A PSYCHOLOGICAL MODEL OF SCENIC BEAUTY BY SILVICULTURAL TREATMENT TWO GROWING SEASONS AFTER HARVEST

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Abstract—This study estimated summer scenic beauty and associated psychological attributes of scenes depicting uncut and several cutting regimes within shortleaf pine-hardwood forests on national forests. Images were captured in the summer of 1994 in nine treated and three comparable untreated stands in the Ouachita Mountains of Arkansas. Treatments imposed in the winter of 1992-93 included group selection, pine-hardwood shelterwood, and clearcut in north, east, and south quadrants of the region. Landscape Architecture professionals, students with professional training, and other students with no training, rated scenic beauty preferences and associated psychological attributes. Analysis of rankings showed significant differences ($P(F)<0.05$) in psychological attributes by treatment type and the background of judges. For all judges, more intensive cutting yielded significantly less scenic beauty, mystery, coherence, and complexity, and greater visual penetration. Legibility, a term used to describe finding one's way, was not significantly associated with cutting treatment. Scenic beauty preferences were indistinguishable among intermediate (shelterwood and group selection) treatments, although group selection was likely the least offensive because it provided mystery, complexity, and visual penetration comparable to untreated areas. There were significant quadrant-by-treatment interactions, suggesting that local conditions also affect the impact of treatments on scenic beauty. Our results lend quantitative credence to the qualitative notion that adapting cutting practices to limit visual penetration and increase coherence, complexity, mystery, and scenic beauty can yield measurable aesthetic benefits.

INTRODUCTION

The National Environmental Policy Act of 1969 requires environmental impact analyses for major projects on Federal land, including assessments of aesthetics. In general, older timber stands and those with open, park-like settings and limited understory vegetation are preferred; young stands and the presence of abundant logging slash from recent cutting are not (Ribe 1989). While the negative impact of timber harvests on scenic beauty of forested land is well known (Benson and Ullrich 1981, Jones 1993, Ribe 1989, Vodak and others 1985), it is poorly understood.

Any scientific assessment of aesthetics uses approaches rooted in psychology or psychophysics (Daniel and Vining 1983). Psychophysics studies the relationship between physical objects and the aesthetic preference of respondents. Through measurement of physical objects, such as the number of tree stems, and a series of preference ratings, the scientist can develop models that relate objects to preferences. Models developed with physical objects tied to psychological theory, such as visual penetration, constitute psychophysical approaches (e.g., Ruddell and others 1989, Rudis and others 1988). Psychological studies emphasize theoretical constructs for the aesthetic response, which describes both how people perceive (make sense of) and organize visual information and how previous experience influences their aesthetic response.

On public land, visual landscape management by U.S. agencies employs the expertise of landscape designers, as well as empirical public preference research (Anderson 1995). For managed forests, empirical aesthetics research focuses on public judgments, largely based on scenic beauty preferences. Yet landscape designers make use of a wider array of psychological attributes than scenic beauty, such as mystery and coherence. Most attributes have been empirically studied only within urban environments (Kaplan and Kaplan 1989). Examination of psychological attributes in managed forested environments should help us understand the causes behind public preference for particular scenes and forest management regimes.

Though landscape designers might not always use the same terminology, most agree that how one perceives a scene involves an array of organizing principles (Motloch 1991). In psychological terms, Kaplan and Kaplan (1989) theorized that one's preference for particular natural scenes was evoked by information processing components, namely coherence, complexity, mystery, and legibility (finding one's way in a scene). Based on Ruddell and others' (1989) psychophysical modeling, Li and Hammitt (1999) added visual penetration as another information-processing component. A theoretical causal model for scenic beauty preferences includes these five components as principal causal factors affecting scenic beauty preferences. If these factors control perception, then comparison of causal attributes by cutting practice should reveal the psychological factors that determine perceived changes in scenic beauty.

OBJECTIVES AND STUDY AREA

Our overall objective was to better understand the psychological response to timber cutting practices on national forests of the Ouachita Mountains. Specific objectives were threefold:

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1. To test the effect of landscape architecture knowledge differences among groups of judges on scenic beauty ratings
2. To test operational-scale cutting practices on scenic beauty of shortleaf pine (*Pinus echinata* Mill.)-hardwood stands, and as a basis for understanding scenic beauty ratings
3. To test operational-scale cutting practices on ratings of causal psychological attributes (coherence, complexity, legibility, mystery, and visual penetration).

Study locations were part of a 52-stand study region on national forest land in the Ouachita Mountains, an area 120 miles east-to-west, 80 miles north-to-south, and located in northwest Arkansas and eastern Oklahoma (Baker 1994, Guldin and others 1994). For operational purposes, the 9,600 square mile study area was divided into quadrants. Quadrants and nearby cities were: north (Danville, AR), east (Cedar Creek, AR) south (Mount Ida, AR), and west (Black Fork, AR). Trees were cut largely to promote pine reproduction. Treatments were harvests in the winter of 1992-93 and site preparation for regeneration early in 1994. The study was designed as a randomized complete block, with silvicultural treatments randomly assigned to 1 of 13 stands in each of the quadrants (Baker 1994). Because of funding limitations, we had limited personnel. In taking photographs, we also sought to minimize variability due to within-season weather conditions. For these reasons, we restricted our examination to the north, east, and south quadrants of the study region.

The north quadrant is in the Arkansas Valley ecoregion, with the other quadrants in the midst of the Ouachita Mountain ecoregion, where streams tend to be ephemeral, and in the south quadrant where they tend to be permanent (Baker 1994, Guldin and others 1994). Stands in the north, east, and south quadrant have average slopes of 15.1, 12.3, and 9.7 percent; 50-year shortleaf site index values of 61.5, 62.2, and 65.8 feet; average micro relief severity ratings (1 mild, 2 moderate, 3 severe) of 1.6, 1.5, and 1.4; and tree ages of 65.4, 65.3, and 62.7 years, respectively (Guldin and others 1994).

Cost and time constraints limited this study to four treatment conditions (National Forest stand and compartment number):

a. Untreated: untreated stands retained in their natural state, referenced commonly in the design of experiments as a control (CON), averaging 130 cu ft/ac. (The north, east, and south stand compartments were 0284-11, 0605-05, and 0023-10, respectively.)
b. Group selection: pine-hardwood group selection (PHGS): clearcut 0.1 to 2.0 ac. Retention of 20-to-45 trees/ac shortleaf pine and 10-to-20 trees/ac hardwoods. (The north, east, and south stand compartments were 0046-18, 1124-11, and 0035-42, respectively.)
c. Shelterwood: pine-hardwood shelterwood (PHSW): Retention of 10-to-30 trees/ac shortleaf pines and 10-to-30 trees/ac hardwoods. (The north, east, and south stand-compartments were 0457-12, 1119-21, 0027-01, respectively.)
d. Clearcut: all merchantable volume removed (CC). (The north, east, and south stand compartments were 0458-16, 1067-15, and 1658-05, respectively.)

METHODS

Approximately 15 photographic images per stand were acquired in July 1994 using 35-mm ASA 400 transparency film, push-processed to ASA 800, and an f2.8 lens (Olympus XA) from 5 or 6 point locations stratified within stands that were designated for periodic bird censuses. Images were acquired two growing seasons after harvest disturbance, generally on sunny-to-partly-cloudy days not before 7:30 AM and not after 6:00 PM. Duplicate, over- or underexposed images, and those with human subjects, were discarded. What remained were images from which random samples were selected by treatment. Random sample selection yielded one to four images representing a single stand, with all but two stands represented by three images.

Judges first viewed all 36 images for 2 seconds each to give them a feel for the range of variation. Then, after being shown each scene for 8 seconds, they rated each image on a scale from 1 (lowest) to 10 (highest). This numerical indication of people's perception is used widely in scenic beauty estimation (Brown and Daniel 1990; Daniel and Vining 1983, Ribe 1989), and all follow procedures outlined by Daniel and Boster (1976).

There were 88 judges—all from Clemson University. Of these, 70 were nonprofessionals, i.e., students from two undergraduate introductory courses (one in psychology, the other in horticulture), 14 were professionals, i.e., students from two upper-level landscape design studio classes, and 4 were experts, i.e., professional educators or researchers familiar with landscape preference research. The judges were 56 percent female and 44 percent male. Rating sessions were held in the spring of 1996 during class periods.

To avoid participant fatigue in rating the images, we used two rating sessions. In one session, judges coded scenic beauty, coherence, and legibility. In the second session a week later, judges coded complexity, mystery, and visual penetration. To avoid conditioning of responses to identical stimuli, participants rated images one attribute at a time. Image order was randomly assigned for each psychological attribute. That is, the sequence of images for scenic beauty differed from the sequence for coherence and for legibility.

We asked participants to rate images but gave them no instruction about what constituted scenic beauty. We then instructed them in the use of causal psychological attributes and showed them images suggesting high, medium, and low values for each psychological attribute. Definitions presented were:

Coherence—how easy it is to visually organize the trees and surrounding vegetation into a well-ordered pattern, and how well the patterns "hang together"

Complexity—how much there is to look at in this forest scene in terms of the number of different kinds of trees, clusters of trees, and other vegetation compositions or natural elements

Legibility—how easy it would be for them to find their way around in the forest area using noticeable landmarks such as big trees, clusters of trees, unusually shaped trees or bushes, clearings, pathways, or any other memorable features

Mystery—how much this forest scene attracts and encourages them to go beyond their standing-viewing point, enter deeper into the forest, and see things that are only hinted at from their current position.

Visual Penetration—the ability to see through a forest scene without interruption by vegetation screening, tree trunks, or other noticeable objects.

To focus on stated objectives and simplify analysis, we averaged ratings for each of the 36 images by judge group (expert, professional, nonprofessional), quadrant (north, east, south), and treatment (untreated, group selection, shelterwood, clearcut). In performing statistical tests, we weighted average values to reflect the number of judges represented.

For statistical analytical purposes, we assumed the resulting ordinal scale preference ratings were interval data, with an implied uniform distance between two adjacent ratings. This is a widely accepted assumption in social science preference studies and commonly is used in scenic beauty preference research (Daniel and Vining 1983). The reader is cautioned, however, that in fact no true interval exists. That is to say, a difference of 1.0 between 5.0 and 6.0, does not necessarily represent the same difference between 9.0 and 10.0.

Traditional parametric tests assume an underlying normal distribution, but ratings may not follow such a distribution. We tested the distribution of average scenic beauty ratings for kurtosis (0=not skewed and normally distributed; plus or minus 1=skewed and not normally distributed) to determine whether the data approximated a normal distribution (SAS 1990). The kurtosis value for scenic beauty, -0.9, suggested rejection of the null hypothesis that the distribution was normally distributed.

Ratings for all psychological attributes were converted to rankings to conduct an analysis of variance (ANOVA) and calculation of F (equivalent to nonparametric) tests of significance at the 0.05 probability level. Analyses were conducted with average ranked values, but averages are reported on a 10-point rating scale for ease of interpretation. Statistical software employed SAS's General Linear Model (GLM) procedures (SAS 1990). Multiple comparison tests used the Bonferroni approach to ensure an experimentwise error rate of 0.05 by using t-tests each at the 0.05/3=0.017 level with SAS's least significant means (LSMEANS), GLM, and mixed ANOVA (MIXED) procedures (SAS 1990, 1996).

RESULTS

A visual inspection of color images suggested that the amount of sky in a scene and overt evidence of disturbance were negatively associated with scenic beauty estimates, and retained vegetation was positively associated. Each group of judges rated untreated stands highest in scenic beauty and clearcut stands lowest. Other treatments were intermediate between these extremes. Black-and-white versions of the images are included in the appendix, along with an average rating for each psychological attribute.

For all quadrants, untreated stands were rated highest and clearcut stands lowest. Most of the variation was among treatments, although the ANOVA revealed that perceived scenic beauty was significantly affected by the interaction between quadrant and treatment (table 1). Nevertheless, by quadrant, clearcut stands were rated lowest and untreated stands highest (fig. 1).

There was no significant interaction between judges and treatments (*P*(larger F)=0.259). F-tests revealed significant differences in perceived scenic beauty among judge groups (*P*(larger F)=0.002). So regardless of treatment, scenic beauty ratings from the expert, professional, and nonprofessional judges were 4.7, 5.8, and 5.5, respectively. Experts gave significantly different ($P|t|<0.01$) and consistently lower rankings, but differences between judges with professional and nonprofessional architecture backgrounds did not ($P|t|=0.03$) (fig. 2).

Other psychological attributes most closely aligned with scenic beauty were, in order of association: mystery, coherence, visual penetration, complexity, and legibility (table 2). Mystery and coherence were the two psychological attributes most closely associated with scenic beauty. Judges gave untreated stands the highest average value for scenic beauty, mystery, coherence, and complexity, and lowest average values for legibility and visual penetration. For brevity, differences in other psychological attributes by

Table 1—Analysis of variance of scenic beauty ranking two growing seasons after treatment, Ouachita Mountains

Source	Degrees of freedom	Mean square variance	F value	*P* (larger F)
Quadrant	2	1,373.01	0.16	0.858
Treatment	3	26,462.82	9.39	0.009
Quadrant by treatment	6	8,802.82	50.53	< 0.001
Judge	2	1,577.11	9.05	0.002
Judge by treatment	6	251.74	1.44	0.259
Residual	16	174.22		

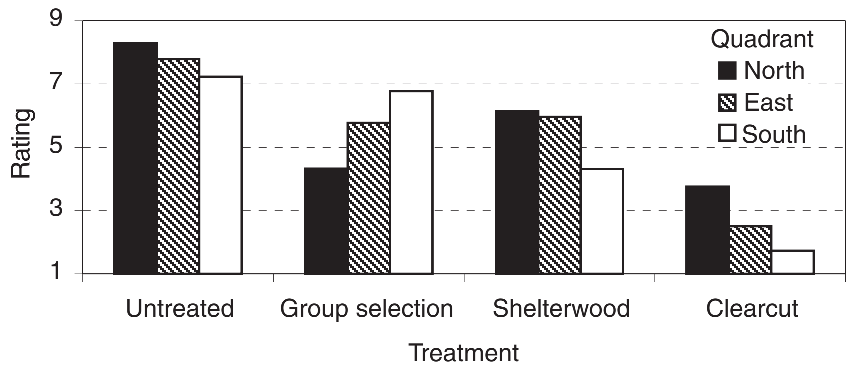

Figure 1—Average scenic beauty ratings two growing seasons after treatment, Ouachita Mountains, by treatment and quadrant of the study region.

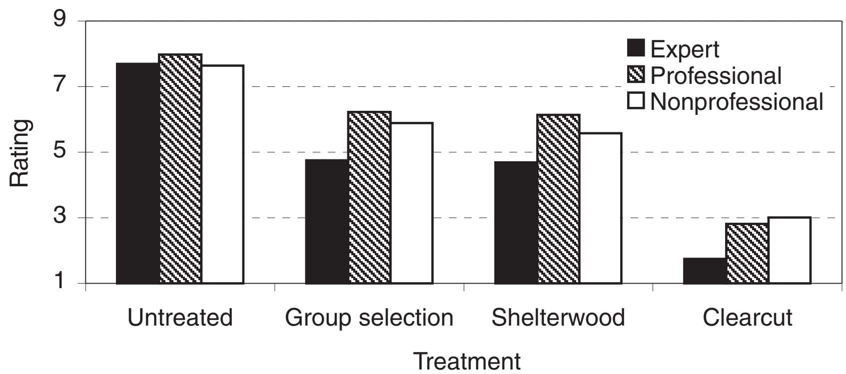

Figure 2—Average scenic beauty ratings two growing seasons after treatment, Ouachita Mountains, by judges with different landscape architecture backgrounds.

Table 2—Correlation between scenic beauty and other psychological attribute rankings (n=36) two growing seasons after treatment, Ouachita Mountains[a]

Code and attribute name	SBE	MY	CH	CM	LE
Visual penetration	-0.76	-0.93	-0.91	-0.93	0.86
Legibility	-0.52	-0.86	-0.71	-0.75	1.00
Complexity	0.59	0.83	0.58	1.00	—
Coherence	0.91	0.87	1.00	—	—
Mystery	0.93	1.00	—	—	—

SBE = Scenic beauty estimate; MY = mystery; CH = coherence; CM = complexity; LE = legibility.
[a] All have significant Pearson correlation coefficients (*P*|larger r|<0.001).

quadrant and by the landscape architecture background of judges are not included in this report.

Apart from scenic beauty, statistically significant (*P*(larger F)<0.05) differences by treatment and causal psychological attribute were for mystery, coherence, complexity, and visual penetration, but not legibility (fig. 3). By treatment, group selection was not significantly different from untreated stands for any of the causal attributes. Shelterwood treatments resembled untreated stands only in coherence and legibility. Clearcut treatments resembled untreated areas only in legibility.

DISCUSSION

Our study showed that of the three treatments, clearcut stands were rated lowest in scenic beauty. Alhough there was no significant difference in scenic beauty ratings of shelterwood and group selection treatments, examination of causal attributes revealed differences between these two in complexity and visual penetration.

Our study was designed to represent the Ouachita Mountains study region, and we had not anticipated a large and significant quadrant by treatment effect, but our results showed otherwise. Guldin and others (1994) documented significant differences in topography by quadrant, with gentler to steeper slopes and lesser to greater micro relief severity from south to east to north. Distant vistas afforded by shelterwood cutting could well have influenced scenic beauty ratings more in the north than in the south. The south quadrant was more mesic (i.e., higher site index) and younger, on average, than the north; so more abundant logging slash remained visible there than in the other quadrants. Our results yielded lower averages for clearcut stands, regardless of quadrant. This is consistent with Vodak and others

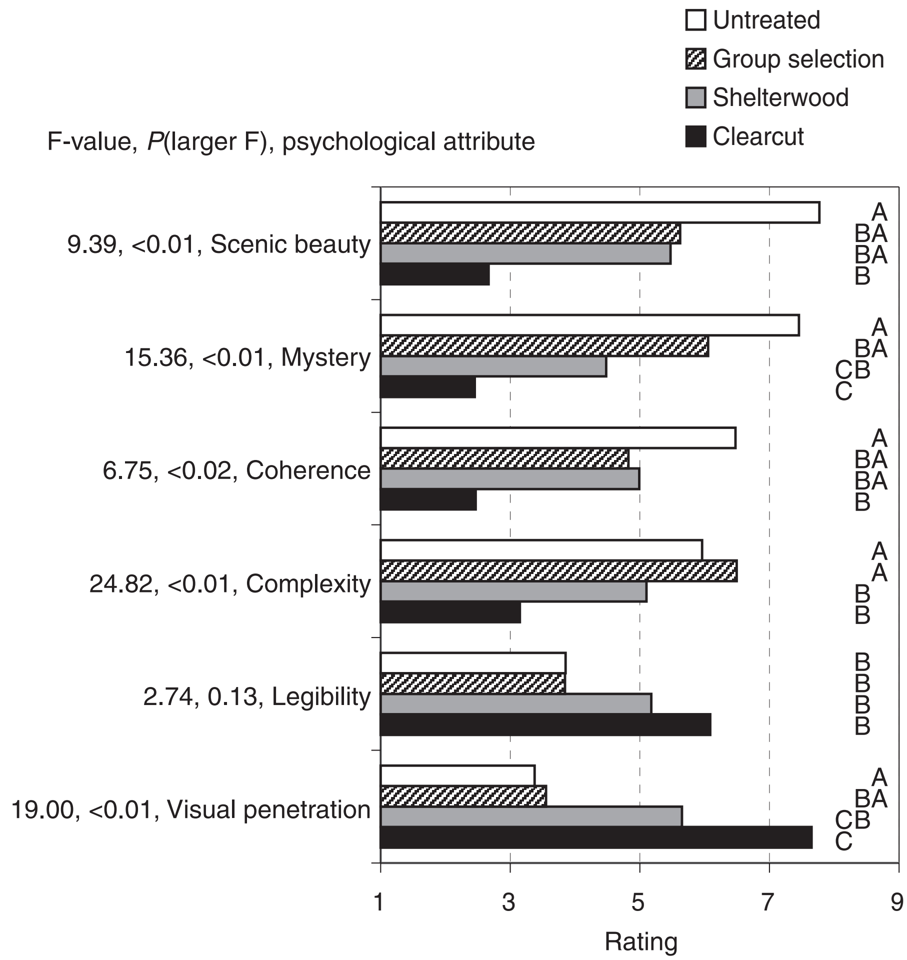

Figure 3—F-value, *P*(larger F) for the treatment effect by psychological attribute, and average rating for summer scenes two growing seasons after treatment, Ouachita Mountains. Averages by attribute with the same letter are not significantly different, using least squares means tests for multiple comparisons (*P*|t|<0.01).

(1985) study that found recent and abundant logging slash detracting from scenic beauty.

Obviously, the expert judges had more experience with landscape evaluation than professional and nonprofessional judges. We anticipated that experts would be more sensitive to differences in scenic beauty, and professionals more sensitive than nonprofessionals but less sensitive than experts. We found only that experts provided lower ratings but otherwise were no different from other groups in their comparative rating of scenic beauty by treatment. For the particular mix of individuals in our sample, none of the three groups of judges rated group selection and shelterwood treatments differently. Repeated experimentation is needed to verify such results, because our sample of both experts (n=4) and professionals (n=14) was limited.

The inclusion of various causal attributes provided insight into psychological reasons for scenic beauty preferences. Overall, group selection or shelterwood were favored over clearcut treatments. Our findings also corroborate an earlier plot-level study of within-stand scenes on north-facing slopes 2 years after treatment. On the Winona Ranger District, Gramann and Rudis (1994) showed that group selection was the favored treatment among other uneven-aged reproduction cutting regimes. They also showed views of north-facing, ridgetop views were more scenic, on average, than views on more mesic, gentler slopes.

Mystery and coherence were most closely correlated with scenic beauty. In a related study using structural equation modeling (SEM), Li and Hammitt (1999) tested a modified version of Kaplan and Kaplan's (1989) information processing components. SEM, widely used in the social sciences (Byrne 1994), is analogous to factor analysis, but with selection of abstract factors constrained by a theoretical, causal construct. Factor analysis uses an unconstrained selection of factors based on an analysis of covariance, i.e., the relationship of measured attributes to each other and upon the dependent attribute of interest. SEM, in brief, incorporates theoretical attributes that may not be directly measured. Further details are provided elsewhere (Byrne 1994, Li and Hammitt 1999).

Li and Hammitt (1999) found that most (81 percent) of the variance in perceived scenic beauty among expert judges varied with two theoretical factors: one factor directly associated with coherence and mystery; and a second factor directly associated with visual penetration and legibility and inversely associated with complexity. Standardized coefficients were 0.91 for the first factor and –0.08 for the second factor, which suggested the first factor was the chief theoretical cause for scenic beauty preferences.

Our direct study of individual causal attributes shows group selection having the most mystery and complexity, and the least amount of visual penetration of all treatments, and not substantially different from untreated areas. Legibility was not a useful metric to distinguish among treatments. We suggest that digital methods to analyze these scenes (Kalidindi and others 1996, Rudis and others 1999) should be helpful in assessing image metrics or features that reflect these and other theoretically relevant psychological attributes.

Few physical attributes have been directly associated with psychological measures, other than scenic beauty and visual penetration. Our findings differ from Rudis and others (1988) and Ruddell and others (1989) regarding visual penetration. Their studies involved an examination of 99 east Texas loblolly pine (*Pinus taeda* L.)-shortleaf pine (*P.echinata* Mill.) and oak (*Quercus* spp.) sample locations across five counties, largely on private land. Our study involved only 12 stands located in shortleaf pine-hardwood stands located in National Forests of the Ouachita Mountains of Arkansas, and by design, three-fourths of the scenes were of 2-year-earlier cutting activities. Our study had many more scenes of more recently disturbed vegetation than the east Texas scenes. Their "visual penetration" also referenced an ocular, scaled physical measurement of visual penetration, rather than the visual penetration perceived by judges.

MANAGEMENT IMPLICATIONS

Aside from approaches to minimize the aesthetic impacts of timber harvesting (Jones 1993), the goals of traditional cutting and management are to maximize timber yield while minimizing damage to the residual stand. The primary goal focuses on the selection of merchantable trees and the status of individual remnant trees, rather than the spatial arrangement of gaps created in the forest or their association with the surrounding ecoregion. Our study lends quantitative credence to the notion that there is a measurable benefit to adapting cutting and management regimes that foster scenic beauty.

Landscape architects commonly design landscapes by organizing elements to promote mystery and coherence, e.g., by making winding paths, small openings, and focal points and creating smooth transitions among objects with similar form (e.g., Motloch 1991). Our study demonstrates that standard, operational-scale cutting regimes do affect mystery and coherence within the scenes changed by traditional logging operations. To retain scenic beauty while harvesting timber, intermediate cutting practices (group selection and shelterwood) are least offensive. The choice between group selection and shelterwood will depend on characteristics within the ecoregion.

Although we can only speculate on the utility of our findings for other types of logging operations and other ecoregions, we offer quantitative credence to the psychological impact of timber harvesting. Adapting cutting practices to novel cutting regimes that increase mystery, coherence, complexity, and scenic beauty, while reducing visual penetration may even foster public acceptance of harvest operations.

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APPENDIX

Within each condition, image order is from highest to lowest scenic beauty value. The legend for each image is:

Treatment condition
Stand: National Forests in Arkansas, stand and compartment code;
Pt: Point number;
Azimuth: compass direction of view when standing at the point:
CD: compact disk and image number.
Psychological attributes, each scaled 1 (lowest) to 10 (highest):

Code	Meaning	Code	Meaning
SBE	Scenic beauty estimate	CH	Coherence
LE	Legibility	CM	Complexity
MY	Mystery	PV	Visual Penetration

Untreated

Stand 0284-11 Pt 2 Azimuth 220
CD 0015-024

SBE	8.4	CH	9.0
LE	4.9	CM	3.7
MY	6.6	PV	5.2

Stand 0284-11 Pt 6 Azimuth 150
CD 0015-030

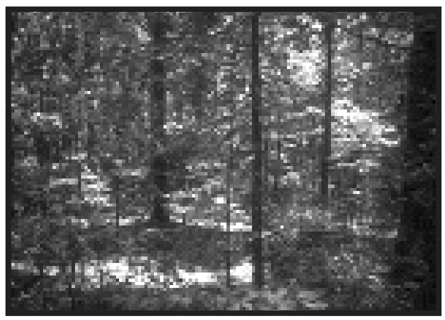
SBE	8.1	CH	5.8
LE	2.4	CM	6.9
MY	8.0	PV	3.0

Stand 0284-11 Pt 3 Azimuth 360
CD 0015-022

SBE	8.1	CH	6.9
LE	2.9	CM	6.6
MY	8.4	PV	2.6

Stand 0605-05 Pt 5 Azimuth 270
CD 2607-068

SBE	7.7	CH	6.5
LE	6.1	CM	5.3
MY	6.5	PV	4.1



Stand 0605-05 Pt 2 Azimuth 120
CD 2607-075

SBE	7.7	CH	6.5
LE	3.2	CM	6.7
MY	7.5	PV	3.0

Stand 0605-05 Pt 4 Azimuth 120
CD 2607-064

SBE	7.7	CH	7.2
LE	4.4	CM	5.6
MY	7.2	PV	3.8

Stand 0023-10 Pt 3 Azimuth 180
CD 2607-007

SBE	7.3	CH	5.2
LE	3.7	CM	6.5
MY	7.2	PV	3.1

Stand 0023-10 Pt 6 Azimuth 150
CD 2607-013

SBE	7.2	CH	3.6
LE	2.9	CM	7.6
MY	6.3	PV	2.1

Stand 0023-10 Pt 6 Azimuth 360
CD 2607-015

SBE	6.9	CH	5.2
LE	3.8	CM	5.8
MY	6.3	PV	2.9

Group Selection

Stand 0035-42 Pt 4 Azimuth 300
CD 2607-084

SBE	7.1	CH	5.7
LE	2.0	CM	7.5
MY	7.6	PV	2.6

Stand 0035-42 Pt 3 Azimuth 180
CD 2607-082

SBE	7.0	CH	4.9
LE	2.1	CM	7.6
MY	7.7	PV	1.9

Stand 0035-42 Pt 2 Azimuth 120
CD 2607-081

SBE	6.9	CH	5.2
LE	6.0	CM	7.8
MY	6.9	PV	3.5

Stand 1124-11 Pt 1 Azimuth 240
CD 2607-025

SBE	6.6	CH	6.4
LE	4.4	CM	5.7
MY	7.1	PV	3.5

Stand 1124-11 Pt 4 Azimuth 120
CD 2607-028

SBE	6.5	CH	7.9
LE	5.3	CM	4.2
MY	5.8	PV	4.9

Stand 0046-18 Pt 1 Azimuth 240
CD 0012-050

SBE	5.8	CH	2.8
LE	7.0	CM	7.5
MY	5.8	PV	2.7

Stand 0046-18 Pt 5 Azimuth 270
CD 0012-57

SBE	5.5	CH	4.2
LE	5.1	CM	7.2
MY	5.0	PV	4.1

Stand 1124-11 Pt 3 Azimuth 360
CD 2607-030

SBE	4.8	CH	2.6
LE	3.2	CM	7.6
MY	5.9	PV	2.3

Stand 0046-18 Pt 2 Azimuth 210
CD 0012-052

SBE	2.3	CH	3.9
LE	5.6	CM	4.6
MY	4.0	PV	5.3

Stand 0457-12 Pt 2 Azimuth 030
CD 2607-048

SBE	8.4	CH	6.4
LE	6.9	CM	4.3
MY	4.2	PV	6.7

Stand 1119-21 Pt 3 Azimuth 180
CD 0012-095

SBE	7.0	CH	5.5
LE	5.3	CM	5.4
MY	4.7	PV	5.0

Stand 1119-21 Pt 2 Azimuth 120
CD 0012-090

SBE	7.0	CH	5.0
LE	3.2	CM	5.1
MY	5.0	PV	4.8

Stand 0027-01 Pt 5 Azimuth 090
CD 2607-058

SBE	5.2	CH	4.9
LE	2.1	CM	5.6
MY	3.1	PV	5.9

Stand 0457-12 Pt 4 Azimuth 300
CD 2607-040

SBE	5.2	CH	5.1
LE	5.6	CM	5.3
MY	5.3	PV	4.5

Stand 0457-12 Pt 4 Azimuth 120
CD 2607-039

SBE	5.2	CH	4.1
LE	5.1	CM	5.9
MY	4.9	PV	5.2

Stand 0027-01 Pt 2 Azimuth 030
CD 2607-050

SBE	4.2	CH	3.5
LE	3.6	CM	5.7
MY	4.3	PV	5.4

Stand 1119-21 Pt 1 Azimuth 240
CD 0012-094

SBE	4.2	CH	5.2
LE	4.4	CM	5.1
MY	4.6	PV	5.5

Stand 0027-01 Pt 6 Azimuth 330
CD 2607-060

SBE	3.9	CH	3.3
LE	2.0	CM	5.2
MY	3.4	PV	6.3

Stand 0458-16 Pt 6 Azimuth 330
CD 0015-009

SBE	4.2	CH	3.0
LE	5.4	CM	4.2
MY	2.6	PV	6.5

Stand 0458-16 Pt 2 Azimuth 210
CD 0015-002

SBE	4.0	CH	2.6
LE	6.9	CM	4.4
MY	3.5	PV	6.3

Stand 1067-15 Pt 3 Azimuth 360
CD 0012-078

SBE	3.5	CH	3.4
LE	6.5	CM	4.2
MY	3.8	PV	6.8

Stand 1067-15 Pt 5 Azimuth 090
CD 0012-066

SBE	3.2	CH	2.4
LE	5.9	CM	3.2
MY	2.5	PV	7.3

Stand 1067-15 Pt 5 Azimuth 270
CD 0012-067

SBE	2.9	CH	2.8
LE	6.2	CM	4.0
MY	2.6	PV	7.0

Stand 1658-05 Pt 3 Azimuth 180
CD 0012-034

SBE	2.7	CH	2.2
LE	6.9	CM	3.3
MY	2.5	PV	7.4

Stand 1658-05 Pt 5 Azimuth 270
CD 0012-043

SBE	1.9	CH	2.3
LE	8.0	CM	2.3
MY	1.6	PV	8.8

Stand 1067-15 Pt 5 Azimuth 030
CD 0012-068

SBE	1.8	CH	1.7
LE	7.0	CM	2.8
MY	2.1	PV	8.6

Stand 1658-05 Pt 2 Azimuth 210
CD 0012-037

SBE	1.6	CH	1.6
LE	6.4	CM	2.7
MY	1.9	PV	8.5