

## Predicting scenic beauty of forest stands in Catalonia (North-east Spain)

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**Abstract:** Relative preferences of 90 images of forest stands, photos and virtual reality images were investigated by the internet to develop a quantitative model for estimating scenic beauty preferences at the stand level. The relative priority values obtained from the questionnaire of a total of 259 judges were analyzed using regression methods for pairwise comparisons. Two models were developed based on two different groups of stands. Both models indicate that the priority of a forest stand increases with an augment in the number of bushes and trees, and also with the mean diameter of trees. On the other hand, the priority is low with large number of pines and small trees. Stands represented by photos receive better priority values than those represented by virtual reality images. When the background of the judges (gender, country or occupation) was included into the model as additional predictors, no significant improvements are achieved.

**Keywords:** analytic hierarchy process; landscape preferences; pairwise comparison; virtual reality

### Introduction

Forest supplies, in addition to wood, a diversity of important non-wood products, and plays an important role in soil protection, regulation of water resources, fixation of CO<sub>2</sub>, biodiversity conservation, and in providing recreation activities (Palahí et al. 2004). Despite this, forest planning has dealt almost exclusively with timber production, trying to maximize the economic profit for the forest owner. However, the current demand of the society is to include non-timber forest services into forest planning. The single-purpose timber production of the past decades is being redirected towards ecological conservation and multiple-use of forests.

The purpose of forest planning is to support forestry deci-

sion-making by suggesting management alternatives, providing information about their consequences, and helping the decision maker to rank the alternatives. In multi-objective forest planning, different objectives and forest management practices are evaluated in order to achieve the highest satisfaction value for the decision makers. Multi-criteria decision analysis is an important tool when a decision has to be taken from multiple objectives. In order to optimize management, numerical values of all decision criteria are required, i.e., products and services that are of interest. However, in certain cases, the numerical values are not easy to obtain because the value itself arises from a subjective perception. One particular case is the amenity of a forest stand. Especially in public forest and in areas used for recreation it is important to know how different forest management options affect people's perceptions about the scenic beauty of the stand (Silvennoinen et al. 2002).

Integration of scenic beauty into the decision-making process of multiple-use forestry requires a relation between scenic beauty perception and other physical forest features that are managed to meet broader goals (Brown and Daniel 1986). Earlier studies have shown reasonable success in relating scenic beauty to forest characteristics (Arthur 1977; Savolainen and Kellomäki 1981; Schroeder and Daniel 1981; Pukkala et al. 1988; Rudis et al. 1988; Silvennoinen et al. 2002).

Nowadays several methods can be used to collect and analyze people's preferences concerning environmental issues. These methods have been adapted from psychophysics, a branch of psychology established in the early 1800s (Hull et al. 1984). These procedures provide precise quantitative indices based on people's perceptions of stimuli. Each of these methods requires information from a survey or experimental situation. A common

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