Is an attractive forest also considered well managed? Public preferences for forest cover and stand structure across a rural/urban gradient in northern Portugal

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Abstract

There is an extensive body of empirical research focusing on public preferences for forest landscapes. However, it is also recognised that visually appealing landscapes may not be ecologically healthy and these differences may cause tensions as indirect ecosystem services become an increasingly important focus for forest management. This study used a questionnaire survey to investigate the extent to which public preferences for characteristics such as forest cover and stand structure varied when framed in terms of attractiveness or good management objectives. The research took place in northern Portugal and also examined the implications of using verbal prompts or visual stimuli as means of eliciting preferences. Key results from the study were: 1) public preferences regarding forest cover and stand structure varied among user groups 3) because ground cover vegetation was not regarded as attractive or good then strategies for future whole catchment management may face some tension, and 4) there were some inconsistencies identified in the preferences derived from verbal prompts and visual stimuli. By contrasting preferences for attractiveness and management criteria the research presents a simple quantitative approach that provides a basis for interventions through design or knowledge exchange to help align aesthetic and ecological goals. However, it also suggests that research approaches able to provide a deeper engagement with the public regarding the indirect ecosystem services from forests via qualitative approaches such as focus groups and incentive mechanisms are likely to be important.

Keywords:
Forest attractiveness
Forest management
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Ecosystem services
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1. Introduction

As the movement towards ecosystem management has begun to dominate forestry an ongoing debate has developed, which involves at least a triangular and balances production with ecology and aesthetics (Sheppard, 2001). Visual resource management as it has been practised over the last quarter century has, in general, successfully addressed “preferred” forest landscape features, but now appears unable to solve the conflicts raised by the prospect of ecologically sustainable forestry (Sayer and Maginnis, 2005). In part, this is because of the need to go beyond the immediate visual dimension and consider the indirect ecosystem services that forests can contribute to and which people may not appreciate. Furthermore, there are still unresolved questions regarding the importance of aesthetics in understanding and affecting landscape change and the ways in which aesthetics and ecology may have either complementary or contradictory implications for a landscape. This study explores such issues and, building upon the conceptual model of the aesthetics–ecology relationship by Gobster et al. (2007) examines, in the context of Portugal, whether the public distinguishes between attractiveness or management objectives and the implications of this in the provision of ecosystem services at the watershed scale.

The study of visual aesthetic preferences or scenic beauty (Daniel, 2001) in relation to the characteristics of natural environment is a recurrent topic in the literature (Appleton, 1975; Thorne and Huang, 1991). Forests are a common focus of research (Ribe, 1982, 1989), though studies have also examined public preferences for agrarian systems (Rogge et al., 2007), hedgerows and other natural features (Evenden, 1988; Misgav, 2000).

A review of public preferences for forests indicates that these are likely to vary with personal and socio-economic factors such as gender and landownership (Abello and Bernaldez, 1986; Tips and Vasdisara, 1986), professional background (Rogge et al., 2007; Winter, 2005) and type of recreational activity (Harshaw et al., 2006; Roovers et al., 2002). In addition, it has been found that farmers, experts and country dwellers have different perception of landscapes (Rogge et al., 2007). Other work has reported differences and conflicts between preferences of “local” and “extra-local” inhabitants of protected areas.
discrepancies between human preferences for natural resources and the goods and services, there are also studies exploring public timber and non-timber goods (Brose and Wade, 2002). Recognising minimal, and honey production will be marginal (Stevens and in 2007). The disjuncture was termed the “aesthetics–ecology debate” by Gobster et al. (2007) who argued that visually appealing landscapes are not always ecologically healthy, in the same way, “ecologically healthy landscapes may not be aesthetically pleasing” (Gobster et al. 2007: 962). A similar argument was previously developed by Sheppard et al. (2001).

In their work some correspondence between aesthetics and ecology was found but was not universally present “it can be seen that what is believed to be ecologically good may not look good, and that what looks good may not be ecologically sustainable” (Sheppard et al. 2001: 284). Selman (2006) also raises the issue by addressing what he calls the “nature–society” debate. He argues that is likely that people prefer tidiness and tend to avoid “landscapes of fear”, whereas nature often creates “scruffiness” and requires natural disturbances such as fire (Selman, 2006: 63). A similar point is made by Nassauer (1995) who discusses the role of “cues to care” and how these cues resonate with some members of the public when they make assessments of forested landscapes.

These differences have potentially important implications for initiatives to incorporate public preferences into the planning (establishing goals and policies) and management (putting planning goals into practice) of landscapes. As far as forests are concerned, in addition to aesthetic and ecological issues, there is also a third dimension relating to the ways in which the productive functions of forests are achieved. Associated with productive functions of forests, in addition to timber, there are a variety of other non-timber goods such as honey and game that are likely to be important for the livelihoods of the communities that live around the forests. The stand composition and structure as well as the arrangement of forest patches can enhance or detract from the ability of the forest ecosystem to provide such direct goods (Kellomaki and Pukkala, 1989). For example, a forest in which ground vegetation is removed in order to reduce competition between species (trees and understorey) and increase timber yield will lack appropriate refuge for game; furthermore, because ground (and floral) vegetation will be minimal, and honey production will be marginal (Stevens and Montegomery, 2002). Ground vegetation removal is one example of forest management practices that affect the provision of both timber and non-timber goods (Brose and Wade, 2002). Recognising the importance of forest management in the delivery of direct goods and services, there are also studies exploring public preferences for thinning (Silvennoinen et al., 2001), afforestation styles (Karjalainen and Komulainen, 1998) and clear cut methods (Rekola and Pouta, 2005) in order to improve management programs (Kellomaki and Pukkala, 1989).

Public preferences for forests are defined by Sheppard and Meitner (2005:7) as “the degree to which a person or group prefers a situation or feature over other situations or features” and they also argue that these may vary according to whether scenic beauty (attractiveness) or management strategy (management) is under consideration. For example, a livestock grazer may find a dense and contiguous forest aesthetically pleasing, while acknowledging that his/her own livestock will not be able to thrive in such habitat, thus making it likely that he or she will not favour continuous cover forestry as a management strategy, at least in the area he/she grazes livestock (Ribe, 2002). Similarly, Tahvanainen et al. (2001) suggested that clear cuts might be appreciated by someone picking berries even though the scenic beauty is likely to be compromised. Thus it is likely that individuals have distinct preferences according to whether a consumer or a citizen viewpoint is adopted (van Rensburg et al., 2002).

A further complication is the extent to which indirect ecosystem services, such as those related to water flow regulation and flood protection, are becoming an increasingly important focus for forest management in many countries (Kimmins, 2008). Managing for a broader set of forest ecosystem services requires not only enlarging the spatial scale (from stand to the landscape), but may also have implications for characteristics such as ground vegetation management and stand structure complexity (e.g. to enhance water retention and slow flow). However, there may be limited public understanding or support for such measures, especially if they need to occur in upland rural locations distant from those urban centres which are the main beneficiaries (Farrella et al., 2000). In essence, it is difficult for people to understand, care about, and act purposefully upon phenomena that occur at scales beyond their own direct experience (Gobster et al., 2007).

Although considerable efforts have been made to explore the attractiveness of forests as well as public opinion about forestry management practices per se, there are few cases in which differences between attractiveness and management-based preferences for forests have been explored in the literature (Shelby et al., 2005). Where this has been done the findings have been varied. For instance, both Tahvanainen et al. (2001) and Shelby et al. (2005) found some differences in scenic beauty and recreational preferences. Contrasts between aesthetic preferences and acceptability of management options were also found by Ribe (2002). In the majority of cases however, even if scientists do not make a strong connection between the appearance and the state of the landscape, the public often does so (Sheppard, 2003; Sheppard et al., 2001). According to Sheppard et al. (2001) the confused relationship between aesthetics and ecology is a problem that research needs to tackle.

This study therefore undertook a questionnaire survey in which participants (including a wide variety of forest users) were asked to express their preferences for scenes varying in forest cover and stand structure. In making these judgments the respondents were asked to “frame” their preferences in two different ways, firstly in terms of attractiveness and then regarding management. By drawing such a distinction the study sought to identify any differences between the two perspectives and determine whether they could be simply related to participant background as is often assumed in the literature.

The research was conducted in the setting of northern Portugal where forests are an important landscape feature whose management has faced a number of challenges (Firmino, 1999; Pinto-Correia, 2000). One of the key issues for forest management in Portugal, as well as in other Mediterranean countries, is to reduce the impact of wild forest fires (DGRF, 2007). If it is recognised that fragmentation is a major threat to forests (Fabrig, 2003), it is also acknowledged that contiguity of forest stands causes problems in fire combat, and consequently discontinuities have been created in order to reduce the risks of fire spread. Another measure to reduce fire impacts is to create variations in stand structures since the different wood densities delay spread more effectively than homogeneous stands. These factors need to be taken into account when interpreting attitudes to variables such as forest cover and stand ages in a country such as Portugal (DGRF, 2007).

Public preferences can be studied through verbal and visual approaches (Tahvanainen et al., 2001). Because technical concepts such as forest cover and stand structure can be unfamiliar to respondents the questions were addressed both verbally and visually. The former was used first because it gave respondents the opportunity to “frame” their own view of the concepts. The visual approach is, per se, one of the most used techniques due to its ability to set the frame and put everyone’s mind in the same context (Tahvanainen et al., 2001). The main questions addressed by the research were therefore:

1. Do public preferences for level of forest cover and stand structure vary according to whether attractiveness or management objectives are considered?
2. Are there differences in aesthetic and management preferences across different user groups?
3. Are there indications that public preferences might threaten the ecological functioning of forests by compromising the provision of ecosystem services (e.g. water flow regulation)?
4. Do the results vary according to whether verbal or visual approaches are used?

2. Material and methods

2.1. Study area

River basins can be highly appropriate units to study forest ecosystems due to their ability to link together cultural and biophysical systems and thus represent a suitable scale to address landscape issues (Selman, 2006). This study focused on the 14 municipalities within the Lima and Câvado watersheds of northwest Portugal. These rivers originate in a mountainous region (up to 1530 m high) and flow to the sea coast along a distance of approximately 80 km. The study area is mainly under Atlantic climatic influence, though some areas show Mediterranean microclimate. Broad-leaved trees such as oak (Quercus robur) are characteristic of the zone, but the most predominant tree species is maritime pine (Pinus pinaster) while in recent years the area of eucalyptus trees (Eucalyptus globulus) has been increasing steadily. The Peneda-Geres national park is located at the top of both catchments.

2.2. Questionnaire survey

Public preferences were studied through a questionnaire survey which investigated opinions regarding i) attractiveness and ii) management of forests with regard to variations in area covered by forests and stand structure. The survey also collected details of forest use namely the number of visits each interviewee had, during the year 2006, in order to undertake activities such as timber and non-timber product collections, recreation, grazing and hunting. During the planning phase of the questionnaire a meeting with the forestry office in each municipality was arranged in order to obtain contact details for people in the local forestry sector. These forestry stakeholders were then included in the potential sample. When these contacts were made a “snowball” approach was used in order to enlarge the sample. In addition, a street survey was carried out in the town centre of each municipality in order to collect information from the general public.

The initial part of the questionnaire focussed on verbally expressed preferences for forest characteristics. At this stage respondents were asked verbally to select one of two contrasting characteristics i.e. for continuous cover or a patchy forest and for even or uneven stands.

2.2.1. The questionnaire images

In order to assess opinions on different cover levels and stand structures typical scenes representing the forests in the study area were chosen. Photos from the study area were considered most appropriate to match with the familiarity of respondents. Pine forest was selected for all the scenes since, despite the presence of oak across the area, it is the most common tree species in the watersheds. In addition, using only pure pine stands provides a “control” for species diversity. All the photos were taken in September 2005 (thus not varying the season) using a Nikon digital camera with a 28 mm lens. The scenes used for the study of cover levels were distant views of forests in a mountain setting whereas for stand structure the images were closer up (Fig. 1). Both sets of pictures were taken at observer eye level; those showing different levels of forest cover were in landscape orientation while those depicting stand structures were in portrait.

The digital images were imported into the Adobe Photoshop image-processing software (Adobe, 2009) and image manipulation tools were used to eliminate all the features such as roads or urban areas likely to distract respondents from the factors under study. This photo manipulation was done taking care not to diminish the “realism” of the scenes (Appleton and Lovett, 2003). In addition, wherever possible, all the background colours were set to approximately same value in order to show only variations in the forest cover and stand structure parameters (e.g. setting the same sky colours). The only exception was in the photos with even stands where a blue sky looked too artificial and a grey colour was used instead to give a more balanced appearance. The final digital images were printed in A5 format and laminated in order to be kept in good condition throughout the survey.

2.2.2. Statistical analysis

Data from the questionnaire survey were analysed in SPSS. Based on their frequency of forest use the participants were classified into groups, e.g. recreationalists vs. non-recreationalists, timber and non-timber collectors. Due to the variety of use patterns a higher order classification was created: respondents that had frequencies above the mean for more than one activity (e.g. timber collection and livestock grazing) were classified as multi-users while those with above-average frequency of use in only one activity were classified as single users. When frequency of use was below the mean in all activities, participants were classified as occasional users. Finally, participants with fewer than five visits per year to a forest were classified as non-users.

Consistency of the image rankings amongst user groups was studied by using the Kruskal–Wallis test. In addition, in order to investigate if there were similarities in the rankings for attractiveness and management a Spearman rank correlation was calculated for each respondent. These calculations were conducted both including and excluding the photos (FE and SE) depicting burnt forests in order to assess the sensitivity of the results to such images (Palmer and Hoffman, 2001).

3. Results

3.1. Uses of forests

In the Minho region of Portugal people use forests in order to obtain multiple goods and services. In addition to being used for collection of timber and non-timber products, forests are also used as recreation sites; traditional activities in forest areas such as grazing and hunting are still important activities in some locations. The overall data shows that the activities in which there were higher frequencies of use were recreation, timber collection and grazing. In general, people that own forest land (landowners) had higher frequencies of use.
The mean frequency of use (number of days spent over one year in forests by activity) in each municipality is shown in Table 1. Municipalities are classified following the socio-economic analysis of Carvalho-Ribeiro and Lovett (2009) with the shading representing the groups from deep rural (no colour) to inner urban (dark grey).

From the total sample of 375 questionnaires, 213 of the interviewees were male (57%) and 162 (43%) were female. The vast majority of respondents were either occasional users or single users, the most common of which were recreationalists. 79 people visited forests for a multitude of uses throughout the year (multi-users). Overall, 87.5% of the interviewees, in some way, used forest areas and 47 (12.5%) did not use forests on a daily basis (non-users).

3.2. Overall image rankings

Table 2 shows the overall rankings of photos by respondents. The mean ranks indicate that there was a general trend for more fragmented forests to be regarded as less attractive. However, it was not the photo showing the most connected forest (FC) that received the best ranking (i.e. lowest score). Instead, the photo showing some discontinuity of forest cover (FA) was ranked as both the most attractive and best managed. Photo FC showing a continuous forest cover got a better ranking for attractiveness than management implying that this type of forest, though aesthetically pleasing is not considered good management as it is associated with easier fire spread.

For stand structures the photo that got the best attractiveness score was an uneven structure in which ground cover by shrubs was minimal (SB) while photo SA showing an even stand with no shrubs at all was rated best for management. Table 2 also indicates that, in general, higher variances occurred in the ratings of management than attractiveness, suggesting that preferences for management strategy were more individualistic than assessments of beauty. This presumably occurred either because people did not fully understand the meaning of management (despite the efforts made in survey implementation) or because attitudes to management greatly depend on the way individuals interact with forests (e.g. for recreation or timber collection).

3.3. Correlations of attractiveness and management rankings

A Spearman rank correlation was calculated from the rankings of attractiveness and management for each respondent. Nineteen respondents did not give valid answers for both questions so the sample size was 356 individuals.

The results in Fig. 2 show that 43% of respondents (156 out of 356) ordered all five photos in exactly the same way (i.e. \( r_s = 1 \)) for both attractiveness and management. A strong positive correlation (\( r_s > 0.5 \)) between the rankings was found for a further 30% of cases and overall 91% of respondents had a positive correlation. When photo FE showing burnt forests was excluded this percentage decreased to 81%. This suggests that the consistently low rating of photo FE enhanced the positive correlation between the two sets of ratings. In general, users of forests (multi, single and even occasional users) were more likely to make a distinction between attractiveness and management assessments. Of the 60 respondents that had...
negative correlations when rating the four photos only four were non-
users.

Fig. 3 indicates that 30% of respondents (130 out of 345) rated the
five stand structure photos identically (rs = 1). In total, 86% of
respondents had a positive correlation coefficient (rs > 0.5). When
photo SE was excluded 78% (279) of the cases still had positive
coefficients and 40% (144 respondents) had an rs value of 1. The
respondents that had negative correlations (i.e. differentiated be-
tween criteria) in the assessment of stand structures were mainly
recreationalists (single and occasional users) of which a considerable
percentage lived in urban areas.

3.4. Preference contrasts by user groups and place of residence

Kruskal–Wallis tests were used to investigate if there were
differences in the rankings amongst type of users as well as according
to places where people lived. Table 3 indicates that respondents who
regularly used the forests (multiple and single users) gave lower
rankings (higher approval) to the photos showing discontinuous
forest cover (FA and FD) for both attractiveness and management. The
average ratings for these two photos were significantly different
across the user groups. People who made little use of the forests (non
and occasional users) rated a continuous cover (FC) as more attractive
than regular users but the difference in ranks was not statistically
significant.

Table 4 presents a similar analysis for the stand photos. Only photo
SB showing an uneven stand produced a statistically significant
difference in attractiveness ratings, with the more regular forest users
preferring this image. Within the ratings for management there were
more significant differences, one example being the “park-like” forest
shown in SA which got better rankings from people who do not use
forests on a daily basis, while multi-users were least likely to consider
such a forest well managed.

The photo showing a burnt forest (SE) was poorly rated by all
groups, but had its highest rating from the multi-users suggesting that
people who used forests most had more appreciation of the benefits of
fire as a management strategy.

Based on the statistical analysis undertaken by Carvalho-Ribeiro
and Lovett (2009), the 14 municipalities in the survey were classified
into four socio-economic groups ranging from deep rural to inner
urban. Differences in the preferences of respondents according to
their place of residence were then examined. The results showed
statistically significant differences in preferences for forest cover and
management across the urban/rural gradient. For instance, inter-
viewees from urban areas favoured more connected forest landscapes
(e.g. photo FC), while photo FA (discontinuous forest) was particu-
larly preferred in the Deep Rural areas.

Fig. 4 shows the variations in attractiveness ratings regarding
stand structure across the urban–rural gradient. Photo SE was clearly
rated as least attractive, while in the other four photos there was more
variation in the mean scores for rural areas than urban ones. All of the
photos except SD had statistically significant differences across the
four categories in Kruskal–Wallis tests.

The ratings for stand structure regarding management in Fig. 5
show a contrasting trend with the variation increasing from rural
areas to urban ones. For instance, Photo SE (depicting fire damage)
was best rated in rural areas, perhaps reflecting the issues of fire
management. In contrast, the trend for photo SA suggests a preference
amongst urban inhabitants for forest environments suitable for
recreational activities.

3.5. Implications of preferences for forest ecosystems services

The results presented earlier in Table 2 indicated that photo SA (an
even stand forest with no understorey) was rated best for manage-
ment, while the type of forest shown in photo SC (even stand with
understorey) was clearly regarded as less good. This implies that the
respondents associated removal of ground vegetation with good
management practices. Such an interpretation is supported by the fact
that the burnt forest photos (FE and SE) were rated better on

![Fig. 2. Spearman rank correlations for forest cover including and excluding FE.](image-url)
management than attractiveness criteria. Controlled fire techniques have been used in countries with high wild fire risk (e.g., Portugal, Spain and Greece) as a tool to remove understorey vegetation and slow fire spread. However, the positive effects of scrubland ground cover in reducing soil erosion and promoting water retention are well known by forestry practitioners. Other environmental benefits of coarse woody debris are related to the provision of habitat structure and enhancing nutrient cycling. There are also recognised beneficial effects of continuous cover forestry (Pommerening and Murphy, 2004), but in this survey photos of a contiguous forest (FC) got better ratings for attractiveness rather than management.

These findings therefore provide a further illustration of the potential tensions between aesthetic and management objectives in multifunctional landscape planning. In the case of the Lima and Cávado watersheds they suggest that simply trying to incorporate local public preferences for forest management could complicate effective partnerships between municipalities located in the upper and downstream parts of the catchments as have been effective elsewhere (e.g. New York City, Johnson et al., 2002; Sabatier et al., 2005) and are a key objective of the EU Water Framework Directive.

3.6. Contrasting verbal and visual approaches

In the verbal question 52% of the interviewees considered a continuous forest to be more attractive than a patchy forest, while 45.3% preferred the latter. 2.7% did not answer the question. When management was considered 42.4% of respondents favoured continuous forests and 57.6% patchy forests. Concerning stand structure preferences 81% of interviewees said that they preferred uneven stands in terms of attractiveness. When asked to consider this choice on management grounds the proportion barely changed.

Fig. 6 plots the mean attractiveness ranks for four photos showing different levels of fragmentation (excluding the burnt area FE because fire issues were not included verbally) distinguishing between respondents according to their stated verbal preferences. Very little difference is apparent. A similar situation occurred when verbal and visual approaches were compared regarding preferences for stand structures (Fig. 7).

The results of the verbal approach suggest that there were only small changes in public preferences when they were asked to judge on attractiveness or management criteria. Referring to the results obtained through the use of photos, the Spearman rank correlations also show that the majority of the public ranked the sets of images in the same way. Therefore the verbal and visual approaches delivered similar results in the sense that both indicate that the public do not make a substantial distinction between attractiveness and management criteria.

Nevertheless, the results in Fig. 6 show that irrespective of respondent verbal preferences for either a "patchy" or a "continuous" forest the photos showing different levels of forest cover were similarly ordered. The same occurred in the case of stand structure, as illustrated in Fig. 7. This result implies some inconsistency between responses to verbal and visual questions.

4. Discussion

This study has focused on the comparison of public preferences for forest cover and stand structure characteristics given attractiveness and management objectives. Spearman rank correlations between rankings of the two sets of photos on these grounds showed that the great majority of respondents (around 80% when photos of burnt forests were removed from the study) ordered the photos in the same way irrespective of how they were asked to make the judgement. Including the photos of burnt scenes (FE and SE) in the calculations increased the extent of positive correlations, highlighting the value of sensitivity analysis when working with visual images (Palmer and Hoffman, 2001). Overall, the main trend in these results implies that whatever was considered by the public as aesthetically pleasing was
also regarded as good management, overlooking some of the qualifiers expressed in the research literature (Gobster et al., 2007; Sheppard, 2003; Sheppard et al., 2001).

The research also highlights the importance of the situational context in forest preferences research (Gobster et al., 2007). It has been reported that, in general, the public prefers lush vegetation covering the forest floor (Matsuoka and Kaplan, 2008; Sheppard et al., 2001). This has been documented in counties where wild fires are not a concern in forest management. However, northern Portugal has the highest number of forest fires in Europe (Catry et al., 2005) and this is reflected in the survey results with respondents considering more attractive and well managed forests showing uneven stand structures with no understorey, as well as those in which cover is not continuous, since these characteristics are more robust to the damaging effects of wild fire (DGRF, 2007; Fernandes, 2001). These findings corroborate the work by Hagerhall 2000 which indicated that environments able to give people a feeling of safety are preferred.

Although the trend for similar ratings in terms of attractiveness and management was paramount, the study also corroborates other empirical work in finding some differences in preferences among user groups. Contrasts were found between types of user (e.g. multi or single users) and between rural and urban populations. This accords with previous findings that urban and rural dwellers have different needs (Matsuoka and Kaplan, 2008; Roovers et al., 2002), as well as those particular user groups value certain forest characteristics (Surova and Pinto-Correia, 2008), these being generally related to the direct usage of forests by respondents.

Since the photos showing forests with ground cover vegetation were considered neither attractive nor well managed the results of this study suggest that in the area of the watersheds surveyed there is little current public awareness regarding hydrological services. As has been noted in other studies (Farrella et al., 2000), preferences appear to be dominated by immediate direct needs and past experiences, despite the fact that within the watersheds surveyed increasing urbanisation pressures in the lower reaches call for more proactive water management in a context of global environmental change (Lindner et al., 2010). This challenge is one of the reasons why awareness of the distinction between aesthetic and management preferences seems important when trying to achieve multifunctional landscapes that can support sustainability goals (Mander et al., 2007).

Although this study shows that most of the public do not distinguish between the two criteria this does not, however, negate the advantages in surveying both aesthetic and management opinions. First, some respondents (mainly forest users in this survey) do make a distinction and this requires acknowledgement. Second, by specifically contrasting attractiveness and management issues it is, in our view, easier to engage with particular stakeholders and the wider public to create awareness of the indirect ecological services that are attracting increasing attention. The disaggregation of criteria for forestry management is widely reported in the Sustainable Forestry Management literature (e.g. in sets of Criteria and Indicators, Sayer and Magginnis, 2005), but such distinctions are not usually made in research on public preferences for forests (Sheppard and Meitner, 2005). Although we should not expect all ecologically-related characteristics of forest ecosystems to be visible, if more can be done to maximize the visibility of key indicators or what represents key non-visible conditions (Sheppard, 2003) then it is more likely that the ecological services from forests will be acknowledged and accepted by the general public (Ribe, 2002).

A key principle underpinning this study was to engage with stakeholders and members of the public in an exercise to explore preferences for forest management, but we did not intend to put into practice a participatory process or seek to provide the public with knowledge regarding ecosystem services from forests. Regarding the latter there are still considerable gaps in knowledge which future research needs to tackle (Huttl et al., 2000; Larsen and Nielsen, 2007).

It is also challenging to establish participatory processes that will effectively engage with the public and “educate” for sustainable forestry management (Sayer and Magginnis, 2005; Sheppard and Meitner, 2005). Mechanisms to link indirect ecosystem services with community payments or other incentives (such as the promotion of specialist tourism) are likely to be increasingly important in such initiatives (Guo et al., 2000).

The final component of the study focused on comparing verbal and visual prompts. It was found that verbally stated preferences did not consistently correspond with the rankings of photos (visual preferences). This is a similar finding to that of Tahvanainen et al.
5. Conclusions

The major conclusions of this study conducted in northern Portugal are: 1) public preferences regarding forest cover and stand structure do not, in general, differ under attractiveness and management criteria; 2) there were statistically significant differences in preferences for forest cover and stand structure amongst user groups; 3) because ground cover vegetation was not regarded as attractive or good management strategies for future whole catchment management in the watershed may face some tension; and 4) there were some inconsistencies identified in the preferences derived from verbal prompts and visual stimuli.

By contrasting preferences for attractiveness and management regarding forests this research has presented a simple approach to explore attitudes and provided a basis for interventions through design or knowledge exchange to help align aesthetic and ecological goals (Gobster et al., 2007). It was also apparent, however, that there will need to be a deeper engagement with the public regarding the indirect ecosystem services from forests and to address such challenges qualitative approaches such as focus groups and incentive mechanisms are likely to be important.

Maintaining the integrity of ecological processes and their capacity to provide ecosystem services is of paramount importance to human welfare. While landscapes and ecosystems affect people in different ways, human actions, based on landscape perception, can affect ecological functions at scales that may not be immediately perceived. Based on empirical data, gathered at the watershed scale, this study reinforces the importance of the issues raised by Gobster et al. (2007) in their conceptual model of aesthetics–ecology relationships. Because essential ecological phenomena operate outside of the perceptible realm, landscape planning, design, and management that create functional links between ecological functioning and aesthetically pleasing landscapes are keys to success of the ecosystems approach in forestry.

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