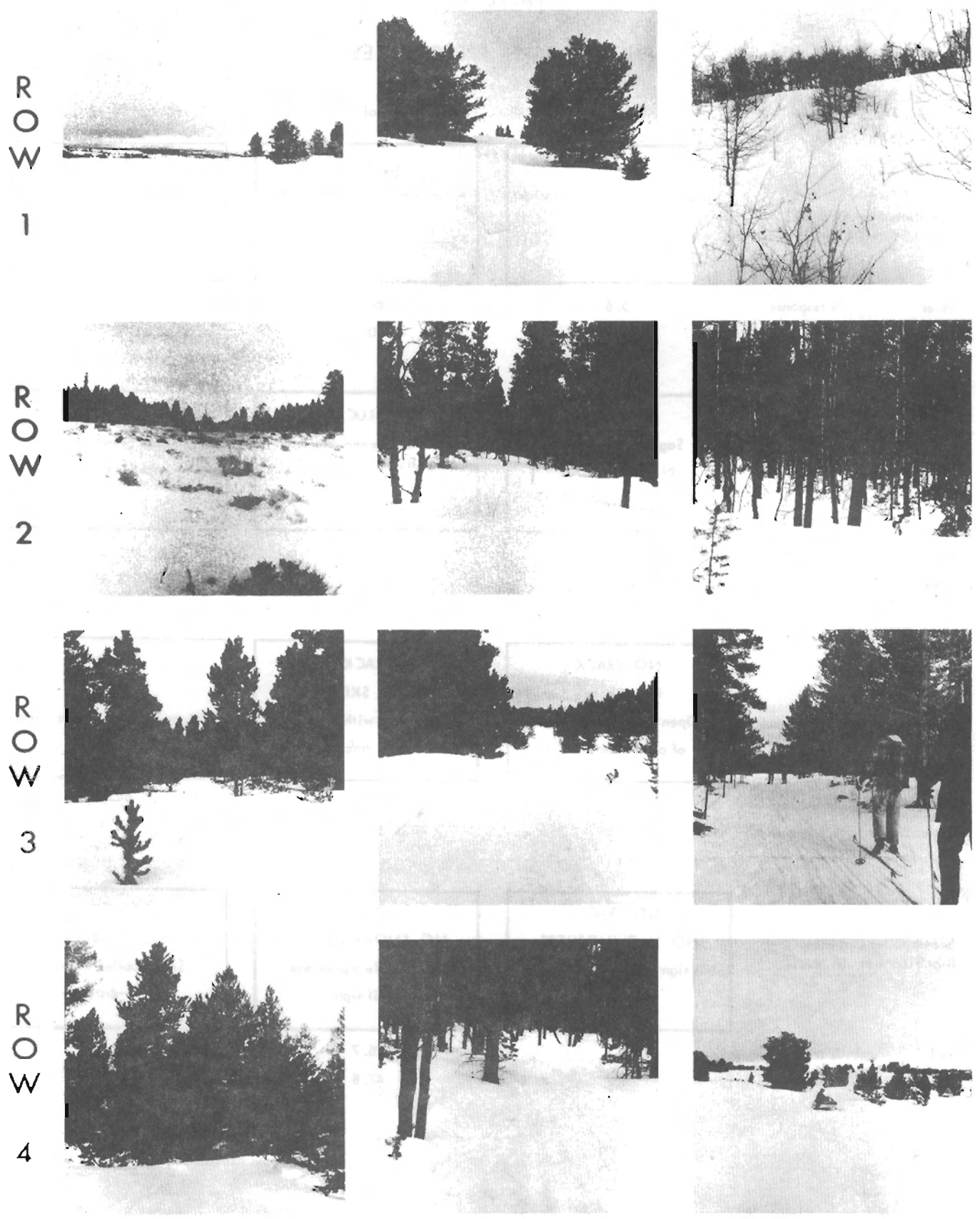

Figure 2

TABLE I

PHOTOGRAPH PREFERENCES

		Col. 1	Col. 2	Col. 3
Row 1 Type of Terrain [significant at .01 level]		FLAT Virtual absence of vegetation	ROLLING A few trees widely separated	HILLY Trees included for depth and steepness perspective
Skier	% response	5.6	80.9	13.5
Snowmobiler	% response	30.4	60.9	8.7
Row 2 Type of Vegetation		SPARSE Sagebrush and snow No bare patches	INTERLUCENT Mixed evergreen and aspen	DENSE Thick growth with many saplings
Skier	% response	4.5	75.0	12.5
Snowmobiler	% response	14.3	81.0	4.8
Row 3 Skier Crowding		NO TRACK NO SKIERS Open area with no sign of over snow travel	TRACK NO SKIERS Open area with a single ski track	TRACK SKIERS Many ski tracks with skiers
Skier	% response	43.4	26.5	25.3
Snowmobiler	% response	28.6	57.1	14.3
Row 4 Snowmobiler Crowding [significant at .01 level]		NO TRACK NO SNOWMOBILERS No sign of over snow travel	TRACK NO SNOWMOBILERS Snowmobile tracks and trail sign	TRACK SNOWMOBILERS Snowmobiler visible in mid-distance
Skier	% response	64.4	28.7	2.3
Snowmobiler	% response	8.7	47.8	43.5

their first preference with skiers preferring hilly areas over flat areas for their second choice. Snowmobilers' second choices favored flat terrain over hilly terrain. In Row 2, "Vegetation," no statistically significant difference emerged, but the percentages indicate that three-quarters of both groups preferred interlucent vegetation (Row 2, Col. 2), and, as a second choice, skiers favored dense vegetation over sparse sagebrush areas and snowmobilers vice-versa. Both groups, then, prefer the middle ground, but skiers are more tolerant of hilly and densely wooded areas; snowmobilers on the other hand, opt for flat areas with sparse vegetation.

The selection of photos depicting degrees of crowding clearly raises many problems, for users appear only in the third photo in each row. It must be noted that the area under examination is Wyoming, the least populated state in the contiguous United States. A pre-test survey showed that a single snowmobile track in the snow indicated a degree of crowding; crowding has clearly to be viewed in a sense relative to commonly accepted regional predelictions. Over half the snowmobilers preferred the photo indicating a single ski track (Row 3, Col. 2), while a virgin snowscape (Row 3, Col. 1) was first preference among skiers. The least preferred photo in Row 3 for skiers and snowmobilers showed skiers on a well-used track. In Row 4, "Snowmobile Crowding," skiers again showed a marked preference for a virgin snowscape (Col. 1) with a meager 2.1 percent favoring the scene showing a snowmobile. Over 90 percent of the snowmobilers preferred the photos which contained either a snowmobile track or snowmobiler.

Some conclusions may be formed from the stated preferences on Rows 3 and 4. Judging from the small percentage disparity in skiers' preferences between Row 3, Col. 1, "No Tracks or Skiers," (43.4%) and Col. 2 and 3, "Tracks, Skiers," (51.8%), it appears that there may be two types of skier, one which could be labeled "cross-country" and the other, "wilderness touring." Cross-country skiers use lightweight equipment and prefer to run on a sign-posted or prepared track. More than half the skiers preferred the photos containing a track in Row 3. Wilderness tourers prefer to move at a slower pace and break trail through untraveled snowscapes; they are easily identified by heavier ski equipment, snow gaiters for protection in deeper snow, back packs, and a plodding gait. This apparent dichotomy in skier habits and preferences could create a problem for recreation land use planners. On one side are the proponents of trail construction and signposting (Knopp and Sande 1974), and others who claim that "In the Rockies and on the East Coast . . . the vast majority settle for groomed trails. . . . The typical Oregon skier is far more self-reliant" (Newman and Sharrard 1974). Despite the apparent regional bias in the above statement the dichotomy exists from coast to coast and is not confined to any particular region. Skiers might have to compromise their personal preference for exclusive use if they are to be accommodated in a recreational land use plan for a specific area.

Skiers appear to share space but avoid contact with snowmobilers, according to the score on Row 4, Col. 3. Snowmobilers overwhelmingly opt for photos depicting tracks, places where others have traveled, and may be unaware that travel on a prepared cross-country track may ruin it for fast ski travel. It is quite clear that both groups prefer separate user tracks (but they may be unaware of the location of the tracks unless signposted. In summary, skiers may require a larger area than previously allocated while snowmobilers may be tolerant of a smaller amount of space, but greater density of use, than currently provided in recreation zones.

Evaluation of Picture Perception Technique

A prime reason for using photos in this study was to enable land management officials to gauge recreationists' "environmental appreciation," that is, the sensitivity with which humans distinctly perceive their surroundings (Meinig 1971), in this instance distinct user groups' recreational localities. The photos were surrogates for real environments as it was not feasible to record the actual behavior of recreationists by unobtrusive observation (Webb et al. 1966), although this ploy might be preferable to the technique used in this study.

A principal drawback to using photos in such a study is that of equating the picture perception images of the researcher with those of the respondent. Although theories of picture perception have been developed by psychologists under experimental laboratory conditions (Gibson 1971), where respondents are isolated and where paintings are used rather than photos of natural landscapes, it is virtually impossible to apply these techniques to the situation investigated in this study. In the selection photos used in this study, a committee established the photographic categories of dimensions thereby creating a consistency which attempted to limit variance in all characteristics in the four rows of photographs other than those for which responses were being sought. Unfortunately, this procedure is contrary to the opinion of some psychologists, as Gibson states that this can only be done under laboratory conditions, using single photographs (Gibson 1966). If this is indeed the case then the present analysis, based on photographs as carriers of optical information, may be questioned. But it might be added that acceptance of Gibson's view would drastically reduce the potential of photographic evidence as a projective device in large surveys (Saarinen 1973).

Several social scientists have attempted to elicit similar information from respondents, using maps, outline drawings (Lynch 1960), surface layout and depth perception (Hudson 1960), and also conducting studies in cross-cultural perception (Segal, Campbell, Herskovits 1966). Outline drawings such as those used by Lynch are viewed with skepticism by psychologists because of ambiguity of contrasts with respect to its environmental origins thereby rendering spurious conclusions (Kennedy 1971).

Cross-cultural studies (on an international scale), are a notable contribution in that some societies have yet to learn the "language of pictures," i.e. respondents are unable to perceive the subject until other details in the photographs are pointed out to them. It would be interesting to compare the responses generated by Rocky Mountain residents with those of New Englanders, thereby obtaining inter-regional differences or congruence of landscape perceptions. The assumption implicit throughout this study is that the pictured world and not the picture is a representation of the environment.

Almost every attempt to quantify landscape aesthetics or "scenic beauty" using photographs (Fines 1968; Leopold 1969; Shafer, Hamilton, Schmidt 1969), stimulates a barrage of critiques (Brancher 1969; Hamill 1975; West 1969). Other investigators have used photographs to elicit responses in environments differing from the above, urban areas and the Arctic (Peterson and Newmann 1969; Sonnenfeld 1967). Several others are discussed in the literature of landscape amenity and perception (Cerny 1972; Goodey 1971; Marsh 1972; Mercer 1971). Shafer and his associates can be commended for their intense and innovative approach in establishing an appropriate methodology in recreation research,

although they did overlook the psychology literature on picture perception. Unfortunately, the non place-specific nature of the photographs used in Shafer's research and intrusion of scientism may limit the specific applicability of Shafer's methodology to regions of North America. With the exception of Sonnenfeld's early research, none of the above studies deals with perception of niveous environments.

Conclusion

The study indicates that there are distinct winter recreationist preferences for and attitudes to separate user zones, the zones incorporating several types of physical and human components, terrain, vegetation, and user crowding. To avoid snowmobiler and skier conflict and to obtain higher user satisfaction it may be necessary for the U.S. Forest Service to amend some current procedures related to land use and to zone land for separate user activities.

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