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The Importance of Water to Rocky Mountain National Park Visitors: An Adaptation of Visitor-Employed Photography to Natural Resources Management

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Abstract. The visitor-employed photography [VEP] method was modified to help determine the social value of water and riparian resources in Rocky Mountain National Park [RMNP]. Water was shown to contribute significantly to the visitors' Park experience, ranking second only to mountain vistas in importance, and favourably in comparison with management features, wildlife, and vegetation. Water resources were photographed more often by hikers and backpackers ($p < .001$) than by campers or drive-through visitors. Riparian resource results were less clear, although visitors reported a serious negative response to potential losses of water, riparian vegetation, or riparian-dependent wildlife, and a willingness to pay 70% more in entrance fees to protect these resources. The modification of the VEP method to adapt it to this resource valuation question shows potential as a resource tool in terms of reducing experience intrusion and especially in the use of respondent-generated photographs and photo logs as keys to memory of the Park experience.

Keywords. Rocky Mountain National Park, water resources, social valuation, recreation, visitor-employed photography

Résumé. La méthode de photographie prise par le visiteur [VEP] fut ici modifiée pour déterminer la valeur sociale de l'eau et des ressources riveraines dans le Rocky Mountain National Park. L'eau contribue de façon significative à 1'expérience des visiteurs du parc, se plaçant seconde en importance derriére les panoramas de montagnes, et comparant favorablement avec l'équipement du parc, la faune, et la végétation. L'eau est photographiée plus souvent par les marcheurs et randonneurs ($p < .001$) que par les campeurs ou les visiteurs en voiture. Les résultats pour les ressources riveraines sont moins clairs, bien que les visiteurs répondirent de façon négative aux pertes éventuelles d'eau, de végétation riveraine, ou de faune dépendente de cet environnement. Ils indiquérent une volonté de payer 70% de plus en droits d'entrée pour protéger ces resources. La présente modification de la méthode VEP présente des promesses comme outil de recherche discret dans un contexte d'étude de la valeur des ressources, ainsi que dans l'utilisation de photographies faites par les visiteurs comme souvenirs clés de la visite d'un parc.

Mots clefs. Rocky Mountain National Park, ressources aquatiques, évaluation sociale, récréation, photographie par les visiteurs

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To determine and substantiate the value of specific resources, it is important for natural resources management agencies to be able to document that these resources provide important biological and physical functions. It is equally as important to determine the degree to which these resources contribute specifically to the experience of visitors and resource recreation users. Laws passed in the 1960s and 1970s, both in the United States and in Great Britain, required management and protection of visual resources (e.g., the *National Environmental Policy Act of 1969* in the United States and the *Countryside Act of 1968* in Great Britain). These and related laws provided major impetus for the development of research techniques that could identify landscape elements that are most amenable to preservation and enhancement (Zube, Sell, & Taylor, 1982).

Perception testing has been adopted to answer resource managers' scenic resource questions. The predominant research approach in this application has been the "psychophysical" paradigm (Daniel & Vining, 1983; Zube et al., 1982). This approach involves testing participants in the environment directly to determine environmental preferences and critical elements. Where direct testing of the environment is not possible (e.g., not-yet-existing conditions) or not economically feasible, simulated environments are used (e.g., photographic slides of the environment or various techniques for rendering hypothetical conditions (see Taylor, Zube, & Sell, 1987). An example of psychophysical testing of environmental perception that has enjoyed widespread application is the "Scenic Beauty Estimation" method (Daniel & Boster, 1976). This technique uses colour slides as environmental surrogates, and has been validated by means of cross-comparisons with on-site assessments in the environments depicted.

Essential to environmental perception research is the recognition that perception is an interaction between humans and environment that is dynamic, inextricably linked to the whole psychology of the observer, and immersed in the environment that is experienced (Ittelson, 1973). Therefore, it is important to explore research methods that may be able to capture this dynamic perceptual interaction in situ, but without redefining the natural resource experience of the visitor.

It is important for researchers of natural area and wildlands experience to find information-gathering procedures, times, and locations that minimize encroachment into visitors' experiences. Such unobtrusive measures are even more critical for resource managers, who must learn about the users' experiences, needs, and preferences if they are to manage effectively. The value and importance of natural environments such as parks and wilderness areas must be empirically demonstrated to ensure their continued protection during times of escalating demands for consumptive uses of resources. At the same time, managers cannot afford to disrupt visitors' experiences of national parks or wilderness areas that are specifically designated to be preserved for public enjoyment.

Interviews of visitors on-site can intrude "as a foreign element into the social setting they would describe, they create as well as measure attitudes" (Webb, Campbell, Schwartz, & Sechrest, 1966, p. 1). Leisure motivations such as "seeking solitude" and "getting away from civilization" rank quite high among visitors to natural areas (Manning, 1986). Therefore, visits to national parks and

wilderness areas are activities that may be especially sensitive to being reshaped by on-site interviews.

On the other hand, testing after the visitors have left the park or natural area may fail to capture the true nature of the experience (Stewart & Hull, 1992). Stewart and Hull (1992) reported a declining correlation between real-time satisfaction and post-hoc satisfaction of a recreational hike which was explained by limits of recall capabilities, context variability, and a growing reliance on inference. Differences between on-site and off-site responses have been reported for recreational needs (Iso-Ahola & Allen, 1982; Manfredo, 1984), environmental attributes of a recreational experience (Peterson & Lime, 1973), and recreation satisfaction (Shelby & Heberlein, 1981).

"[Survey] questions ... make an implicit demand to remember and enumerate specific autobiographical episodes, [but] respondents frequently have trouble complying because of limits on their ability to recall" (Bradburn, Rips, & Shevell, 1987, p. 161). In temporal organization of information, people use inferences to fill gaps in memory (e.g., I have visited that area three times in the past three months so I must have visited it about 12 times in the past year). "Inference plays an inevitable role in responding [to surveys]. Respondents are simply unable to retrieve separate incidents. Instead, they use the fragmentary information that they have and extrapolate the rest" (Bradburn et al., 1987, p. 161). These same researchers also suggested that recall can be successfully improved by the use of cues about location or social occasion. Some surveys have used lists of events or products to enable respondents to use recognition rather than recall in reporting their behaviour (Sudman & Bradburn, 1982).

Hull, Stewart, and Yi (1992) have pointed out that outdoor recreation experiences are not static in nature. Their tests of recreational experience patterns showed that some hikers had quite diverse experiences during the course of a strenuous day-hike while others' experiences were less varied. This raises the question of what is being captured in a single, real-time interview of a park or wilderness user. Some researchers have addressed this problem by having visitors fill out survey or report forms at several times during their recreational experience. Although this avoids the error of one-spot measurement of a dynamic experience, potentially it may redefine a visitor's experience.

Purpose

The study reported here was a collaboration among two federal resource agencies and several volunteer organizations. Our purpose was to determine the importance of surface water resources and water dependent ecosystems to visitors' experiences of Rocky Mountain National Park (RMNP or the Park). Water has been found to be one of the most important attributes in several landscape assessment studies (Zube, Sell, & Taylor, 1982). In this paper we report the importance of a number of landscape features to the Park visitor, including water and riparian resources. Here we also consider the adaptability of the visitor-employed photography [VEP] method to resource valuation and
assessment of visitors' experience of natural environments such as parks and wilderness areas.

Visitor-employed photography is an experience-recording technique that has been successfully employed to measure human perceptions of a variety of natural environments (Chenoweth, 1984; Cherem, 1973; Cherem & Driver, 1983; Cherem & Traweek, 1977; Traweek, 1977). This earlier VEP research conducted by Cherem, Driver, and Traweek focused on features that attracted visitors

along nature trails and the Huron River in Michigan and on a nature trail in Colorado. Chenoweth and his students have used VEP to study several areas in Wisconsin: the St. Croix River, the lower Wisconsin River, and the Alpine Lakes area.

Early VEP work documented the importance of diversity and sensory environmental changes to viewers' perceptions of natural landscapes. Perceptually exciting areas were often changes from one basic landscape structure to another: from land to water, from open meadow to forest. Cherem and Driver (1983) stated that VEP holds "tremendous potential for analysis of the public's perceptions" of both natural and man-made items, and suggested a valuable potential in linking VEP to remote sensing to aid in geographic isolation of perceptually exciting scenes.

VEP involves distributing cameras to a sample of users of a particular environment and asking them to photograph scenes, areas, or items according to stated research criteria. An objective advantage of this research method is that the results originate from the visitor, not from a list provided by the experimenter. As described by Cherem and Driver (1983), VEP results are "generated as directly as possible from the perceptions of on-site visitors, and not recorded on questionnaires but by the visitors' pressing the shutter-release button on a camera."

The original VEP research involved the use of moderately priced 35-mm cameras loaded with 36-exposure rolls of film (Cherem & Driver, 1983), or "instamatic box cameras" (Chenoweth, 1984). The danger of losing equipment has somewhat limited the broad application of this research method to fairly controlled settings such as loop trails, although researchers reported an extremely low incidence of lost cameras. Nevertheless, the recent introduction into the market of inexpensive, single-use, 35-mm cameras greatly expands the potential for using VEP as an environmental perception testing method.

For VEP applications, it is important to consider whether respondents will actually focus on given research criteria. For example, if asked to focus on negative items, will the participant actually do so? Taylor and Daniel (1984) demonstrated the willingness and ability of respondents to focus on directed criteria in evaluating photographs of natural forest areas. Participants successfully distinguished between recreational acceptability and scenic quality of the areas depicted, based on different forest conditions. This same ability to focus is applicable to visitors taking photographs as well as to those evaluating photographs. Therefore, we are confident that instructions to photograph "scenes, features that contribute importantly to your experience," will result in photo sets that are, indeed, keyed on that research question.

The Rocky Mountain National Park Application

The Rocky Mountain National Park, established in 1915, was "hereby reserved and withdrawn from settlement, occupancy or disposal under the laws of the United States, and the said tract dedicated and set apart as a public park for the benefit and enjoyment of the people of the United States under the name of the Rocky Mountain National Park" (Act of January 26, 1915, 38 Stat. 798). The Park contains some of the most spectacular mountain scenery in North America. It is also famous for the fall gathering of elk and for the fall colours of aspen groves.

The need driving this research, as stated by RMNP resource managers, was to determine whether water bodies and riparian areas were important to visitors' experience of the Park. This information need was restated as a research hypothesis: When asked to identify the scenes, areas, or features that were most important to their experience, (a) RMNP visitors would place water and riparian areas among the top five areas or features, and (b) the majority of a sample of visitors would select water and riparian areas at least once among their most important features.

Method

In July and September 1993, we passed out 193, single-use, 12-exposure, 35-mm cameras which had been contributed to the project by Eastman Kodak Corp. The cameras were given to a stratified random sample of visitors to Rocky Mountain National Park.' The distribution was divided evenly among four User Groups, defined by Park personnel: drive-through visitors (Drivers), campers, day-hikers (Hikers), and backpackers (Packers). Cameras were distributed evenly among access points identified by Park personnel for each of these User Groups. Distribution was divided evenly between July and September and was spread across a full week in both months to avoid any day-of-the-week bias in the results.

The participants in this study were asked to photograph 12 scenes, features, or situations within the Park which had the most important effect on their experience. These important effects could be positive or negative. Accompanying the cameras were photo-log booklets in which participants were asked to record what they had photographed, the location in the Park, the subject of the picture, whether the effect on their experience was positive or negative, and why they took each picture. Identifying the subject is critical for this is not always apparent from the photograph alone. For example, one photo of an open meadow was labeled, "There were elk in this meadow when we first arrived." Visitors were also given statements detailing how the various parts of the cameras are recycled or reused in the manufacturing process. This avoided our being perceived as promoting "throw-away" technology.

The specific resource valuation focus of the research team, surface water bodies in the Park, both standing and flowing, and the ecosystems which depend on them (riparian, wetlands, marsh), were not stated to the participants. By leaving these research foci unstated, our aim was to obtain objective estimates of the relative importance of water bodies and riparian areas to Park visitors themselves. We determined importance as: (1) the proportion of all photographs that focused on or included these features, (2) the proportion of visitors who included at least one such feature among the scenes they photographed, and (3) the relative frequency per respondent of water and riparian photos.

The major modification of the VEP method, in adapting it to a specific natural resource valuation question, was the follow-up mailing. First, this included a complete set of the respondent's own photographs. Participants knew in advance that they would receive prints of their RMNP photography, so this served as an incentive to participate in the VEP exercise. In addition, this provided an easy access for re contacting each participant in a context that would predispose them to further assist the research effort. Respondents were sent follow-up surveys with their photographs which allowed us to collect demographic, Park-use, resource value, and other information without intruding into their Park experience. In the follow-up survey, we directed the respondent to focus on an identified photograph and its accompanying photo-log description. This gave us a means of cueing memory of the experience, of having both recognition and recall to which we could key critical questions concerning knowledge and attitude of water and riparian resources.

Every photo had a code number written on the back. A specific photograph was selected for each respondent, depicting water or riparian areas if available, and the corresponding photo-log page was included. We instructed each participant to study the identified photograph and photo-log page and to recall what they felt when they took the photo. They then were asked several questions, keyed specifically to the selected photograph. For example, to tap into the park experience, respondents were asked to reflect on such questions as: "What particularly attracted you to the environment in this picture?" and "What would be the effects on your experience if one third of the water.... of the vegetation.... or of the wildlife were lost?" Related to knowledge, respondents were asked a question similar to this one: "Is the bank-side vegetation in this scene dependent on the adjacent stream or lake?" Finally, respondents were asked to state their willingness to pay, in the form of increased Park entrance fees, to assure continued protection of the resources depicted in their photograph. We categorized visitor experience of the Park in two ways. Cameras were distributed using stratified random sampling to the four User Groups (described earlier). Second, we asked each respondent, in the follow-up survey, to describe the experience they had come to RMNP to have on this trip. Self-defined experiences were aggregated into groups of similar experiences, for example, to view the grandeur, to experience solitude, or to climb a mountain.

The Colorado Mountain Club, a local hiking club with intimate knowledge of the Rocky Mountain National Park environs, identified where each photograph had been taken and recorded the latitude and longitude coordinates. These coordinates, along with the photograph identification codes, were entered into a Geographic Information System data base. By means of this GIS data base, the locations of view points and critical features (both positive and negative) can be physically located within the Park.

Data Analysis

Photographic Topics

The subjects or features were verified by comparing each photograph with the verbal description in the photo log. The subjects photographed by respondents were organized into 10 main groups, each of which contained several subcategories (see Table 1). The six subject groups that were photographed most often-Vistas, Water, Management Features, Vegetation, Wildlife, and Human

Impacts-were selected for further analysis. Riparian Vegetation was also selected because one of the goals of this project was to determine how the public values wetlands and riparian areas.

Table 1
Categories of Park Features Photographed

Category	Sub-category (examples)
Water	Lakes, Rivers and Streams, Waterfalls
Vegetation	Forest, Wildflowers, Fall Foliage, Riparian Vegetation
Wildlife	Birds, Small Mammals, Deer, Elk
Management Features	Trails, Signs, Visitor Centres, Ranger Programs
Human Impacts	Litter, Tree Carving, Feeding Wildlife, Horse Manure on Trails
Vistas	Mountain Tops, Valley Vistas
People	Companions, Other People, "Crowding"
Snow	New Snow, Residual Snow
Meteorology	Cloud Formations, Thunderstorms
Geologic Formations	Cliffs, Rock Falls, Glacial and Flood Moraines

Photographic Topics Within User Groups

One-way Analysis of Variance (ANOVA) was used to determine whether different classes of park users appreciate different aspects of RMNP (Wilkinson, Hill, Welna, & Birkenbeuel, 1992). Scheffe's pairwise comparison tests were used to assess which pair(s) of group means were significantly different. The SYSTAT non-parametric Kruskal-Wallis procedure was used to test significant differences in rankings when the Scheme test assumption of equality of variances did not hold.

Experience Analyses

Respondents to the follow-up survey listed the experiences for which they had come to RMNP. This was an open-ended question requiring interpretation and clustering of results. Each response was divided into verb-action (What did they come to do?) and noun-object (... with, on, or about what?). For example, if a respondent reported coming to hike Long's Peak, the experience was coded: action = hike, object = mountain. With an n of 152 returned questionnaires representing 85% of the 179 respondents who had returned the cameras and photo logs) and up to three experiences listed per person, the combined experiences (action + object) spread too thinly for a meaningful assessment-that is, there were too many cells with too few responses. Therefore, experience was analyzed separately, by action and by object. Occasionally a respondent reported an action only (e.g., "to camp") or an object without a stated action (e.g., "for the elk"). These are included in the desegregated experience action and experience object sets. Of these experience categories, four verb groups-"Senses," "Feelings ... .. Actions," and "Picnic or Camp" were listed by at least 10 respondents. One-way ANOVAs were conducted to compare the ratio of the number of photographs per respondent (for Water, Vista, Wildlife) among three of these experience groups (i.e., "Senses," "Feelings," and "Actions" experience groups). "Picnic or Camp" were not included in this test because of the small sample size.

Experience Groups Compared with User Groups

These verb-experience categories were compared with Park User Groups defined by Park personnel by contingency table analysis (Wilkinson et al., 1992) to determine if respondents who stated the same desired experiences were also in the same User Groups (i.e., did the Park staff's method of categorizing respondents match the respondents' self-defined categories?).

Results

Photographic Subjects

In our VEP survey, 179 participants of the 193 given cameras, took 2,055 photographs of the Rocky Mountain National Park. This represented a 92.75% response rate. The most frequently photographed features were the spectacular mountain peaks and deep valley vistas of the Park. Ninety-four percent of the participants took at least one "vista" shot (see Table 2). This subject was identified for nearly one third of all photos taken in the VEP study. The second most frequently photographed subject was water. Water features were the subject of more than one fifth of all photos, taken by four fifths of the participants.

Table 2
The Six Most-Photographed Features of Rocky Mountain National Park[a]

Photographed Features	Photos taken[b]	Number of respondents taking pictures[c]	Mean number of photos per respondent
Mountain Vistas	627 (31%)	168 (94%)	3.50
Water Features	458 (22%)	148 (83%)	2.56
Management Features	395 (19%)	132 (74%)	2.21
Vegetation	370 (18%)	138 (77%)	2.07
Wildlife	330 (16%)	134 (75%)	1.84
Human Impacts	85 (4%)	57 (32%)	0.47

[a]Based on photo subjects stated by respondents.
[b]Since respondents sometimes listed more than one subject per photo, column two does not sum to the total number of pictures (n = 2,055) nor to 100%.
[c]Total number of respondents = 179.

Photos of various management features of the Park ranked third, (i.e., one fifth of the photos, taken by three quarters of the survey participants). Examples of such features included "good trails ... .. campgrounds," and "informative signs." This category was followed by vegetation, including wildflowers, forests, vegetative colours (18% of the photos, taken by 77% of the sample), and wildlife photos (16% of photos, taken by 75% of respondents). The wildlife photographed varied among small mammals, birds, and large mammals such as deer and elk.

The vast majority of features photographed (almost 89%) were listed as positively affecting the visitors' experiences. The negative features constituted 7% (151) of the photos, averaging 0.8 photos per person. Since photographing negative features is contrary to most vacationers' usual behaviour with a camera, it is not surprising that the overwhelming majority of photos were listed as positive features. Occasionally, respondents did not list positive or negative, or listed a scene as having both positive and negative effects on their experience; therefore, the positive plus negative features do not sum to 100%. Most of the negative-effect photos were either of human impacts (e.g., people feeding wildlife, carved trees, horse manure on the trail, too many people or crowding) or of management features that individuals did not like (e.g., road and trail closures). Although the proportion of photographs of negative features is small, half (n = 89) of the participants took at least one photo of a negative feature.

Seasonal Variation in Photo Subjects

The differences in photo subjects, between the July and September subsamples, are primarily reflections of natural seasonal variation. Wildflowers were photographed more often in the summer; forests and vegetative colours more often in the fall. Elk were photographed more often in

the fall, the time when elk come down to lower elevations for the mating rut and are in closer proximity to visitors. The human impact of feeding wildlife was photographed only in July, when small mammals and birds congregate more at the scenic pull-outs; however, there were only nine of these photos in the sample.

Variation Among User Groups in Feature Selection

There were several differences among the User Groups in the Park features they chose to photograph. Analysis of variance [ANOVA] of the proportion of photographs per respondent showed significant differences for Vistas, Water Features, Management Features, Wildlife, and Human Impacts. Packers and Drivers took mountain and valley vista photographs more often than Campers, while the Packer and Driver groups were remarkably similar in vista-photo ratios (see Table 3). These results can be explained, in part, by the fact that the backpacking trails and Trail Ridge Road both give greater access to these high-altitude views than the campgrounds and shorter trails on the valley floors.

Table 3
Differences Between Ratios of Features Photographed Among User Groups of Rocky Mountain National Park

Features photographed	More often by:	Less often by:	Level of significance
Vistas	Packers (.35) Drivers (.33)	> Campers (.23)	$p < .05^a$
Water Bodies	Hikers (.28) and Packers (.25)	> Campers (.12)	$p < .001^a$
Management Features	Campers (.31) Hikers (.4)	> Drivers (.13) and	$p < .0l^b$
Wildlife	Drivers (.20) Hikers (.18) Campers (.16)	> Packers (.08) > Packers (.08) > Packers (.08)	$p < .001^a$ $p < .01^a$ $p < .05^a$
Human Impacts	Packers (.06) and Hikers	> Drivers (.03) and Campers (.03)	$p < .05^b$

Note. Values in parentheses represent the proportion of photographs that were taken of the subject by the group listed (e.g., 35% of the Packers' photos were of Vistas).
[a]Based on Scheffe's Pairwise comparison.
[b]Based on Kruskal-Wallis non-parametric test.

Hikers and Packers took more water photos per respondent than Campers, and more human-impact photos than either Campers or Drivers. Indeed, Packers and Hikers took almost twice as many photos of human impacts as did Drivers and Campers. GIS mapping of photo locations showed that Campers tended to cluster their photos around their camp area, photographing management features more often than anyone else (e.g., buildings, campsites, parking lots, interpretive programs). Campers took, on average, more than twice as many photos of management features than did Drivers or Hikers.

Drivers took more wildlife photos than did members of other groups. A result of the RMNP study that may seem counterintuitive was that wildlife was photographed least often by Packers. Small mammals were photographed most often by Hikers ($p < .01$). This suggests a pattern of wildlife acclimated to human presence. Small mammals and birds tend to cluster around scenic pull-outs

and along front-country trails rather than in back-country areas where the greatest amount of undisturbed habitat is actually located.

Visitor Experience

Survey respondents were asked what experiences they sought at RMNP and their responses were grouped by the research team. Three categories accounted for nearly 90% of the verb descriptors listed (see Table 4). A third of the respondents listed actions such as hiking, climbing, backpacking. Slightly fewer listed feelings such as to enjoy, relax, find peace. One fourth listed a visual sense, for example, to see, sight-see, or watch. No other senses (sound, smell, touch) were listed as important to their experience, except "quiet," the absence of noise. None of these experience-action groups were significantly different in what they photographed, based on analysis of variance of photo-subjects across these three major experience codes. However, there were near-significant differences in wildlife photographs ($F_{2,123}$=2.951, p=.056) between *sense* and *action* experience respondents.

The VEP results showed greater discrimination (in photo subjects) among the stratified User Groups (Drivers, Campers, Hikers, Packers) than among the user-stated experience categories. However, we found a significant relationship between User Group and reported experience. A contingency table showed a Pearson chi-square significance at $p < .001$ (df=6). The interaction cross-tabulation is shown in Table 4. In this table, half of the Drivers listing an experience action chose seeing (sightseeing, to look at ...) and half of the seeing experience group were Drivers. Half of the Campers who listed an experience action came to RMNP for feelings (enjoy, relax, peace). The action experience group was made up predominantly of Packers (43%) and Hikers (34%). Sixty-nine percent of the backpackers listing an experience action stated that they had come for an action experience. The differences in photo subjects between user categories preselected by the research team and experiences stated by the visitors is related to the spread of open-ended responses as opposed to a delimited set of user categories. The significant relationship between Park-selected and self-selected user categories tends to validate the User Group categories selected by the Park Service personnel.

Table 4
Cross Tabulation Between User Groups (as defined by RMNP personnel) and Self-Selected Experience Codes (as defined by users and coded by research team)

	User Groups			
Experience Codes	**Drivers** ***n***	**Campers** ***n***	**Day Hikers** ***n***	**Packers** ***n***
Seeing (25)[a]	18 (50)	6 (17)	10 (28)	2 (6)
Feeling (29)	12 (29)	13 (31)	10 (24)	7 (17)
Actions (34)	5 (10)	6 (13)	16 (33)	20 (42)

Note. Chi square $p < .001$, $df = 6$.
[a]Values in parentheses in Column 1 represent the percentage of all Action Experience responses. The numbers in parentheses in all other columns represent the row percentages.

The noun-objects of RMNP visitors' experiences varied greatly: from mountain grandeur to wildflowers; from wilderness to family and friends. Experience objects were less consistently listed than were experience verbs. Thirty-seven percent of the respondents listed no noun-object. Of all objects listed in the experience descriptions, 32% were mountains and scenery, 24% flora and fauna, and 16% nature or wilderness. Other experience objects listed included "the Park" or the heritage it protects (8%) and family and friends to share the experience with (7%). Interestingly, only two respondents listed water as an object of the experience they had come for at RMNP.

There was general consistency between respondents' stated experience objects and what they photographed. Of the 30 respondents who listed mountain scenery or grandeur as their primary experience object, 90% took photos of mountain vistas, averaging 3.5 mountain photos each. Those who specifically came for wildlife (first object descriptor = 16) all took at least one wildlife photo, averaging 3.8 wildlife photos each; this is high compared with the average of 1.8 wildlife photos taken per person for the overall sample. Those who listed "the Park" or its "heritage" took an average of 4.0 photos per person of management features. However, visitors who mentioned "family and friends" to share the experience did not photograph them so often (averaging 1.7 photos of their companions).

Resource Importance

Because the focus of this study was on the value of water and water-dependent ecosystems to visitors, we reviewed all the photographs, noting when there was water or riparian vegetation shown. This was then compared with whether these features were stated by the respondent as the photo subject (see Table 5). The results indicate a marked difference in visitor consciousness and understanding between water and riparian features.

Whereas 148 visitors recorded water as the subject of 458 photo graphs, we found only 157 photos showing water that had not been mentioned by the respondents. Conversely, only 16 visitors recorded taking 17 photos of riparian or wetland vegetation. However, we found 393 additional photos in this sample with unmentioned riparian vegetation, taken by 149 participants. Chenoweth (1984) cautioned against inferring importance to elements which are incidentally included in VEP photographs. Some riparian and wetland features were unavoidably included, for example, in photographs of water bodies. Nevertheless, the fact that 83% of the participants took 410 photos (20% of all the photos) that included water-dependent ecosystem features suggests that these ecosystems are important to Park visitors, although the visitors may not be sure just what the riparian areas are or what to call them.

Several questions on the follow-up survey were keyed to one of the respondent's own photographs. Photographs selected were coded by the research team to represent water and riparian areas, if available, water only if a riparian shot was not included in the photo set, or general Park scenery if neither riparian areas nor water were included. These questions dealt with the water and riparian areas of the Park, the potential impact of loss of some of these resources, and visitors' willingness to pay to help preserve water and riparian flora and fauna.

Those respondents who had a photo showing riparian vegetation were asked whether the plants in that picture were dependent on the nearby water body. Although very few of the respondents in the sample listed riparian vegetation as a photo subject, 63 of the 91 persons queried (69%) correctly stated that the riparian vegetation was dependent on the adjacent water body. A further 15% did not know, and 15% answered incorrectly.

Table 5
Detailed Results for Water and Riparian Vegetation Photographs

Photographic Category	Riparian Vegetation Feature	Water Features
Number of photos of these features noted by respondents	17	458
Number of respondents who photographed and stated these features	16	148
Mean number of photos per respondent who stated this category	1.06	3.09
Number of photos of these features noted by NBS staff (not by respondent)	393	157
Number of respondents who photographed but did not state these features	149	96
Mean number of photos per respondent who did not state this category	2.64	1.64
Total number of respondents who photographed these features[a]	149[a]	160[a]

Note. Results include both visitor-stated and researcher-identified photo subjects. Research team scanned all photos for water and for riparian vegetation.
[a]Some respondents noted some of their riparian and water photos but others did not; therefore, row 2 plus row 5 do not equal row 7.

When asked how reductions of the water and of the vegetation (shown in their photos), and of the wildlife dependent on that water and vegetation, would affect their experience of Rocky Mountain National Park, the respondents gave strongly negative ratings. On the 1-to-10 scale provided (I = "negatively affect my experience" to 10 = "positively affect my experience") over 90% of the responses were negative (1-to-5); the median was 2 and the mode 1 (the negative pole) for each resource loss listed. The average rating of a "one-third reduction in water" on this scale was 2.8 A "one-third reduction in vegetation" averaged 2.5, and a comparable reduction in wildlife was rated, on average, 2.3.

When asked how much they would be willing to pay (in addition to the current Park entrance fee of $5.00) to preserve these resources, the respondents averaged approximately $3.50; the median category was $2.00 and the mode split between $1.00 and $5.00. The willingness to pay (WTP) to preserve these resources was significantly different among User Groups (Pearson chi-square $p < .05$, df = 12). Campers were willing to pay the least ($2.26), and Drivers ($2.90), Hikers ($3.85), and Packers were willing to pay the most ($4.13). This variation in willingness to pay can be interpreted as correlating with the relative level of physical effort and the degree of getting away from the front-country exhibited by the different User Groups.

Another possible interpretation might be that campers, who were least willing to pay for preserving these resources, already are burdened with camping fees of $10-12 per night. However,

backpackers are also required to pay $10 for back-country reservations, and these Park visitors are willing to pay the most to preserve water and related ecosystems in RMNP.

Predictably, the willingness to pay to protect water and riparian resources correlated positively with household income ($p < .001$), but only about 4% of the variance of WTP was explained by income (R^2=.039). Interestingly, the group willing to pay the most, Packers, earn the least per household, although their earnings and number of earners did not differ significantly from the other User Groups.

Ratings of Importance for Selected Park Features

The follow-up survey asked respondents to rate, on a 1-to-10 scale, the importance of 14 listed Park features to their experience of RMNP. The purposes of these questions were, in part, to provide a verification cross-check for the photographic exercise-that is, were the features that were rated highly also photographed most often? However, these questions were also used to compare VEP with another questionnaire research method. Ratings of importance for these features were fairly uniform and quite high. Average ratings (rounded) ranged from 6 to 9; medians ranged from 6 to 10, and 11 of the 14 modes were "10," the maximum importance. Taking into account the average, median, mode, plus the frequency of minimum and maximum responses, these features were ranked in order of importance to the visitors' experience, as shown in Table 6.

Table 6
Rating of Listed Park Features by Importance to Experience

Rank-ing	Feature	Average rating	Median rating	Mode	Number at min. = 1	Number at max. = 10
1	Wildlife	9	10	10	2	87
2	Mountain Vistas	9	10	10	0	60
3	Forests	9	9	10	0	60
4	Rivers and Streams	9	9	10	0	57
5	Trails	8	9	10	5	57
6	Tundra	8	9	10	1	48
7	Wildflowers	8	8	10	2	41
8	Riparian Vegetation	8	8	10	2	41
9	Lakes	8	8	8 and 10	0	40
10	Mountain Meadows	8	8	8	0	34
11	Campgrounds	6	6	10	28	35
12	Paved Roads	6	6	10	16	24
13	Visitor Centres	6	6	8	11	18
14	Glaciers	6	6	7	15	18

Note. Scale of importance: 10 = extremely important, 1 = not at all important.

These rankings support the photographic evidence of importance of mountain vistas, wildlife, water, and vegetation to the visitors' experiences of the Park. Note that the lists of features in Tables 1 and 2 do not correspond completely with Table 6; the latter was generated before the fact, whereas Tables 1 and 2 were generated from the evaluation of photo subjects identified by the respondents. The relative rating for wildlife is higher in Table 6 than in Table 2, which may reflect a limited availability of wildlife for visitors to photograph.

Demographics

The survey respondents ranged in age from 11 to 75 years; both the average and median ages were 41 years. Drive-through visitors tended to be a bit older (Mean = 49 years) and backpackers a bit younger (Mean = 34 years). Three quarters of the survey respondents were married and 19% were single. The respondents were fairly evenly divided between men and women (48% and 52%, respectively). Ninety percent of the sample were Caucasian, 5% "other," 2% Native American, and 1% each Hispanic and Asian American. No African Americans participated in the study.

Generally, these visitors were well educated, 90% having more than high school educations, 59% with Bachelors' degrees or higher, and 28% with graduate or professional degrees. Their households generally included two adults, an average of 1.8 wage earners (median and mode = 2), few or no children (Mean = 0.6, median and mode = 0), and an average income of $56,000 per year.

Respondents in the photo exercise came from Colorado (25%), the Midwest/Great Lakes area (25%), Texas (10%), Europe and Canada (8%), and various other locations across the United States. The number of times these visitors had been to RMNP differed greatly, ranging from first-time to an estimate of 200 visits. The time spent in the park ranged from 1 to 32 days; the average stay was five days. These people tend to visit outdoor recreation locations fairly regularly, the average was 3.7 visits per year.

Conclusions

Findings for Rocky Mountain National Park

Water is a critically important element in visitors' experiences of the Park. The hypothesis was confirmed for water: 83% of the respondents took some photos specifically identified as water features (e.g., lakes, streams, waterfalls), and water was included in at least one photo of 89% of the VEP respondents. Water was the subject or included in 30% of all the RMNP photographs taken. Water features ranked, in number of photos, second only to vistas, which are the primary attraction of Rocky Mountain National Park.

The results concerning the importance of riparian areas are less conclusive. Although one fifth of all the photos taken by 83% of the VEP participants included riparian or wetland features, only 17 photos were actually labeled by the respondents to have this feature as the subject. Some of the riparian inclusion undoubtedly was coincidental; nevertheless, these features cannot be dismissed as unimportant.

The follow-up survey provides additional support to the hypotheses that water and riparian areas are important to visitors' experience of RMNP. When asked to scale the effect of the loss of some water, riparian vegetation, and wildlife resources on their experience, respondents listed all three losses as having very negative impacts. They further indicated that these resources were sufficiently important to them that they would pay an additional $3.50, representing a 70% increase in Park entrance fees, in order to preserve them.

Differences among User Groups have some important implications for Park management. The back-country users, in this study (Packers), were the most supportive of Park resource protection. This group was willing to pay more to protect water resources and water-dependent ecosystems despite having somewhat lower household incomes and having to pay extra fees for back-country permits. These are also the visitors who seek out the more remote areas of the Park and who have been shown in numerous recreation research studies to be most likely to be displaced if the resource becomes "overcrowded." That is, those visitors most likely to be lost are those who are most sup portive of management efforts to protect the Park.

In summary, this study has shown water and riparian resources to be important to visitors' experiences of Rocky Mountain National Park. Water ranked second in importance of all the Park features photographed. Although riparian resources were seldom mentioned by respondents, they were photographed in abundance, and a majority of visitors recognized the water-dependent relationship of these ecosystems. The locations where visitors currently go to experience these important resources are now stored in a geographically referenced data base at the Park. Rocky Mountain National Park visitors are willing to pay extra to protect these resources; their loss would have a serious negative impact upon these visitors' experiences of the Park.

Modification of VEP for Natural Resource Valuation

The advantages of VEP that were previously noted were observed in the Rocky Mountain National Park application. VEP operated as an objective, unprompted measure of feature importance. Visitors expressed interest and enjoyment in participating and gave an excellent response rate. The photography was not seriously restricted in either time or space and therefore depicts some of the dynamic nature of a RMNP visit.

However, there are clearly some identifiable limits that must be recognized in applying the VEP method. Identification of important resources is a function not just of preference but also of accessibility. Researchers must be careful not to assume that what has been photographed in a VEP study represents all of the resources preferred by visitors. Some very valuable resources or areas may have been currently or temporarily inaccessible.

Another potential difficulty in VEP comes from the lack of control over the spread of participants' photography. There could be sampling bias in selection of photo topics relative to the fixed number of exposures. Visitors might be so struck by the beauty or grandeur of the natural area under study that they would take many of their photos at their first location. Conversely, others might "save up" their photos for the very best (or worst) features, only to find much of their film unexposed at the end of their hike or drive. A cross-check of our GIS photo locations showed that the Drivers, Hikers, and Packers all distributed their photos over a variety of locations. Only the Campers tended to cluster their photographs in one area, around the campground. This could be interpreted as meaning campers do less exploring of the Park environs than the other User Groups, or it could simply reflect the fact that Campers spend all of their day in the Park, and half or more of that time is spent in the campground.

Visitor-employed photography was just one component of the research design used to measure resource value in Rocky Mountain National Park. The offer to send a complete set of the photographs taken during their Park visit was new and provided a strong motivational factor for the

participants in this survey. We believe it would be advantageous in future VEP studies to return copies of the complete photo log, as well as the photographs, to each participant. Many respondents also described this activity as important to them as a means of making a contribution to the management and protection of the Park, a resource they valued highly.

The innovation of keying the respondents to their own photographs for specific resource or landscape questions in the follow-up survey seemed to work quite well. Both the photographs and the photo-log entries provided important cues for recalling the experience. The effectiveness of these photographic cues is in part pictorial but, more importantly, because the photos and photo logs were self-generated, respondents were reviewing what they had seen, pictured, and written about these resources themselves. By keying the respondent to a specific photograph, and also providing what she or he had written about it, we were able to query in depth about specific resource questions in a context that was quite familiar to the participant. We believe this use of photo-cues has much broader applicability than experimented within this study. We selected just one photograph from each respondent set on which to focus questions about the water and riparian resources of research interest. A much broader set of resources could be keyed to several photos and their accompanying written descriptions for follow-up investigation in this fashion. Validation of the effectiveness of these photographs as cues to the experience is an important area of future research on this modified VEP method.

Finally, we correlated the photograph and survey information with a Geographic Information System [GIS], as had been suggested by Cherem and Driver (1983). We used the location stated by the respondent in the photo log, cross-checked and corrected by a panel of experts on the Park environs, to enter GIS coordinates of the location from which every photograph in this study had been taken. Park resource managers can use this data base as both word and picture identification of the most important accessible features of the Park and of the most significant problem areas. Thus, both critical features and critical vantage points can be located from this VEP-GIS data base and targeted for protection or improvement.

The ratings of Park features on the follow-up survey were intended as a comparison test with the VEP results. Those ratings did not appear to be as discriminating as the exercise of distributing 12 photographs among the most important features for the Park experience. However, the two exercises were qualitatively different; one was rating, the other distributional. Therefore, the comparison cannot be made quantitatively. But, in addition to the apparent greater discrimination of the photographic selection of features, the GIS location of key features and vantage points was possible with the photographic data, but not with the general feature rating results.

The RMNP study demonstrates the important potential of combining VEP with a follow-up study for investigating resource values and environmental perception. The full research potential of this VEP modification is just beginning to be explored, particularly as a technique for capturing without reshaping natural wildland experiences.

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Note

1. Cameras were donated to the Rocky Mountain Nature Association, a collaborator in this study. Use of product names in this report does not imply an agency endorsement.

References

Bradbum, N.M., Rips, L.J., & Shevell, S.K. (1987). Answering autobiographical questions: The impact of memory and inference on surveys. *Science*, 236,157-161.

Chenoweth, R. (1984). Visitor employed photography: A potential tool for landscape architecture. *Landscape Journal*, 3(2), 136-143.

Cherem, G.J. (1973). Looking through the eyes of the public. *In Proceedings of Aesthetics Opportunity Colloquium* (pp. 52-64). Logan, UT: Utah State University.

Cherem, G.J., & Driver, B.L. (1983). Visitor employed photography: A technique to measure common perceptions of natural environments. *Journal of Leisure Research*, 15, 65-83.

Cherem, G.J., & Traweek, D.E. (1977). Visitor employed photography: A tool for interpretive planning on river environments. In *Proceedings of River Recreation Management and Research* (pp. 236-244). USDA Forest Service GTR NC-28. St. Paul, MN.

Crandall, R. (I 980). Motivations for leisure. *Journal of Leisure Research*, I 1, 165-181.

Daniel, T.C., & Boster, R.S. (1976). Measuring landscape esthetics: The scenic beauty evaluation method. Research Paper RM- 167. Fort Collins, CO: USDA Forest Service.

Daniel, T.C., & Vining, J. (1983). Methodological issues in the assessment of landscape quality. In I. Altman & J.F. Wohlwill (Eds.), *Behaviour and the natural environment*. (pp. 39-84). New York, NY: Plenum Press.

Hull, R.B. IV, Stewart, W.P., & Yi, Y.K. (1992). Experience patterns: Capturing the dynamic nature of a recreation experience. *Journal of Leisure Research*, 24, 240-252.

Iso-Ahola, S.E., & Allen, J.R. (1982). The dynamics of leisure motivation: The effects of outcome on leisure needs. *Research Quarterly for Exercise and Sport*, 53, 141-149.

Ittelson, W.H. (1973). *Environment and cognition*. New York: Seminar Press.

Manfreds, M.J. (1984). The comparability of onsite and offsite measures of recreation needs. *Journal of Leisure Research*, 18, 245-249.

Manning, R.E. (I 986). *Studies in outdoor recreation: Search and research for satisfaction*. Corvallis, OR: Oregon State University Press.

Peterson, G.L., & Lime, D.W. (1973). Two sources of bias in the measurement of human response to the wilderness environment. *Journal of Leisure Research*, 5, 66-73.

Shelby, B.B., & Heberlein, T.A. (1981). *Carrying capacity in recreation settings*. Corvallis, OR: Oregon State University Press.

Stewart, W.P., & Hull, R.B. (1992). Satisfaction of what? Post hoc versus real time construct validity. *Leisure Sciences*, 14, 195-209.

Sudman, S., & Bradburn, N.M. (1 982). *Asking Questions*. San Francisco, CA: Josey-Bass.

Taylor, J.G., & Daniel, T.C. (1 984). Prescribed fire: Public education and perception. *Journal of Forestry*, 82(6), 361-365.

Taylor, J.G., Zube, E.H., & Sell, J.L. (1987). Land assessment and perception research methods. In R.B. Bechtel, R.W. Marans, & W. Michelson(Eds.), *Methods in environmental and behavioral research* (pp. 361-393). New York, NY: Van Nostrand Reinhold.

Traweek, D.E. (1977). *Visitor employed photography on the Huron River: A tool for interpretive planning*. Unpublished doctoral dissertation, Ohio State University, Columbus, OH.

Webb, E.J., Campbell, D.T., Schwartz, R.D., & Sechrest, L. (1966). *Unobtrusive measures: Nonreactive research in the social sciences*. Chicago, IL: Rand McNally.

Wilkinson, L., Hill, M., Weina, J.P., & Birkenbeuel, G.K. (1992). *SYSTAT Statistics*. Evanston, IL: SYSTAT, Inc.

Zube, E.H., Sell, J.L., & Taylor, J.G. (1982). Landscape perception: Research, application and theory. *Landscape Planning*, 9, 1-33.