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Thinning and Scenic Attractiveness in Second-Growth Forests: A Preliminary Assessment

by

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Second-growth forests in Montana have become particularly important as areas that can provide a variety of resource values. Evaluations of resource interrelationships are frequently necessary, not only to identify the most efficient use of a given area, but to determine the impacts of one resource use on other values within the context of multiple-use management. For example, careful manipulation of stand density can both increase wood production in such forests and improve their utility as range resources. Manipulation may also affect wildlife habitat and watershed functions and may have significant effects on the recreational opportunities provided by the forest (Taylor and Daniel 1984).

Because of intensive road development, managed second-growth forests are relatively accessible to the general public. Aesthetic or scenic values of forested settings can be an important backdrop for the recreational opportunities available in these areas. Thus, understanding relationships between timber production and aesthetic considerations may suggest ways of optimizing multiple-resource values or mitigating the impacts of one use on another. For example, a variety of research has shown that the public reacts negatively to near views of recent timber harvesting activity (Ashor 1983, Benson 1982). Intensively managed second-growth stands are subject to periodic thinning, and these management activities may have substantial aesthetic consequences.

What are these consequences? Are thinned stands of lesser or greater scenic value to viewers? Does the intensity of thinning affect perceptions of scenic attractiveness? Are there seasonal differences in aesthetic perceptions of various thinning intensities? Are there differences in scenic attractiveness by tree species? Do differences in perceptions change with time? If we address such questions, can we predict the aesthetic consequences of alternative thinning scenarios?

This research note reports the results of a study that addresses some of these questions. The research is a component of the University of Montana's Mission-Oriented Research Program (MORP), directed at intensive second-growth forest management. The objective here is to assess the scenic attractiveness of three thinning intensities.

METHODOLOGY

This study uses a method developed by Daniel and Boster (1976) to estimate the scenic attractiveness of forested landscapes that have been manipulated for timber production. Termed the Scenic Beau-

Figure 1

Figure 2

ty Estimation (SBE) method, it uses photographic slides of forested areas to represent scenes that may be viewed by an individual in the field. The slides are presented to a group of viewers who are asked to rate each slide on a 10-point like/dislike scale. These raw scores are converted to SBE scores by using a cumulative z-score based on the total frequency distribution for each slide and point on the raw scale. The z-score for each slide, area and treatment is subtracted from a reference slide, area and treatment z-score; the result is an SBE score. The validity and reliability of this method have been tested extensively in a variety of situations and has been found to give accurate and consistent results (Taylor and Daniel 1984, Benson 1982).

The results presented herein are based on two experiments involving second-growth stands that are part of a levels-of-growing-stock study at Lubrecht Experimental Forest. Experiment One used two stands that are 80-year-old mixtures of Douglas-fir and ponderosa pine on similar sites. Experiment Two used a similar stand of ponderosa pine. Thinning treatments were established as:

1. Control—no thinning (Figure 1).
2. Light thinning—desired 10 × 10 ft. spacing (400 trees/acre, Figure 2).
3. Moderate thinning—desired 14 × 14 ft. spacing (220 trees/acre, Figure 3).
4. Heavy thinning—desired 20 × 20 ft. spacing (110 trees/acre, Figure 4).

Thinning was done as part of a whole-tree utilization project in which trees were felled directionally and piled for removal by a farm tractor with a grapple skidder. Stumps were cut near the ground, and much of the slash was removed to a central chipping site.

A permanent photographic reference point was established on each of the four plots in each of the three stands. The reference point was used to establish bearings for each of the photographs (using different compass direction) to represent the visual effects of the treatment and control plots. For Experiment One, a total of 2 (stands) × 4 (plots) × 6 (bearings) = 48 photos were taken. In Experiment Two, a total of 1 (stand) × 4 (plots) × 5 (bearings) = 20 photos were used.

Twenty students in an Introduction to Recreation Management class and 28 students in a Silviculture class at the University of Montana were chosen as subjects in the fall of 1982 to evaluate the slides in Experiment One. In Experiment Two, 32 students in the fall 1983 Introduction to Recreation Management class evaluated the slides. Previous research has found that students are broadly representative of the general public when evaluating the scenic beauty of forested areas (Ashor and McCool 1984, Daniel and Boster 1976); they are also frequently vocal critics of some timber harvesting practices.

Slides were randomly ordered in the slide tray, and each slide was presented for a period of five seconds, a period that previous research has determined acceptable for this type of study (Ashor and McCool 1984). Ten preliminary slides were chosen to help subjects become accustomed to the time period and familiarized with the range of scenes to be evaluated. Instructions to all groups were the same: They were told only that they were to view some forest management activities and were then given instructions to rate the slides on the 0 to 9 like/dislike scale.

RESULTS AND DISCUSSION

Table 1 displays results for Experiment One of this study. High positive SBE values indicate that subjects viewed a particular treatment as more scenically attractive than treatments with lower scores. High negative SBE values indicate the lowest rating of a particular treatment. While the SBE method results in an interval level scale, the zero point is arbitrary. Thus, relative conclusions about different SBE values can be made. Table 2 shows the result of a two-

Figure 3

Figure 4

way analysis of variance of the data, examining the effects of class and thinning intensity for the two stands.

The control plot in stand one was used as the reference for establishing SBE scores and therefore has an SBE score of zero; all other plot scores are in reference to it. Subjects rated the 20-foot spacing in stand one and the 10-foot spacing in stand two as the least scenically attractive, while the 10-foot and 14-foot spacing plots in stand one were considered most attractive.

The SBE scores differ somewhat between each class, suggesting differing normative standards of scenic beauty, but the rank ordering of the scores is similar. Indeed, the analysis of variance (Table 2) shows no significant differences due to class. Because the rank ordering is similar, it may be safe to conclude that thinning has similar aesthetic consequences for the two differing groups of students.

Examination of the photos indicated that some showed views which contained substantial residual slash. Benson (1982) found in his study of residue treatment that slash has a large and significantly negative affect on scenic attractiveness ratings.

In order to test the hypothesis that the presence of slash may have had an adverse effect on the SBE scores of certain plots, four judges reviewed each slide used in this study and made judgments as to the amount of visible slash. Based on the judgments of the four individuals, the slides were divided into two groups: those with a low level of slash in the foreground and those with high levels. The data were then re-analyzed, controlling for the two slash levels, and omitting the control plots. The analysis of variance (Table 3) shows that the main effects of stand, plot and slash are all significant, and two-way interactions are also significant. Photos with heavy slash had a mean SBE value of -12, while those with light slash resulted in a mean of 19, indicating that aesthetic evaluations increase when slash is reduced or removed.

Experiment Two was conducted to confirm these results. This stand of ponderosa pine contained no slash. The results (Table 4) indicate that the class SBE scores showed the same rank order achieved in Experiment One, with the 14-foot spacing treatment rating the highest, followed by the 10-foot spacing; 20-foot spacing was rated the lowest of the three thinning treatments. The uncut control was used as the reference plot and assigned a zero value. However, the analysis of variance (Table 5) indicated that there were no significant statistical differences between the plot scores.

The results of these tests suggest that thinning, in the intensities studied, does have implications for scenic beauty perceptions. They imply that such activity may actually enhance viewer perceptions of the forest stand, at least when slash is removed from the immediate foreground. In addition, among the thinning intensities studied, the 14-foot spacing appears to be optimal.

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Table 1
SBE Scores and ranks ( ) by stand, treatment, and class, Stands One and Two, for Experiment One.

	Recreation Management (n = 20)	Silviculture (n = 28)
Stand 1		
Control	0 (5)	0 (5)
10 Ft.	19 (2)	47 (2)
14 Ft.	20 (1)	48 (1)
20 Ft.	−26 (7)	−26 (8)
Stand 2		
Control	−5 (6)	− 8 (6)
10 Ft.	−27 (8)	−21 (7)
14 Ft.	1 (4)	21 (3)
20 Ft.	2 (3)	4 (4))

Table 2
Analysis of Variance, Recreation and Silviculture Classes, Stands One and Two, for Experiment One.

Source of Variation	df		MS	F	Sig. of F
Main effects	5		4516.492	4.513	0.001
class		1	2440.167	2.438	0.122
stand		1	4845.042	4.841	0.031
plot		3	5099.083	5.095	0.003
2-way interaction	7		3705.847	3.703	0.002
class × stand		1	360.375	0.360	0.550
class × plot		3	914.250	0.913	0.438
stand × plot		3	612.625	7.606	0.550
3-way interactions	3		170.903	0.171	0.916
Residual	80		1000.829		
Total	95		1358.917		

Table 3
Analysis of Variance, Recreation and Silviculture Classes, Stands One and Two, Testing for Effects of Slash, Experiment One.

Source of Variation	df		MS	F	Sig. of F
Main effects	4		9443.295	10.620	0.000
stand		1	10115.038	11.375	0.001
plot		2	5188.040	5.834	0.005
slash		1	18709.541	21.040	0.000
2-way interactions	5		5259.957	5.915	0.000
stand × plot		2	8487.781	9.545	0.000
stand × slash		1	5939.263	6.679	0.012
plot × slash		2	4930.643	5.545	0.006
3-way interactions	2		597.464	0.672	0.515
Residual	60		889.227		
Total	71		1670.725		

Table 4
SBE Scores and Ranks ( ) by Treatment, Recreation Class, Stand Three, Experiment Two.

Stand 3	
Control	0 (4)
10 Ft.	7 (2)
14 Ft.	9 (1)
20 Ft.	2 (3)

Table 5
Analysis of Variance, Recreation Class, Stand Three, Experiment Two.

Source of Variation	df	MS	F	Sig. of F
Main effects	3	94.467	0.140	0.935
Residual	16	676.550		
Total	19	771.017		

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