Forest Science, Vol. 35, No. 1, pp. 76–90.

Perceived Scenic Beauty and Contingent Valuation of Forest Campgrounds

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ABSTRACT. Campers' photo-based scenic beauty judgments of 35 forest areas were compared with other campers' photo-based judgments of their willingness to pay to camp at the same areas. A nearly perfect linear relationship was found between the scenic beauty and willingness to pay judgments, indicating that respondents using either response mode were sensitive to the same variations in forest characteristics in providing their judgments. Forest conditions that produced perceptions of greater scenic beauty also increased the value that recreationists verbally assigned to their campground experience. FOR. SCI. 35(1):76–90.

ADDITIONAL KEY WORDS. Forest scenic beauty, forest recreation, recreation value, contingent valuation, forest campgrounds, ponderosa pine.

AT LEAST FROM THE TIME OF THE NATIONAL ENVIRONMENTAL POLICY ACT of 1969 the USDA Forest Service has operated under a mandate to systematically consider esthetics and outdoor recreation opportunity in the management of the National Forests. This mandate was reinforced and refined by the Forest and Rangeland Renewable Resources Planning Act of 1974 and the National Forest Management Act of 1976. Initial efforts to implement these policy directives focused on the development of expert assessment systems (Daniel and Vining 1983, Zube et al. 1982) such as the Forest Service landscape architects' Visual Management System (USDA 1974) and the Recreation Opportunity Spectrum (Buist and Hoots 1982). These systems produce categorical classifications of forest areas based on an expert evaluation of the characteristics of the area. The resulting classifications typically enter the planning process as part of the inventory of resources and in the form of general guidelines and constraints to management actions.

While recreation opportunity and scenic beauty are sometimes treated as separate concerns in legislation and management guidelines, they are frequently considered to be closely related and occasionally even synonymous. For example, more stringent visual quality objectives may be specified as a way of protecting recreation values, and recreation use of an area

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will often be used to justify increasing the assigned "sensitivity" of the area to visual/scenic impacts.

The relationship between esthetic or scenic quality concerns and recreation value is important for several reasons. Depending on the nature of that relationship, forest management actions to achieve scenic quality objectives could conflict with recreation values. Alternatively, if scenic beauty and recreation value were very closely (positively) related, then assessments of the scenic and recreational consequences of management actions could be redundant, potentially resulting in a "double-counting" of benefits. In any event, effective management of scenic and recreation resources requires a clear understanding of their interrelationships and means to predict the effects of forest management actions on both.

Brown and Daniel (1984) hypothesized that the relationship between scenic quality and recreation value could be represented as a continuum. At one extreme, the value of recreation activities such as driving for pleasure and picnicking may rely heavily on the scenic quality of the environment in which those activities take place. At the other extreme, the value of recreation activities that have a strong performance element, such as abseiling or white-water kayaking may have a lesser dependence on the scenic quality of the surrounding environment. Taylor and Daniel (1984) found some evidence of such a continuum in scenic beauty to recreation value relationships in the context of a study of public perceptions and attitudes toward the effects of fire on forest environments. Fire was found to have very similar effects on perceived scenic beauty and judged quality of forest areas for picnicking. The relationship was not so strong between scenic beauty perceptions and judgments of the quality of forest areas for hiking or for nature study. While both scenic beauty and suitability for camping were similarly affected by less severe fire (low intensity burn), camping quality judgments were more adversely affected by more severe fire (high intensity burn) than were scenic beauty judgments.

The continuum hypothesis seems intuitively appealing, and there is some data that is supportive. There are other findings, however, that indicate that the relationship between scenic beauty and recreation value may be more complex. For example, Wellman et al. (1982) surveyed recreators engaged in walking or in off-road vehicle use at Cape Hatteras National Seashore, and also backcountry visitors to Shenandoah National Park. These activities could be viewed as nearly spanning the extremes of recreation activities with respect to their dependence on scenic beauty. Somewhat surprisingly (especially to managers who were asked to estimate the values of the recreator groups), all three groups indicated that "enjoying scenery" was the most important factor affecting the quality of their recreation experience.

The value of forest camping experiences almost certainly depends to some extent on the conditions of the surrounding forest landscape. However, conditions that are most suitable for camping may not be optimum for scenic beauty. Scenic beauty models (e.g., Brown and Daniel 1986) indicate that downed wood and dense stands (with low visual penetration) are negative factors. These same features might be viewed as positive for forest campers, seeing downed wood as a fire wood supply and dense stands as providing privacy. There are also undoubtedly other factors important to campers that are not related to forest conditions or scenic beauty, including the number, quality and condition of physical facilities (toilets, tables, and fireplaces); the social conditions at the site (crowding, noise, and privacy); and special features (streams or lakes, fishing, and wildlife). Thus, the relationship between forest scenic beauty and the value of forest camping expe-

rience is not necessarily direct. Indeed, the relationship may well be quite complex.

Determining the relationship between scenic beauty and the value of forest camping experience requires relatively precise assessments of both in the context of specific changes in relevant conditions at forest camping sites. Two methods that offer the needed precision and the opportunity to systematically relate both scenic beauty and value of camping experience to changes in specific features of the forest are the "psychophysical" method for assessing scenic beauty, developed by environmental psychologists, and the "contingent value method," developed by resource economists, for assessing the value of camping experience.

The Scenic Beauty Estimation method (Daniel and Boster 1976) assesses scenic beauty in terms of the perceptual judgments of observer panels. Observers are sampled from some population of interest and asked to indicate their judgments or preferences for different levels of environmental quality. Environmental conditions are typically represented by color slides or prints and respondents indicate their judgments using a 10-point rating scale. Responses of a number of respondents are subjected individually to a psychometric scaling routine and then aggregated to provide a standardized (interval scale) index of preference or perceived quality. This basic methodology has been applied in a number of environmental assessment contexts (e.g., Shafer 1964, Peterson 1967, Kaplan et al. 1972, Daniel et al. 1973, Shafer and Richards 1974, Zube 1974). Recent applications (e.g., Schroeder and Daniel 1980, Benson and Ullrich 1981, Buhyoff et al. 1982, Vining et al. 1984, and Brown and Daniel 1986) have shown the method to be reliable for gauging the effects of forest management practices on public perception of scenic beauty of forest areas.

The contingent valuation method is based on eliciting individuals' responses to hypothetical markets. In a typical application respondents are asked their "willingness to pay" for different levels of environmental quality (e.g., levels of scenic beauty, air quality, water quality, or access to various recreation opportunities). The environmental quality levels may be described verbally or represented graphically, as by photographs or computer simulations. The respondent may "bid" different amounts that he or she would be willing to pay in the form of a direct payment, extra taxes, utility bills, or some other "payment vehicle." A number of variations on the basic format have been used, but the goal is to use responses to the hypothetical market to estimate the economic value of the environmental quality level (or change in level) represented (Cummings et al. 1986, Rowe and Chestnut 1982). These contingent values have the advantage of providing relatively precise (cardinal) measures of value that are potentially commensurate with other costs and benefits of environmental change.

Contingent valuation and scenic beauty estimation methods were applied in the present study to assess the effects of forest conditions in developed campgrounds on campers' perceptions of the value of their camping experience and of the scenic beauty of the surrounding forest. The present experiment sought to determine the relationship between perceived scenic beauty and estimated value of camping experience over a range of forest conditions that typically occurs in developed campgrounds in northern Arizona forests.

METHOD

Study sites representative of northern Arizona forest campground areas were selected to represent a range of overstory and understory character-

istics as well as general features such as slope, aspect, and habitat type. In conjunction with a biophysical inventory, the sites were systematically photographed.

Several color prints for each site were mounted on separate pages of a "photo album," which was shown to campers in the context of a personal interview. Each respondent saw the photo pages in one of six predetermined random orders. One-half of the respondents rated the area represented by each page of prints for *scenic beauty*. The other half of the respondents provided *contingent value* estimates of maximum willingness to pay, in the form of total trip expenses, for a hypothetical camping trip to an area with forest characteristics like those represented in the prints. Expense estimates and scenic beauty ratings for each of the forest sites represented in the photo pages were appropriately scaled and aggregated to yield an index of willingness to pay and of scenic beauty, respectively.

Study Areas

The study areas consisted of 20 timber stands and 12 USDA Forest Service campgrounds, located on four National Forests in northern Arizona. The elevation of the study areas ranges from 5,600 ft to 7,600 ft. The timber stands were all predominately ponderosa pine, with some stands having mixes of gamble oak or juniper. Stands included various mixes of small, intermediate, and mature sawtimber, pole timber and saplings (a more detailed description of the 20 stands is found in Brown and Daniel 1984).

The 12 campground sites represent a range of forest conditions, including various tree age classes, densities, stories, and species. Most are predominantly occupied by a two-storied ponderosa pine stand. An exception is Ashurst Lake campground, which is located in a mixed stand of one-seed juniper and ponderosa pine. Each campground has either a lake or stream nearby and includes a standard set of facilities such as parking spaces, restrooms, drinking water outlets, picnic tables, firepits, and grills. The season of use is principally from Memorial Day to Labor Day.

Photographic Representation of Study Areas

In each of the 20 timber stands, 4 color slides were taken at each of 15 randomly located inventory points according to the procedure described by Brown and Daniel (1984). Six of the 60 available slides from each stand were randomly selected to represent the stand to campground respondents. In each of the 12 campgrounds, 30 color slides were taken at randomly selected locations under the constraint that the scenes did not contain people or manmade features, such as lakes, picnic tables, vehicles, or tents. The photos showed only the surrounding forest as viewed looking out from the campsites and thus showed scenes similar in character to those in the photos of the 20 timber stands. Slides from each campground were visually inspected for photographic quality (exposure, focus, etc.) and sets of 6 acceptable slides were randomly selected for presentation to campers. One campground was represented by 2 sets of scenes (12 slides) and another by 3 sets (18 slides) to provide a preliminary test of the reliability of the photo representation procedure. The other 10 campgrounds were each represented by 1 set of 6 slides.

Three by five-inch prints were made of each selected slide. A total of 35 sets of 6 prints each were produced, one set for each of the 20 timber stands,

one for each of 10 campgrounds, 2 for one campground, and 3 for the other campground. The prints of each set were mounted in a 3 × 2 array on separate pages of a photo album, which was shown to campers.

General Survey Procedure

Direct personal interviews were conducted with campers sampled at each of the campgrounds during the summer of 1985. At one of the campgrounds, Knoll Lake, the water supply failed early in the study, resulting in substantially reduced use and discontinuation of surveys at the site. As a result, the responses obtained at Knoll Lake were dropped from the study, although responses about the Knoll Lake photo set obtained at other campgrounds were retained. Table 1 lists the 11 retained campground samples.

Three trained interviewers visited the campgrounds following a predetermined sampling schedule. Individual campers were approached at their campsites and asked to participate in the interview. Two interviewers operated as a team to survey campers at the Spillway, Christopher Creek, and Canyon Point campgrounds during June. This same team then surveyed campers at Kaibab Lake, White Horse Lake (A and B) and Dogtown campgrounds in July. The third interviewer surveyed Ashurst, Pine Grove, Dairy Springs, and Rock Crossing campgrounds during both June and July. The assignment of interviewers and sample times were determined by the geographic distribution of the sites and the time and personnel available for the study.

The interview was composed of three sections: (1) an initial set of questions regarding the current camping trip; (2) the scenic beauty or contingent valuation responses to the hypothetical areas represented in the photo albums; and (3) some basic demographic questions about the respondent. The initial questions covered items such as the length of stay, number in the party, previous trips to the sample site, other destinations on the current trip, and trip expenses.

At the end of the first section, preceding the photo survey section of the interview, all respondents were asked to estimate their (household) expenses for the trip. Respondents were specifically asked to estimate their party's expenditures for gasoline, food and beverages, and campground and rental fees for the Arizona part of their trip. The three amounts were summed by the interviewer and divided by the number of days to be spent in Arizona to get a total dollar expenditure per day for the Arizona part of the trip. The daily expenditure was multiplied by the number of days the party would be staying at the campground to obtain a total expenditure per party for the stay at the campground, the Expense TOTal, or *ETOT*.

After confirming (or correcting) the final calculated ETOT, the respondent was told:

> We are interested in knowing how much more you (your household) would have been willing to spend on this trip before deciding not to come to this campground—that is, before deciding to do something else or to stay at home.

The interviewer then asked, "How much MORE would you have been willing to spend?" The sum of ETOT and MORE, then, was taken as the respondent's expressed maximum willingness to pay (via incurred expenses) for the current trip to the campground.[1] The interview then pro-

[1] It is a "compensating variation" measure because the initial and reference levels of utility are the pretrip level (Brookshire et al. 1980, Just et al. 1982).

TABLE 1. Interview sites and characteristics of respondents.

Campground	National Forest[a]	Respondent type	Sample size	% male	Mean age (yr)	Mean income[b] ($1000)	Mean stay (days)	Mean number of people	% first time
Ashurst Lake	CO	SBE	60	44	43	32	2.6	3.0	49
		CVM	62	55	46	31	3.5	2.7	48
Canyon Point	AP	SBE	108	41	54	37	5.2	2.4	34
		CVM	112	57	54	37	5.2	2.4	36
Christopher Creek	TO	SBE	106	44	41	31	3.3	3.0	43
		CVM	106	48	40	32	3.2	3.1	43
Dairy Springs	CO	SBE	59	49	46	31	6.7	3.0	54
		CVM	62	47	47	33	6.4	3.1	55
Dogtown Reservoir	KA	SBE	39	42	46	36	3.2	2.8	42
		CVM	36	53	47	37	3.2	2.9	47
Kaibab Lake	KA	SBE	81	44	43	33	3.3	3.0	58
		CVM	80	48	44	33	3.5	3.2	55
Pine Grove	CO	SBE	60	48	53	28	6.7	2.4	32
		CVM	63	57	55	29	6.3	2.4	39
Rock Crossing	CO	SBE	51	40	39	35	3.1	2.8	62
		CVM	49	49	40	38	2.9	2.9	65
Spillway	AP	SBE	91	48	42	33	4.0	3.1	46
		CVM	91	54	42	35	3.7	3.2	41
Whitehorse A	KA	SBE	53	50	43	29	3.5	3.2	42
		CVM	55	47	42	31	3.6	3.3	39
Whitehorse B	KA	SBE	102	42	43	33	3.9	2.9	40
		CVM	102	56	43	34	3.9	2.9	40

[a] CO = Coconino, AP = Apache-Stigreaves, TO = Tonto, KA = Kaibab.
[b] Mean of interval midpoints for each respondent.

ceeded to the photo-based evaluations with half of the respondents following the scenic beauty rating procedure and half following the contingent valuation procedure as described below.

Scenic Beauty Survey Procedure

Half of the respondents in the survey were asked to rate the scenic beauty of the forest areas depicted in the 35 photo pages. Each respondent first looked through all 35 pages of photos "to get an idea of the types of areas represented" and then assigned a rating to each area shown in the photos using a scale that extended from 1 (low scenic beauty) to 10 (high scenic beauty). Respondents were instructed that they were to rate the areas represented by the photos, not the photos themselves.

Following the interviews, scenic beauty ratings obtained for each respondent were first inspected, and any respondent not recording a rating for each photo set was dropped from the sample. Consistency with other respondents in the appropriate campground sample was also assessed; any respondent producing a correlation with the mean ratings for his/her campground sample that was less than 0.05 was dropped from the sample. The number of respondents dropped for these reasons ranged from 0 in the Rock Crossing sample to 11 (9%) in the Canyon Point sample. The resulting sample sizes are listed in Table 2.

The scenic beauty ratings of retained respondents were then scaled to Scenic Beauty Estimates (SBEs) using the "by slide" procedure (Hull et al. 1984, Brown and Daniel 1984, Daniel and Boster 1976). This procedure, based on Thurstone's theory of categorical scaling (Torgerson 1958), yields an interval scale measure of perceived scenic beauty. The origin of the SBE scale was determined in this case by the average rating across all 35 photo sets. Each campground sample was scaled independently, so that SBEs were obtained for each photo set for each campground sample.

TABLE 2. Trimmed sample size, reliability coefficient, and mean scenic beauty rating and CV *values for 11 campground samples.*

	Contingent valuation sample			Scenic beauty sample		
Campground	Sample size	IRC[a]	Mean[b] *CV* ($)	Sample size	IRC[a]	Mean[b] scenic beauty rating
Ashurst Lake	45	0.83	0.45	54	0.92	5.83
Canyon Point	100	0.96	0.19	97	0.98	5.69
Christopher Creek	86	0.95	−0.77	101	0.98	5.61
Dairy Springs	57	0.91	−0.21	56	0.95	6.08
Dogtown Reservoir	33	0.91	0.11	38	0.93	6.10
Kaibab Lake	70	0.93	−0.22	79	0.97	5.94
Pine Grove	52	0.89	−0.58	53	0.96	6.18
Rock Crossing	46	0.92	0.05	51	0.94	6.29
Spillway	80	0.94	−0.65	82	0.97	5.67
Whitehorse A	46	0.92	−0.40	50	0.96	6.19
Whitehorse B	92	0.96	−0.03	96	0.98	5.76
Total	707			757		

[a] Intra-class reliability coefficient (Ebel 1951).
[b] Mean response across 35 photo sets.

CONTINGENT VALUATION SURVEY PROCEDURE

For the other half of the respondents, a variation of the contingent valuation method was used to elicit willingness to pay to camp at the campground where they were sampled given that forest characteristics were as depicted in a page of color prints. The interview process and the adjustments made to the responses were designed to ensure that valid estimates were derived and to provide a contingent valuation measure for the areas represented in the photographs that could be compared to the scenic beauty indices.

Respondents were given a response sheet on which their maximum willingness to pay (sum of ETOT and MORE, obtained as described above) was written and were asked to respond to the following question with regard to each set of photographs:

> On the lines below, please indicate the most you would have been willing to spend on this trip if forest conditions at this campground, all other things being equal, were like the forest areas depicted in the photos.

Respondents first looked through the entire book of photos to get a "preview" of the forest areas represented. They then proceeded to indicate on the response form the maximum expense that they would be willing to incur for a camping trip to a forest area like that depicted in each of the photo sets. The expressed maximum expenses the respondent was willing to incur were used as the basic measure of the recreational value of a trip per party to the campground if forest conditions were as depicted in each of the 35 photo sets.

Any respondent not recording an expense estimate for each photo set was dropped from the sample. Between 2 and 9 respondents were dropped from each of the 11 campground sample groups. The value index for the contingent valuation assessment of the photos was then expressed in dollars as net willingness to pay in terms of expenses per individual per day. The value index, *CV*, was calculated as:

$$CV_{ij} = (MAX_{ij})ETOT_j / (D_j * N_j) \quad (1)$$

where Max_{ij} = the maximum expense respondent j was willing to incur for the current trip to the campground if the forest had the appearance depicted in photo-set i;

$ETOT_j$ = current trip expense estimate for respondent j;

D_j = the number of days for respondent j's current trip;

$_j$ = the number of people (in the household) on respondent j's current trip.

CV_{ij}, then, was the amount more (or less) per person per day that a respondent estimated his or her household would be willing to spend given forest conditions as depicted in the photographs. Any respondent producing a standard deviation of 0 over the 35 photo set estimates was considered to have "rejected" the *CVM* procedure and was dropped from the sample.[2] A

[2] It is possible that a person reporting identical estimates of willingness to pay for all 35 photos was indicating that he/she found no differences among the 35 different conditions, or at least assigned no monetary value to the differences. In any case, as reported in footnote 6, removing these respondents did not significantly affect the results.

total of 24 cases (2.9%) were dropped as a result of this rule, leaving the sample sizes listed in Table 2. *CV* responses were further "trimmed" by elimination of extreme values. Individual *CV* estimates that were three standard deviations or more above the sample mean *CV* were dropped from the sample as being "strategic" responses or coding errors. A total of 480 estimates (1.8%) were dropped by this rule. CV_{ij} were then averaged across respondents to yield mean *CV*s for each photo set (CV_i) for the various respondent groups.

RESULTS

RESPONDENTS

The number of campers interviewed at each site varied depending on the number of campsites and campers visiting during the survey period. As shown in Table 1, the number of campers interviewed ranged from 75 at Dogtown Reservoir to 220 at Canyon Point.

Inspection of Table 1 reveals considerable similarity among the 11 campground samples. The Ashurst Lake and Rock Crossing samples tended to have shorter stays, about 3.0 days, and the Dairy Springs and Pine Grove samples had the longest stays, about 6.5 days. Canyon Point and Pine Grove respondents tended to be older (about 54 years) and Rock Crossing respondents were younger (about 40 years) than the overall average. These same campground samples also yielded the fewest and the most first-time visitors, respectively about 36% and 63%. For the most part, however, there were few substantial differences between campground samples.

Table 1 also reveals strong similarity between the scenic beauty rating and contingent valuation samples, as was expected given the random assignment of respondents to the two versions of the survey. In addition, there were no significant differences between the two respondent categories in their estimates of current trip expenses (*ETOT*) or additional willingness to pay (*MORE*).

Intraclass reliability coefficients (Ebel 1951) were computed for the scenic beauty and contingent valuation samples at each campground. These coefficients ranged from 0.83 to 0.98, and all but two were greater than 0.90 (Table 2), indicating that the scenic beauty rating and *CV* values obtained from similarly drawn samples of recreationists at each of the campgrounds would be expected to be very similar to those reported here.

RELIABILITY OF PHOTO REPRESENTATIONS

The 20 timber stands depicted in the color prints had earlier been evaluated for scenic beauty, offering an opportunity to compare results with the photo-book representation procedure. All 60 slides available for each stand were individually rated for scenic beauty by groups of student volunteers at the University of Arizona (Brown and Daniel 1984). The individual slide *SBE*s were then averaged to yield an overall *SBE* for each stand. Correspondingly, the *SBE*s for the same 20 stands obtained during the campground interviews were averaged across campground samples to yield one *SBE* for each of the 20 stands. The correlation of the color-slide *SBE*s and the photo-set *SBE*s for the 20 stands was 0.90, indicating both procedures produced very similar relative scenic beauty judgments.

Another check of reliability was provided by the two campgrounds that were represented by more than one photo-set. Pine Grove was represented

by two photo-sets and Kaibab Lake by three sets. Comparison of *CV* and *SBE* values (averaged over the total *CVM* and *SBE* samples, respectively) in separate one-way ANOVAs revealed highly significant differences among the 35 photo-sets, F (34/24004) = 148.32, $P < .001$, and F (34/25704) = 253.69, $P < .001$, respectively. Post-hoc multiple comparisons tests (Winer 1971) were used to assess the differences between the repeated photo representations. The conservative Scheffe test found no significant differences in *SBE*s or *CV*s between the two photo-sets representing Pine Grove (mean *SBE* = 7.1 and 7.0, *CV* = 2.0 and 1.6) or among the three Kaibab Lake sets (*SBE* = 6.7, 6.4, and 6.1; *CV* = 1.7, 0.8, and 0.3). A less conservative Tukey "Wholely Significant Difference" test found the highest and lowest *SBE/CV* of the three Kaibab Lake samples to be significantly different, but neither was different from the middle sample. The two Pine Grove samples were not significantly different for either the *SBE* or the *CVM* analysis.

Taken together, the results of these analyses indicate that the representation of the forest surrounding the campgrounds by color photo-sets was successful. Earlier studies in which the 20 stands were represented by 60 color slides each produced the same relative *SBE* values as did the photo-sets of 6 color prints. Though one test found a significant difference between the two most divergent Kaibab photo-sets, there were no substantial differences between multiple photo-set representations for two of the campgrounds.[3]

Campground Sample Comparisons

Scenic beauty rating and *CV* judgments for the photo sets were very similar between the different campground samples. The mean values across all 35 photo sets shown in Table 2 reveal little difference from one respondent sample to another. Mean scenic beauty ratings ranged from a high of 6.29 for the Rock Crossing sample to a low of 5.61 for the Christopher Creek respondents. The Ashurst Lake campground sample produced the highest average *CV*, \$0.45, and the Christopher Creek sample produced the lowest, \$−0.77.

Two-way analyses of variance (with the number of observers in each campground group randomly reduced to 35 for all groups) for the scenic beauty rating and *CV* measures showed that mean responses to the photo sets were not significantly different across campground samples. For scenic beauty ratings, campground was not significant, with F (10,374) = 1.74, and the effect of photo-set was again highly significant, with F (34,12716) = 109.54, $P < .001$, and explained (eta squared) 23% of the variance in ratings. For *CV*, campground was again not significant, with F (10,352) = 1.00, but the effect of photo-set was highly significant, with F (34,11968) = 81.63, $P < .001$, and explained 19% of the variance in willingness to pay. The two-way interaction, photo-set by campground sample, did prove statistically significant in both analyses, F (340,12716) = 1.38, $P < .001$, and F (340,11968) = 1.50, $P < .001$ for scenic beauty ratings and *CV*s, respectively. However, the interaction accounted for only 4% of the variance in each case, indicating that there were not substantive differences in the rela-

[3] The photo-based estimates of both *CV* and *SBE* were consistently lower than the estimates for the same campground areas when made on-site for the current trip. The relationships between photo-based evaluations and on-site evaluations are complex, and have been addressed in detail in a companion paper (Brown et al. under review). The focus of the present paper is on a comparison of photo-based *CV* and *SBE* values.

tive scenic beauty or *CV* values assigned by the different campground samples.[4]

The intercorrelations among campground samples for scenic beauty and contingent valuation responses to the 35 photographed areas indicates the extent to which the samples agree about the relative value of the areas. The 55 pairwise correlations between the *SBE*s of the 11 different respondent groups range from a low of 0.78 between Rock Crossing and Christopher Creek to a high of 0.97 between White Horse A and B, with a median of 0.92.[5] The 55 pairwise *CV* correlations range from a low of 0.79 between the Ashurst Lake and the White Horse A samples to a high of 0.96 for the Christopher Creek and White Horse B samples, with a median correlation of 0.93. Even the lowest values indicate high agreement in the relative *SBE* and *CV* values, respectively, for the depicted forest conditions. Overall, there is clearly very good agreement between campground samples in both the *SBE* and the *CV* values derived for the 35 areas represented in the photo book pages. Further analyses, then, are based on aggregate measures of *SBE* and *CV*, with values for each photo set averaged over the 700+ respondents without respect to the campground in which they were sampled.

Comparison of SBE and CV

The principal objective of the present study was to determine the relationship between perceived scenic beauty of the forest and the value of forest recreation experience. Figure 1 presents a plot of the grand mean *SBE* against the grand mean *CV* for each of the 35 photo-page areas. The relationship is strongly positive; the simple correlation coefficient is 0.96, indicating a nearly perfect relationship. Inspection of the scatter plot in Figure 1 reveals that the consistency between *SBE* and *CV* values is uniform over the entire range of both variables; as the judged scenic beauty of the forest increases, campers' estimated willingness to pay (in expenses) for a camping trip to the area increases proportionately.

Figure 1 indicates a range in net willingness to pay of about $7 per person per day over the obtained range of *SBE* values ($20 on a household per day basis). That is, campers in general indicated a considerable willingness to pay for improved scenic beauty of the surrounding forest, when assessed in

[4] Interestingly, it was the Ashurst Lake campground sample that yielded the greatest departure from the pattern of the other campground samples; Ashurst campers gave higher *SBE*s and higher *CV*s for the Ashurst photos. Because the Ashurst campground was primarily juniper forest with a few ponderosa pine, it was the most distinguishable from the other sites assessed. The Ashurst sample, unlike the others, almost certainly recognized the photos of their campground, and apparently elevated their assessments of those photos.

[5] In two additional experiments, ratings were obtained in a classroom setting from observers with no direct involvement with the campgrounds. In one experiment, the notebooks of color prints that were used in the campground interviews were rated by 78 students of introductory psychology classes at the University of Arizona (UA) and by 21 forestry graduate students at Northern Arizona University (NAU). The students' *SBE*s correlated 0.83 (UA) and 0.89 (NAU) with camper's *SBE*s (the UA and NAU SBEs correlated 0.87 with each other). In the other experiment, 35 sets of 6 color slides corresponding to the 6 prints found on each page of the notebooks were rated by 33 UA undergraduates and by 44 NAU undergraduates. Respondents provided one rating for each set of 6 sequentially projected slides, using methods described by Brown and Daniel (1984). Students' *SBE*s of the slide sets correlated 0.79 (UA) and 0.84 (NAU) with the campers' *SBE*s.

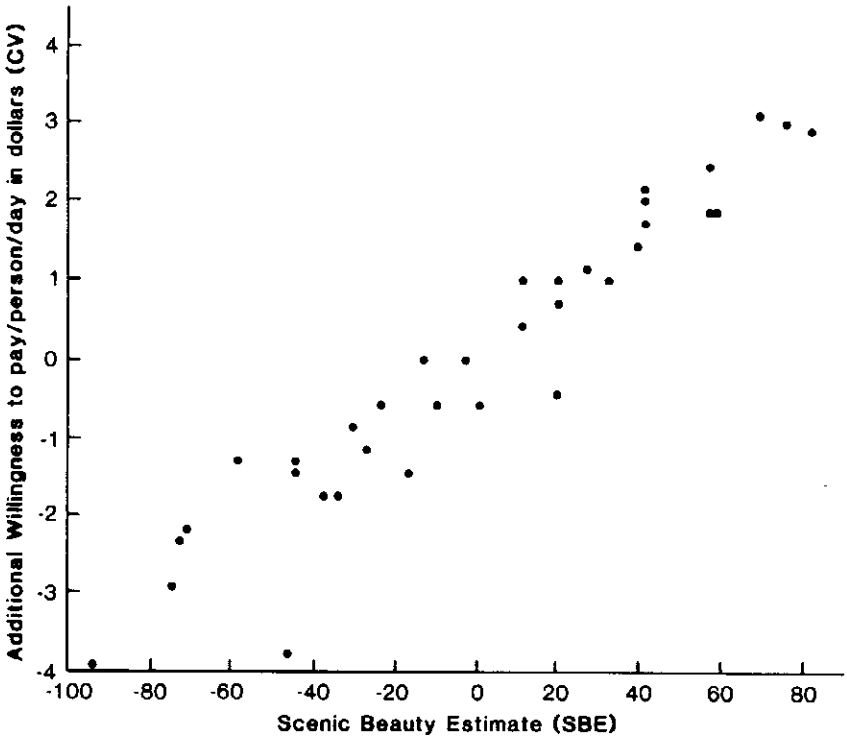

FIGURE 1. Relationship between perceived scenic beauty (*SBE*) and willingness to pay (*CV*) for 35 forest areas represented by sets of color photographs.

the context of constant levels of all other features of the camping experience.[6]

DISCUSSION

Of principal interest in this study are the contingent valuation and scenic beauty responses about 35 forest areas depicted by sets of color photographs. Those responses were obtained from campers sampled at 11 Forest Service campgrounds in northern Arizona. One-half of the sample at each campground responded to scenic beauty questions about the photos and the other half responded to contingent valuation questions. Respondents were told that the photo sets represented alternative forest conditions for campgrounds similar to the campground where they were.

The responses were very consistent across campground samples, as indicated by the intercorrelations among the *CV* responses and among the *SBE* responses of the 11 sample groups. Additional evidence of the consistency of the results is the high correlation between *SBE*s of campers' responses to

[6] The procedures used to trim and aggregate scenic beauty and contingent valuation responses are typical of those used in other applications of these techniques. They were employed here to arrive at what we consider to be the best estimates of *SBE* and *CV* for the forest areas studied. However, it should be noted that these procedures did not significantly affect the reported relationship between *SBE* and *CV*. Correlations between *SBE* and *CV* were also computed individually for each of the 11 campground sample groups with all respondents included (i.e., before any trimming). The obtained correlations ranged from .82 to .96, with a median of .92.

20 of the photo sets and *SBE*s of student volunteers to a much larger set of color slides of those same 20 areas. Furthermore, students in a classroom setting, who had no personal involvement with the campgrounds rated the forest scenes of the campgrounds similarly to the campers. The consistency of the contingent valuation responses is notable because it holds across 35 levels of a multidimensional stimulus. Previous contingent valuation studies have typically obtained responses to at most 4 or 5 levels (Cummings et al. 1986).

The principal finding of this study is that the correlation between mean *SBE* and mean additional willingness to pay (*CV*) for the areas depicted in the 35 photo sets was nearly unitary (see Figure 1). Both response models elicited the same preference ordering. That is, subject to a linear transformation, the scenic beauty and contingent valuation measures were essentially identical for the forest stimuli used in the study. This indicates that scenic beauty and contingent valuation respondents were both sensitive to the same variations in forest characteristics—that the forest characteristics that influence perceived scenic beauty also influence perceived value of camping, all else equal.

The strong linear relationship between *CV* and *SBE* has several implications of interest. First, campers' expressed willingness to pay for forest characteristics, other features of the campground being equal, is closely related to scenic beauty, as indicated in Figure 1. Thus, models of forest scenic beauty, developed from regressing measures of perceived scenic beauty on measures of forest biophysical characteristics (e.g., Buhyoff et al. 1982, Schroeder and Daniel 1981, Hull and Buhyoff 1986, Brown and Daniel 1986) should indicate forest features that are important to the value of forest camping experiences. For ponderosa pine forests similar to those of this study, scenic beauty models indicate that large trees, lush low ground cover, openness in the stand, and the lack of downed wood all contribute to improved scenic beauty. These same features were found to affect the value that campers' assigned to their experience.

It must be acknowledged, however, that the strong linear relationship found between *SBE* and *CV* is based on responses to sets of photos that differed only on a subset of the factors that might be expected to affect camping quality. The photo sets differed only in terms of the characteristics of the surrounding forest, and the contingent valuation respondents were instructed to indicate willingness to pay assuming everything about the campgrounds except the forest characteristics remained the same as in the campground where they were interviewed. The close correspondence between perceived scenic beauty and the value of camping might not hold if other campground features (e.g., facilities, crowding) were varied in addition to forest characteristics. It is possible that variations in these other features would be of sufficient importance to campers that the sensitivity to forest characteristics found in this photo-based assessment would not be found, or would be different. Still, these data do support the conclusion that scenic beauty of the surrounding forest makes an important contribution to the value of recreators' camping experience. The relative importance of forest scenic beauty as compared to other features of campgrounds, and the potential interaction of forest characteristics with other social and physical characteristics of campgrounds should be addressed in future research.

It is also worth noting that the close correspondence between *SBE* and *CV* found at campgrounds might not be found for other forest recreation activities. For example, judgments of the quality of forest areas for hunting would very likely differ from scenic beauty judgments, much as the judg-

ments of quality of forest areas for nature study differed from scenic beauty judgments in the study by Taylor and Daniel (1984).

CONCLUSIONS

Three conclusions seem warranted based on this research. First, both the scenic beauty and willingness to pay measures appear to be very reliable. This is supported by the within-group reliability coefficients and by the agreement among different respondent samples about the relative scenic beauty or contingent value of the 35 photographed areas. Second, the very close correspondence between the two measures indicates that perceived scenic beauty of forest environments, at least in ponderosa pine, is closely related to perceived value of those environments for camping, all else (i.e., other campground characteristics) equal. Third, the importance of the "all else equal" qualification, and the corresponding importance of various other features of campgrounds relative to scenic beauty and the monetary value of camping, should be investigated in future research.

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