Mark Brunson

# Changes in Scenic Quality after Harvest

## *A Decade of Ratings for Six Silviculture Treatments*

**Bo Shelby, Jonathan Thompson, Mark Brunson, and Rebecca Johnson**

ABSTRACT

Scenic beauty is one attribute that foresters consider when planning a silviculture treatment. To better understand how scenic quality changes in the years following a harvest, six sites on Oregon State University's research forest were evaluated annually for 11 years. Regression analysis was used to describe the change in average ratings over time. Initially there were differences between sites, but as stand development continued those differences diminished substantially.

**Keywords:** aesthetics; nontraditional forestry; public perceptions

Increasingly, foresters are using alternative silviculture techniques to enhance habitat, emulate natural disturbances, and address social values. Considering the scenic beauty of a forest is one important facet of contemporary management. A baseline study in 1990 on the Oregon State University research forest assessed scenic ratings for six silviculture treatments within two years of treatment on the harvested stands (Brunson and Shelby 1992). Comparisons were made for old-growth, traditional treatments (clearcutting and thinning), and nontraditional treatments (patch cut, snag retention, and two-story). That study found scenic ratings were significantly

***Above:*** **This old-growth stand in the Oregon State University research forest has changed little in the years since this photo was taken in 1990.**

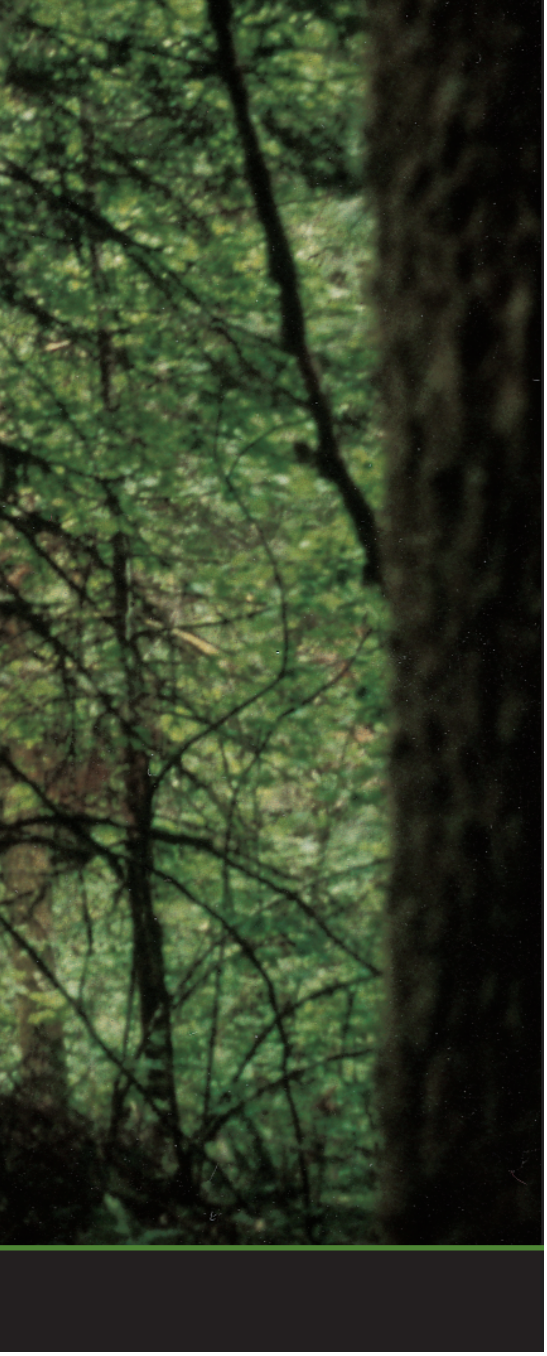


**Table 1. Comparison of silviculture treatments in an Oregon State University research forest.**

| Harvest type | Stand type | Stand description |
|---|---|---|
| **None** | Old-growth | Dominated by Douglas-fir approximately 250–300 years old, with diverse maple, grand fir, and Pacific yew understory. |
| **Nontraditional** | Patch cut | Half-acre cuts with all trees removed, scattered throughout a 20-acre unit of mature Douglas-fir forest (age 100) with about one-third of the total volume removed. |
| | Two-story | 21 acres, Douglas-fir dominated, about two-thirds of volume removed, 8–10 scattered overstory trees per acre retained. Similar to shelterwood in appearance, but prescription does not call for removing overstory after regeneration establishment. |
| | Snag retention | 17-acre clearcut with 1.5 large (>30″dbh) Douglas-fir snags (saw-topped at ~70 feet) retained per acre as wildlife trees. Tree tops were left where they fell for habitat. |
| **Traditional** | Thinning | 8 acres, Douglas-fir dominated plantation, thinned to approximately 100 trees per acre. Residual trees are 30–40 years old, with understory of sparse herbs and shrubs. |
| | Clearcut | 45 acres, all trees removed. |

*NOTES: All harvested sites except thinning received herbicide site preparation and were replanted to approximately 200 trees per acre; the clearcut, snag retention, and two-story sites have denser stocking due to natural regeneration. All harvested sites were cut between winter 1989 and winter 1990.*

higher for nontraditional treatments than for traditional treatments (Brunson and Shelby 1992). The present article describes a followup study of those same sites from 1990 to 2000. Two questions were examined:

1. More than a decade after harvest, how do evaluations of the scenic quality of the silviculture treatments compare?

2. How do scenic evaluations change through the first 11 years of regeneration?

There is no clear agreement within the forestry community about the most appropriate terminology to describe these nontraditional silviculture treatments. Brunson and Shelby (1992) settled on "new forestry" but expressed reservations about the term. For the purposes of this article, "nontraditional" will be used as a more general term to describe the two-story, snag retention, and patch cut sites. These treatments are intended to more closely emulate natural disturbance and emphasize the retention of live trees, snags, and logging slash for wildlife habitat. The sites are also placed in the landscape in a manner that reduces habitat fragmentation and produces a multi-aged forest. This contrasts with even-aged forestry, which historically has been the dominant method of harvesting in the Pacific Northwest. The clearcut and thinning treatments in this study will be referred to as "traditional" treatments.

## Methods

Following the same protocols developed for the 1990 study (Brunson and Shelby 1992), scenic evaluations were obtained at six sites in the McDonald Research Forest near Corvallis, Oregon. The sites consisted of one old-growth Douglas-fir *(Pseudotsuga menziesii)* stand (age 250 to 300) and five other stands that had been harvested in 1989 and 1990. The traditional treatments included a 45-acre clearcut and a thinned stand with 30- to 40-year-old residual trees at a density of approximately 100 trees per acre. The nontraditional treatments included a half-acre patch cut in a 20-acre matrix of mature Douglas-fir (age ~100 years) with approximately one-third of the volume removed, a snag retention cut with 1.5 large saw-topped snags per acre, and a two-story stand with eight to 10 overstory trees left per acre.

Logging debris was left except where replanting required its removal. Hiking trails or skid trails crossed all sites except the snag-retention cut. All sites were replanted within 18 months of harvest. *Table 1* describes the sites in more detail.

Each October from 1990 to 2000, a group of students enrolled in a junior-level wildland recreation class at Oregon State University were taken to the research forest. Enrollment ranged from 37 to 67 students. Other studies

**Table 2. Mean scenic-quality ratings for different stands.**

| | | Unmanaged | Traditional | | Nontraditional | | |
|---|---|---|---|---|---|---|---|
| Year | *n* | Old-growth | Clearcut | Thinning | Patch cut | Snag retention | Two-story |
| 1990 | 42 | +2.83[a] | –1.69[b] | –0.40[c] | +1.07[d] | +0.48[d] | +0.93[d] |
| 1991 | 49 | +2.58[a] | –1.24[b] | –0.61[bc] | +1.71[d] | –0.71[bce] | +0.12[ce] |
| 1992 | 67 | +3.12[a] | –1.84[b] | +0.20[c] | +1.35[d] | –1.20[be] | +0.18[c] |
| 1993 | 62 | +2.92[a] | –1.62[b] | +1.23[c] | +1.68[d] | –0.11[e] | +0.47[e] |
| 1994 | 43 | +2.95[a] | –0.67[b] | +0.67[c] | +2.12[ad] | –1.19[be] | +0.23[c] |
| 1995 | 53 | +2.77[a] | +0.10[b] | +0.75[bc] | +2.15[a] | +1.23[cd] | +0.83[cd] |
| 1996 | 48 | +3.02[a] | –0.31[b] | +1.23[c] | +2.00[cd] | –0.09[b] | +1.10[c] |
| 1997 | 54 | +3.02[a] | +0.44[b] | +1.17[bc] | +1.56[c] | +0.77[bc] | +0.79[bc] |
| 1998 | 37 | +2.86[a] | +1.68[b] | +1.73[b] | N/A | +0.95[b] | +1.27[b] |
| 1999 | 41 | +3.25[a] | +0.80[b] | +1.05[b] | +1.49[b] | +0.93[b] | +1.05[b] |
| 2000 | 41 | +3.05[a] | +0.80[b] | +1.44[bc] | +0.95[bc] | +1.38[bc] | +1.85[c] |
| *r* | | 0.54 | 0.91 | 0.84 | 0.87 | 0.65 | 0.75 |
| $r^2$ | | 29% | 82% | 70% | 76% | 43% | 56% |
| Slope* | | +0.02 | +0.32 | +0.18 | N/A | +0.19 | +0.12 |
| *p* value | | 0.086 | <0.001 | 0.001 | <0.01 | 0.029 | 0.007 |

[a,b,c,d,e,f] *Ratings with different superscripts are significantly different within rows, using the LSD multiple comparison test.*

** Slope is equal to the annual rate of change in the evaluation.*

have found that college students' scenic assessments are similar to those of the public, both generally (Daniel and Boster 1976; Anderson and Schroeder 1983) and at these specific sites (Brunson 1991; Brunson and Reiter 1996). Instructions were given to the respondents explaining the purpose of the study and directing them to respond only for the stand of interest. If they had additional questions about the sites they were asked to wait until after the surveys for all sites were completed. On the self-administered questionnaire, students were asked to judge the "scenic quality of this location." Responses were on a nine-point acceptability scale, with –4 being the most unacceptable, zero being "neutral," and +4 being the most acceptable. Silviculture treatments and past evaluations were discussed in a followup class session.

## Findings

*Table 2* shows the mean scenic ratings for each site from 1990 to 2000. Positive ratings indicate that, on average, the site was rated "acceptable," and negative scores indicate an "unacceptable" rating. To allow us to explore the changes in evaluations from 1990 to 2000, a regression line was fitted to the average ratings for each site over time *(fig. 1)*. A linear equation reasonably represents the relationship between time and average scenic ratings for all the harvested sites except the patch cut ($r^2$ = .42–.82).

For the patch cut, average ratings improved for the first six years and declined for the last five, so the relationship is best described by a quadratic equation ($r^2$= .76). There was no significant difference between the 1990 and 2000 average ratings (one-sided *p* value = 0.39).

For all years, the old-growth site received the highest average rating, and there was no significant change in average ratings between 1990 and 2000 (one-sided *p* value = 0.158). The regression lines for the two-story (slope = 0.12, $r^2$ = 0.56), thinned (slope = 0.18, $r^2$ = 0.84), and snag retention (slope = 0.19, $r^2$ = 0.43) stands were fairly similar to each other; all showed significant improvement between 1990 and 2000 (one-sided *p* values all below 0.03). The clearcut had the lowest evaluation in 1990, showed the greatest improvement (slope = 0.32, $r^2$ = 0.82), and improved significantly from 1990 to 2000 (one-sided *p* value <0.001).

*Figure 2* shows the percentage of respondents who rated each stand "acceptable" (+1 or higher), which may be of interest from a policy point of view. A harvest method might be defined as meeting the public's standards if judged acceptable by some proportion of the public; for the purposes of this discussion, a simple majority (>50 percent) is used.

During the initial years after harvest, the old-growth site and the three nontraditional sites all met this standard, whereas the traditional sites did not. In 2000, when the sites had 11 to 13 years to recover, all treatments met the standard and the distinction between the sites decreased. The most notable improvement was in the clearcut site; only 21 percent of respondents rated it acceptable in 1990, compared to 68 percent in 2000.

## Discussion

Prior studies have shown that scenic quality is at its lowest in the time period directly after a clearcut or thinning (Hull and Buhyoff 1986). But little research has been done to investigate the rate of recovery on the types of nontraditional harvests discussed here. However, low scenic quality has been associated with small stems, large amounts of downed wood, and evidence of mechanical disturbance (Benson and Ullrich 1981). Because these features are present on all recently harvested sites, it was not surprising to see that ratings had generally improved more than a decade after harvest. This was enough time to allow the more obvious evidence of logging operations to fade as coarse woody debris began to decay, understory plants obscured stumps and slash, and replanted Douglas-firs began to thrive. This may also explain why

the clearcut had the highest rate of improvement, given that it showed the greatest impact immediately after harvest and had the most rapid regrowth because of aggressive site preparation and lack of overstory competition.

The old-growth site was the highest-rated and had the least variability throughout the study. These results were expected, because a decade of growth makes little difference in the appearance of 200- to 300-year-old trees.

The clearcut site is now a dense plantation of young Douglas-firs. Although it is among the lowest-rated sites each year, its rating has improved steadily throughout the study. Will the ratings continue to improve? The young trees are now reaching 12 to 15 feet in height, and in future years the view of the stand (from the road at the top of the slope) will be obstructed by the new growth. There is evidence that, beyond some moderate point, increasing density is associated with a decrease in scenic beauty—in effect, the near-view vistas become less interesting (Tahvanainen et al. 1996). The next decade of research will show if the scenic ratings are affected by the obstruction and the corresponding lack of "visual penetrability."

The thinned site has also improved over time and has had positive ratings for the past nine years. This finding supports other research showing that high scenic beauty is associated with mature trees and low to moderate stand densities (Ribe 1989). Ratings will likely continue to improve over the next decade as the trees grow older and the visual evidence of harvesting diminishes.

The patch cut is the only site whose scores over time cannot be characterized by a straight linear function. We hypothesize the initial improvement (years 1–6) is due to the reduction in evidence of logging accompanied by an increase in forb cover. After year 6, however, the brush in the understory grew up enough to look "messy" and caused a decrease in ratings. Ribe (1991) has shown that other factors, such as the character of nondominant vegetation (forbs versus shrubs) and woody material, may complicate a simple linear relationship. We did not collect data on individual characteristics of the site, so it is not possible to specify any effect these variables may have had on the average ratings.

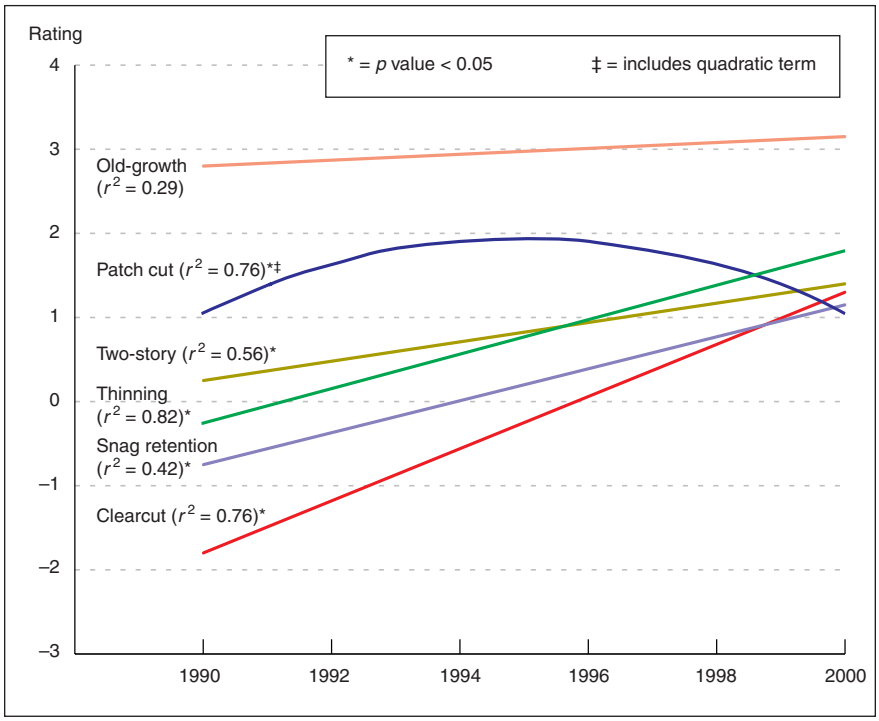



***Figure 1.*** **Regression lines fit to the average scenic rating for each site from 1990 to 2000.**

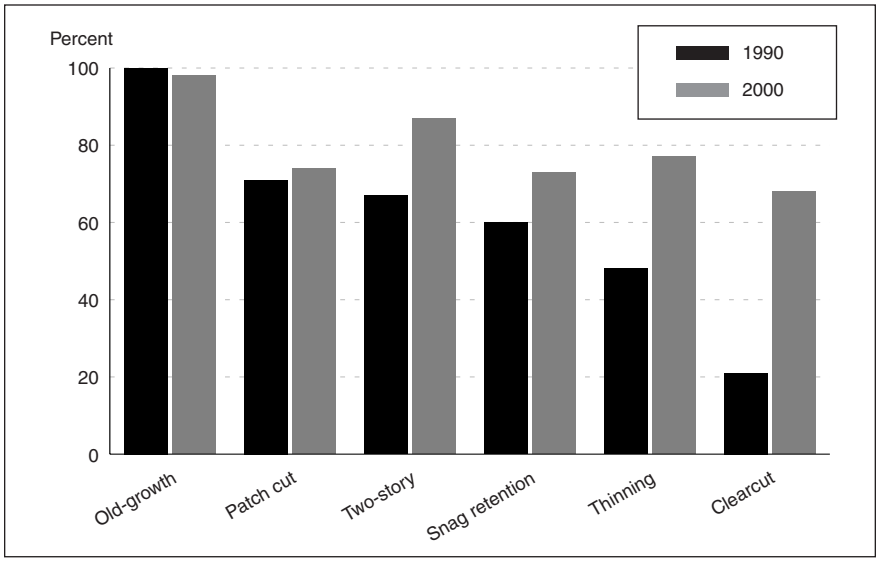



***Figure 2.*** **Percentage of respondents who rated a site "acceptable," 1990 and 2000.**

The score for the snag retention site increased slowly through the study period. Scores might be raised further if the snags were topped in a more "natural-appearing" manner. For example, dynamite-topped trees have a more jagged appearance and look more like wind-snapped trees than do sawtopped trees. Research suggests that the ratings would also improve if respondents were informed about the wildlife benefits of the snags (Brunson and Reiter 1996).

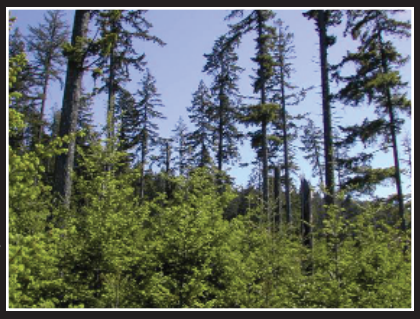
The most remarkable result of this study may be the tendency of scenic ratings for harvested sites to become similar over time. Immediately after harvest in 1990, the scenic evaluations for the harvested sites were quite different, with the traditional treatments (particularly the clearcut) scoring

**More than a decade after harvest, the clearcut is now a dense plantation of 12- to 15-foot Douglas-fir. Although its ratings are still comparatively low, it has improved the most over the course of the study.**

**The patch cut showed initial improvement, but its ratings decreased as brush built up in the understory.**

**The snag retention site has improved throughout the study, although not as rapidly as the clearcut site.**

**The thinned site has received positive ratings for the past nine years as the evidence of harvesting has diminished.**



**Although the two-story site received positive ratings throughout the study, it has improved less rapidly than some of the others.**

Photos by Jonathan Thompson

lower. Over time, however, the ratings for sites with the biggest impacts have improved the most, and the evaluations in 2000 are remarkably similar. This does not mean they look the same, and scenic quality is still below that of the old-growth stand. But the short-term advantages of the nontraditional treatments have faded, and the present similarity of the scenic-quality ratings is remarkable.

Are nontraditional treatments worthwhile, given that they improve scenic quality in the short term? It is important to consider these results from several time contexts. Eleven years is not a long time from the perspective of a forester who thinks in terms of rotation ages, which for these Oregon Coast Range sites are typically 40 to 50 years. But to the residents who live around the research forest and the recreationists who use the area, 11 years may seem much longer. To them, the improved scenic quality associated with nontraditional silviculture may be well worth the costs, especially in situations where harvests can be seen from people's homes or recreation sites. In a separate study on this research forest, Johnson et al. (1994) used computer-based image-capture technology to show homeowners adjacent to the forest how the view from their homes might change under different silviculture scenarios. Results suggested that visual impacts are more important in specific valued settings, such as one's own home (Johnson et al. 1994). The study also showed that the average length of residence was eight years. The short-term effects are particularly significant given this short "rotation" of homeownership; five to 10 years of looking at a clearcut in one's back yard may seem like a long time.

The convergence of scenic beauty scores found in this research is applicable only to these sites in the highly productive Douglas-fir stands of the Oregon Coast Range. In lower productivity areas such as the Rocky Mountains or even much of the Cascades, where rotations may be over 60 years, the length of time to convergence is likely to be longer, and the relative benefits of nontraditional silviculture approaches for scenic quality protection are probably greater.

Finally, these results should not be taken as an argument against using nontraditional treatments for other purposes, such as wildlife habitat, emulating natural disturbances, and maintaining biodiversity. There are many factors to consider when deciding on a silviculture approach, and scenic beauty is only one.

## Literature Cited


ANDERSON, L.M., and H. SCHROEDER. 1983. Application of wildland scenic assessment methods to the urban landscape. *Landscape Planning* 10:219–37.

BENSON, R.E., and J.R. ULLRICH. 1981. *Visual impacts of forest management activities: Findings on public preferences.* Research Paper INT-262. Ogden, Utah: USDA Forest Service, Intermountain Research Station.

BRUNSON, M. 1991. Effects of traditional and "new forestry" practices on recreational and scenic quality of managed forests. PhD thesis, Oregon State University, Corvallis.

BRUNSON, M., and D.K. REITER. 1996. Effects of ecological information on judgments about scenic impacts of timber harvest. *Journal of Environmental Management* 46:31–41.

BRUNSON, M., and B. SHELBY. 1992. Assessing recreational and scenic quality: How does new forestry rate? *Journal of Forestry* 90(7):37–41.

DANIEL, T.C., and R.S. BOSTER. 1976. *Measuring landscape esthetics: The scenic beauty estimation method.* Research Paper RM-167. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.

HULL, R.B., and G.J. BUHYOFF. 1986. The scenic beauty temporal distribution method: An attempt to make scenic beauty assessments compatible with forest planning efforts. *Forest Science* 32(2):271–86.

JOHNSON R.L., M.W. BRUNSON, and T. KIMURA. 1994. Using image capture technology to assess scenic value at the urban/forest interface: A case study. *Journal of Environmental Management* 40:183–95.

RIBE, R.G. 1989. The aesthetics of forestry: What has empirical preference research taught us? *Environmental Management* 13(1):55–74.

———. 1991. A general model for understanding the perception of scenic beauty in northern hardwood forests. *Landscape Journal* 9(2):86–101.

TAHVANAINEN L., L. TYRVAINEN, and I. NOUSIAINEN. 1996. Effect of afforestation on the scenic value of rural landscape. *Scandinavian Journal of Forestry Research* 11:397–405.



*Bo Shelby (bo.shelby@orst.edu) is professor, Jonathan Thompson is graduate research assistant, and Rebecca Johnson is professor, Department of Forest Resources, Oregon State University, Corvallis, OR 97331; Mark Brunson is associate professor, Department of Environment and Society, Utah State University, Logan.*