

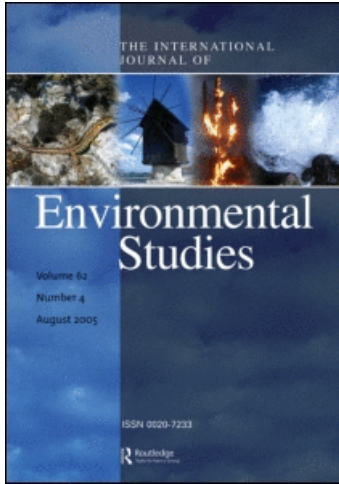
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### Measuring the beauty of forests

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# Measuring the beauty of forests

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Aesthetic considerations are increasingly being taken into account when forest management decisions are made, but more quantitative studies testing assumptions are needed. This study tests the assumption that mature forests are perceived as being more beautiful than young forests; it also tests the philosophical concept of 'serious beauty', which hypothesises that the more knowledge one has about the ecological functioning of an environment, the more beautiful it will seem. All tests were done *in situ*. University students ( $N = 334$ ) rated the mature forest as more beautiful than the young forest. The young forest was rated as less than neutral in appearance, and the mature forest was rated as more beautiful than neutral. Male students rated the forest as more beautiful than the females did. No significant difference was seen between the ratings from before or after an ecology presentation. Thus we did not confirm the serious beauty hypothesis in this instance.

*Keywords:* Environmental aesthetics; Forest age; Serious beauty; Nature aesthetics; Gender perception

## Introduction

The quality of 'beauty' is largely thought of as being based on subjective feelings that differ from person to person. But is beauty really judged differently by different individuals? Is it merely 'in the eye of the beholder'? Although this is what many have been led to believe, when these questions are assessed quantitatively we find that the experience of beauty is more universal than individual. The studies that have been done, mostly by psychologists or landscape architects, find that we have a common aesthetic sense, and that arguments against the objectivity of aesthetic judgments usually overstate the extent of disagreement [1,2]. For example, in studies where participants were asked to rate photographs of various scenes, a solid preference was shown for scenes of the natural world, and particularly for scenes including trees [3,4].

These preferences often lead to conflicts when the public objects to the cutting of trees – on both public and private lands. Forest defenders frequently cite biodiversity and carbon sequestration as reasons for leaving the forest uncut, but just as frequently they note the beauty of the forest. The consensus seems to be that older forests are more beautiful than younger forests. Studies done in the American southwest confirm that that number one predictor of scenic beauty, at both the stand and the site level, is the size of the trees: the larger the trees the higher the estimates of scenic beauty [5–7].

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In recent decades, in part to avoid these conflicts, forest managers have been asked to take the aesthetic impacts of their logging plans into consideration; but methods of aesthetic assessment of forested landscapes have been spread out across disciplines as diverse as landscape architecture, economics, philosophy, geography, and psychology; and no consensus has been reached on a common methodology [8,9]. Frequently assessments are based on photographs, or the opinion of only a few persons [10–12].

The aesthetics of beauty have traditionally been the domain of philosophers, but recently a few leading philosophers of environmental aesthetics have suggested that ecologists trained in natural history are those best able to appreciate nature's beauty [13,14]. These contemporary philosophers agree that beauty is more than just form; knowledge is involved in its interpretation, particularly knowledge of the natural sciences. The philosophers argue that because ecologists understand the workings of nature, the beauty that ecologists see in a forest is a more 'serious' beauty (in the terminology of the philosophers). This understanding leads to appreciation, appreciation leads to valuing the aesthetics, and valuing the aesthetics leads to an enhanced experience of beauty. The notion that people alter their preferences as a result of learning new information is also termed an 'ecological aesthetic' in contrast to an uninformed 'scenic aesthetic'.

Ecologists, on the other hand, have largely shrugged off the responsibility for determining nature's beauty. If pressed to explain our aesthetic sense, ecologists are more likely to cite responses developed through natural selection during human evolution than recently acquired knowledge [15].

My research questions quantitatively measure perceptions of natural beauty. In this study I test whether an educational presentation on forest ecology immediately prior to experiencing the forest makes a difference in the rating of its beauty. (This is the 'serious beauty' hypothesis of the philosophers.) I also test whether a mature forest stand is perceived as being more beautiful than a younger forest stand. I test these questions within the forest, not by photographs.

## Materials and methods

University students of varying majors between the ages of 18 and 23, and enrolled in an introductory biology class, were bussed in groups of 20–24 to an area where a young forest stand and a mature forest stand exist in close proximity (the Nassawango Field Station, Wicomico County, MD, USA). The study was conducted during regularly scheduled laboratory sessions, 12–15 October 2009.

As each class arrived students were divided randomly into two groups. One group was led directly to the forest where students were told only that they were participating in a research project investigating environmental aesthetics. No mention was made regarding the age of the forest stands. Students entered either a young or mature forest on a 10 m long path, where they completed the survey while standing, surrounded by the forest. The 'young' forest was a loblolly pine plantation, typical of the area. Native loblolly pines (*Pinus taeda*) 11 years old, 3–17 cm in diameter, and spaced approximately 1 m apart, comprised the dominant trees. The 'mature' forest was located directly across a dirt lane from the young forest. It, too, had been logged and managed for pine, but the pines were 57 years old, 30–44 cm in diameter, and spaced approximately 5 m apart. Other tree species such as American holly, sweet gum, and southern red oak grew among the pines, as is typical for an older pine plantation in the area. In both forests, climate, soil type, and aspect were similar.

Students rated the forests by placing a mark on the survey sheet along a 20 cm line that was labelled 'Unattractive' to the far left, 'Neutral' in the centre, and 'Beautiful' to the far right. No definition was given for the term 'beauty'. Students were simply asked to use their own personal definition. After viewing and rating the first forest stand students were led to the second forest stand directly across the road. In addition to rating the forests by marking the line, students were also asked which forest stand was more beautiful. Answer choices were 'the first one', 'the second one', or 'both were equal'.

Meanwhile the second group was taken inside the field station and given a 20-minute presentation on forest ecology and shown a few specimens of the tree species in the forest. The presentation made no reference to forest beauty or age, although many of the illustrating slides were taken in older forests. The presentation concentrated on the ecological function and ecological services provided by a forest (e.g. energy capture, carbon capture, habitat, improved stormwater quality, improved air quality, etc.). After the presentation this group was taken to the forest to complete the survey in the same manner as the first group.

After the surveys were collected the marks were translated to numerical values by measuring the distance the mark fell along the line. In this manner 'Unattractive' became equal to 0, 'Neutral' became equal to 10, and 'Beautiful' became equal to 20.

Three hundred and thirty-eight students visited the field station and completed the surveys. Only four students were older than 23 years and those four were dropped from the analysis to concentrate the demographic to 18–23-year-olds, leaving 334 for the final analysis; 146 males and 187 females.

In an analysis of environmental perception rating scales Schroeder [16] determined that 'in all cases the simple mean rating produced virtually identical results to the more sophisticated analyses'. Consequently, I used mean ratings for all comparisons. Data were normally distributed (Kolmogorov-Smirnov and Shapiro-Wilk) and the statistics package SPSS 17.0 was used for analysis.

## Results

When all ratings were combined the students rated the mature forest stand as being more beautiful than the young forest stand (figure 1; paired  $t$ -test,  $p < 0.005$ ). The mean rating for the mature forest was 12.1 (SE = 0.21) putting it above neutral, while the mean rating for the young forest was 8.8 (SE = 0.26) putting it below neutral. There were 329 responses to the question that directly asked which forest was more beautiful. Fifty students said they were both equal, 47 chose the younger forest, and 232 chose the mature forest. Of the students who chose one forest over another in terms of beauty, 17% selected the young forest and 83% selected the mature forest.

When all ratings were combined by gender, males and females showed no difference in the mean spread between ratings of the young and mature forests (males = 3.2, females = 3.3; two-tailed  $t$ -test,  $p = 0.780$ ), but males rated the forest as more beautiful overall (figure 2; 11.1 vs 10.0, SE 0.30 and 0.26 respectively; two-tailed  $t$ -test,  $p < 0.005$ ). The mean forest beauty rating for males was above neutral while the mean forest beauty rating for females was neutral.

When the data were examined according to whether or not the students had seen the presentation before rating the forests (figure 3), the ratings were higher after the presentation for both the young (8.4 before presentation versus 9.2 after presentation) and the mature (11.9 before presentation, 12.3 after presentation) forest, but the differences were

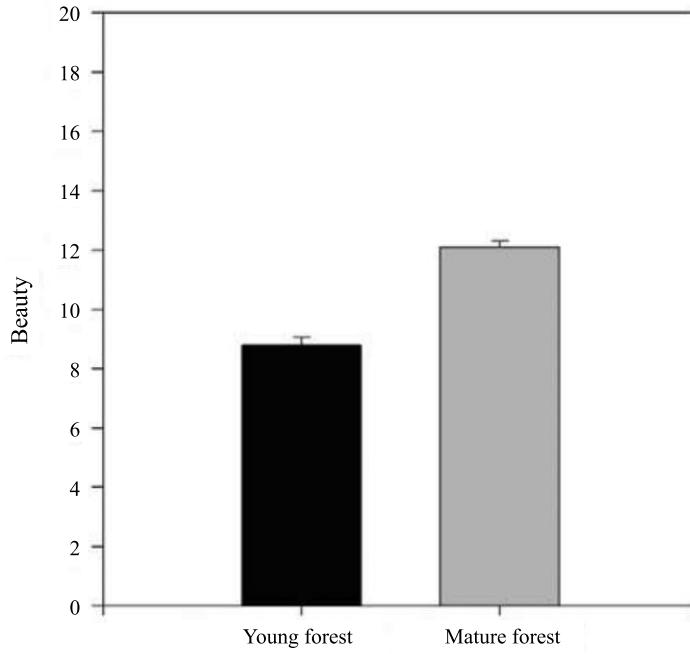


Figure 1. The mature forest was rated as more beautiful than the young forest. Differences are significant ( $p < 0.005$ ).

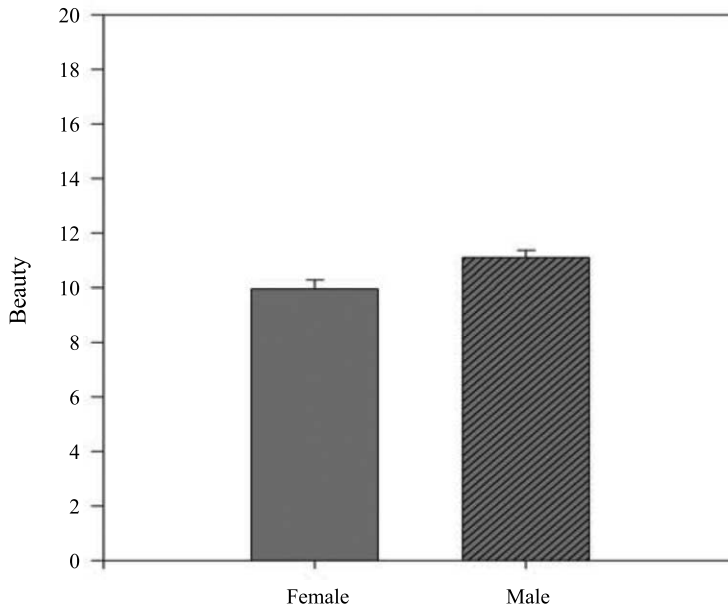


Figure 2. Males rated the forest higher in beauty than the females did (Individual ratings for both young and mature forests were combined and the means were used for comparison. Differences are significant  $p < 0.005$ ).

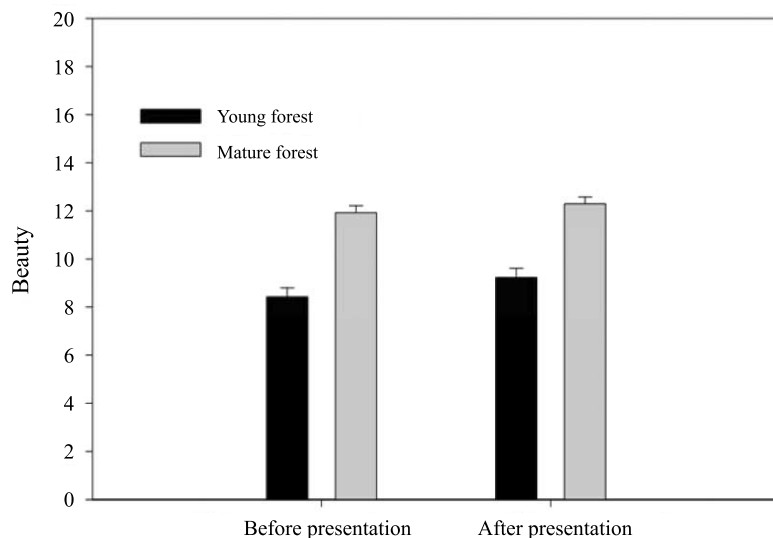


Figure 3. A presentation on forest ecology prior to viewing the forest stands made no significant difference in the ratings of the forests.

not statistically significant (two-tailed  $t$ -test,  $p = 0.120$  and  $p = 0.387$ , respectively). Again, both mean ratings were below neutral for the young forest and above neutral for the mature forest.

In other studies no consistent differences were detected in scenic beauty estimates given by students and nonstudents [7] therefore these figures are likely to represent the responses of a general population.

## Discussion

In 1949 Aldo Leopold wrote, 'A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise' [17]. In the 60 years since it was published this has become his most frequently quoted line. Although many studies have attempted to measure the *integrity* and *stability* of biotic communities, far fewer studies have been focused specifically on measuring the *beauty* of the biotic community. Consequently, we have no standardized tools used for measuring beauty, and no agreed method for comparing and communicating the attractiveness of various landscapes.

Despite this lack of quantification, the aesthetic qualities of natural areas are frequently mentioned as a reason for preserving them from development. But if aesthetic arguments are to be taken seriously in planning and policy-making then some level of objectivity and agreement is necessary. More studies are needed to quantify common responses to natural scenes. In this study I was able to show that 83% of the participants in a controlled study rated the mature forest as more beautiful than the young forest. This overwhelming agreement gives strength to the argument that there is a shared, objective, basis to the quality of beauty in the natural world.

I found that the older forest was rated as more beautiful than the younger forest even though all other factors (terrain, soil type, climate, time of day) were similar. The mature forest was rated as above neutral and the young forest was rated as less than neutral in terms of beauty. Overall, males rated the forest as more beautiful than females.

Most attempts at measuring nature aesthetics use photographs [e.g. 3,12,18], but in this study the measurements were done *in situ*. Visual perceptions are the most powerful determining factor in aesthetic preferences, but by measuring preferences in the actual environment more subtle perceptions such as sounds, smells, and even the feel of the soil beneath the feet, may be included in the ratings. Although the methodology of this experiment is simple, this was a trade-off in return for the ability to test a large pool of subjects *in situ*.

Viewing a presentation about forest ecology immediately preceding the survey increased the ratings a small, but insignificant, amount. Hence the 'serious beauty' hypothesis of the philosophers was not confirmed by my results. (The hypothesis states that the more one understands the natural world the more beautiful it will seem.) These results strengthen the argument that our aesthetic preferences are biologically based (and hence not capable of being readily changed) rather than knowledge-based (and thus likely to change depending on circumstances). These results indicate that knowledge of the forest ecosystem does not appreciably alter the perception of beauty. These results are similar to the findings of Hill and Davidson [12] who found that varying the information that participants received about restoration decisions (some information favouring cleared areas and some information favouring forested areas) did not significantly alter the strong shared preferences for photographs of certain scenes.

In this study the mature forest was selected as being more beautiful than the young forest. In effect, the subjects *preferred* the older forest. Although this is not surprising, a quantification of this preference is important for environmental economists and policy-makers, who relate choice to value [19,20]. Because older trees are preferred, they are more valuable than younger trees to the observer (in the currency of beauty); just as older trees are more valuable than younger trees to the logger (in the currency of money). Given these circumstances we should expect conflicts between these two groups to increase as forests age, and to reach intense levels concerning the fate of mature forests.

This study was conducted in a single young and a single mature forest stand in close proximity to one another, to reduce variables. The results could be strengthened by repeating it in other young and mature forests; and in other seasons. It is also possible that a lengthier course of study might influence the ratings. There is much more research which needs to be done regarding the beauty of nature. It would be interesting to learn why the forests were rated as more beautiful by the males than the females. Is this a result of familiarity? Of safety? Or is it an inherent difference in the sexes?

Beyond the questions relating to our perceptions of beauty in nature, there are also questions that remain regarding the policy implications of our perceptions. The philosopher Allen Carlson notes that 'An aesthetics of nature that cannot support grounds for preserving that which we find beautiful is not worthy of consideration' [21]. Should beauty have a place in determining environmental policy? If we can say that one place is more beautiful than another, indeed, if it is more beautiful than most, or even all, other places are we then ethically obligated to preserve it? Leopold would answer these questions in the affirmative, but more understanding of the thing we call beauty is needed before it can be used as a determining factor in land use decisions. This research is an exploratory step in that direction.

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