Images of Nature, Environmental Values, and Landscape Preference: Exploring their Interrelationships

Agnes E. Van den Berg

Alterra, Green World Research, Wageningen, The Netherlands

Danny H. de Vries

University of North Carolina at Chapel Hill, USA

Charles A.J. Vlek

University of Groningen, The Netherlands

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Correspondence to Agnes van den Berg, Alterra, P.O. Box 47, 6700 AA Wageningen. E-mail: a.e.vandenberg@alterra.wag-ur.nl

Abstract

The present study explores the links among images of nature, environmental values, and group differences in landscape preferences. Groups of students from three different educational disciplines (agriculture, psychology, and biology) evaluated the scenic beauty of slides depicting managed and unmanaged natural landscapes with varying degrees of human influence. Multilevel analyses revealed group differences in the relationship between perceived landscape beauty and perceived human influence. Beauty ratings of biology and psychology students were negatively related to perceived human influence, while beauty ratings of students of agriculture were positively related to perceived human influence. In addition, the present study found group differences in images of nature, assessed by means of prototypicality ratings of descriptions of nature instances, and group differences in environmental values, as measured by the NEP scale (Dunlap & Van Liere, 1978). Students of biology and psychology displayed more ecocentric images of nature and environmental values than students of agriculture. Participants with more ecocentric images of nature and environmental values also displayed higher preferences for unmanaged as compared to managed natural landscapes. However, mediational analyses provided no evidence that group differences in the relationship between perceived landscape beauty and perceived human influence were mediated by group differences in images of nature and environmental values. Taken together, the findings of the present study underline the key role of perceived degree of human influence in group differences in affective and cognitive responses towards nature.

Images of Nature, Environmental Values, and Landscape Preference: Exploring their Interrelationships

Throughout history, wilderness and rural landscapes have been evaluated in opposed ways. Some people have regarded wilderness landscapes as 'waste land', filled with threats, while praising rural landscapes for their usefulness and orderliness (Lemaire, 1970). Conversely, others have regarded wilderness landscapes as a divine place of bliss and harmony, while criticizing rural landscapes for their lack of spiritual value (Nash, 1973). Although the relative importance of pro-rural orientations and pro-wilderness orientations may vary over time and across cultures, historians have emphasized that both orientations have always co-existed within different time periods and cultures (Tuan, 1974; Schama, 1995; Eisenberg, 1998).

As the most important difference between wilderness and rural landscapes concerns their degree of human influence, these historical accounts suggest that in modern times degree of human influence may still be an important source of interpersonal differences in landscape preferences. Consistent with this interpretation, there is accumulating empirical evidence for the existence of group differences in the preferred balance between spontaneous and human-influenced patterns in natural landscapes (e.g., González Bernaldez & Parra, 1979; Schroeder, 1983; Dearden, 1984; Fenton, 1985; Kaplan & Herbert, 1987; Orland, 1988; Van den Berg, Vlek, & Coeterier, 1998). For example, farmers and low-income groups have been found to prefer managed natural landscapes with a high degree of human influence, while environmentalists and high-income groups have been found to prefer unmanaged natural landscapes with a low degree of human influence (Van den Berg, 1999).

How can individual differences in preferences for natural landscapes be explained? Within the field of environmental psychology, individual differences in landscape preferences are generally thought to reflect the influence of people's personal and socially shared experiences with respect to natural environments, including their value and belief systems and past experiences (cf. Ulrich, 1983; Wohlwill, 1983; Kaplan & Kaplan, 1989). Obviously, experiences can only influence people's landscape preferences when they are somehow

recorded in the brain. Psychologists refer to these mentally recorded experiences as 'cognitions', or symbolic representations of personal and/or socially shared experiences and values. Cognitions are thought to act as broad and abstract layers through which initial, affective responses to concrete environmental stimuli are filtered and interpreted (Wohlwill, 1983). To the extent that members of a group share the same cognitions, this filtering process may explain differences in landscape preferences between groups from different sociocultural backgrounds.

Thus, in the course of their lives, people develop an intricate and rich cognitive structure that embodies their vision of what nature really is, and how it is related to humans. According to environmental philosophers (Worster, 1985; Keulartz, Swart, & Van der Windt, 2000), such visions of nature can generally be classified along a continuum that ranges from anthropocentric to ecocentric. People with an anthropocentric vision of nature tend to describe and value nature in terms of it's usefulness to humans. These people are likely to interpret a high degree of human influence in natural landscapes in a positive manner, because a high degree of human influence generally signifies a high level of usefulness to humans. People with a more ecocentric vision of nature tend to describe and value nature in terms of it's intrinsic value. These people are likely to interpret a high degree of human influence in natural landscapes in a more negative manner, because a high degree of human influence often implies a low intrinsic value of the landscape, particularly when human interventions are carried out without respect for plants and animals.

This paper presents the results of a first exploration of the relationships between visions of nature and landscape preferences among groups of students from different educational backgrounds (agriculture, biology, psychology). Visions of nature were studied both in a descriptive sense, i.e., the vision of what nature is, and in a normative sense, i.e., the vision of why nature is important and how people should treat nature. In the remainder of this paper, these two types of visions of nature will be referred to as 'images of nature' and 'environmental values', respectively.

Images of Nature

Images of nature can be defined as people's general cognitions of what nature is (cf. Kaplan, 1983). Thus far, empirical studies of images of nature have mostly relied on preference judgments as an indirect means of measuring images of nature (e.g., Kaplan, 1985; Kaplan & Kaplan, 1989; Strumse, 1996). Underlying this general practice is the assumption that people's affective responses toward a specific scene are guided by rapid cognitive appraisals of the scene (Kaplan & Kaplan, 1982). Although this assumption may be true, it should be pointed out that rapid, unconscious cognitive evaluations of a scene (perceptual filters) are quite different from higher-order cognitive structures that represent people's conscious image of nature. Thus, it seems worthwhile to study images of nature and preferences in their own right, and to gain more insight into possible relationships between these two kinds of responses.

A number of studies have employed similarity or prototypicality ratings to investigate images of nature independent from preference judgments (e.g., Fenton, 1985; Purcell, 1986, 1987, 1992). Using statistical techniques to uncover dimensions underlying people's similarity or prototypicality ratings, the results of these studies have consistently identified human influence as an important underlying dimension. These findings are in agreement with descriptive classifications of images of nature which have characterized these images in terms of their position on a dimension ranging from untouched by humans to visibly influenced by humans (e.g., Nature Conservation Council, 1993). Generally, people who perceive landscapes that are visibly influenced by humans as typical examples of nature can be described as having an anthropocentric nature image, while people who perceive landscapes that seem untouched by humans as typical examples of nature can be described as having an ecocentric image.

Environmental Values

Environmental values can be defined as ethical-normative cognitions concerning the value of nature and the relationship between humans and nature[1]. Analogous to images of nature, environmental values are often classified according to their position on a dimension ranging from anthropocentric to ecocentric (e.g., Catton & Dunlap, 1980). Individuals holding anthropocentric environmental values view nature as subordinate to humans, who are seen as rulers or managers of the natural world. Individuals holding ecocentric environmental values regard nature as the most important reality, and view humans as only part of that reality.

In order to assess individual differences in environmental values, Dunlap & Van Liere (1978) have developed the New Environmental Paradigm (NEP) scale. The NEP scale was intended as a unidimensional measure of environmental values, with low scores indicating anthropocentrism, and high scores indicating ecocentrism. The scale consists of twelve items that cover three broad themes, i.e., humanity's ability to upset the balance of nature, the existence of limits to growth for human societies, and the appropriate role of humans relative to the rest of nature (for a description of items, see Van den Born, this volume). Studies employing the NEP scale have revealed relationships between ecocentric environmental values and a wide range of sociodemographic variables, including knowledge of the environment and urban versus rural place of residence (Buttel, 1987; Arcury, 1990; Arcury & Christianson, 1990). Although in recent years the dimensionality of the NEP scale has been contested and a revised scale has been proposed (Strumse, 1996; Dunlap, Van Liere, Merting & Jones, 2000), the original NEP scale continues to enjoy considerable popularity as a unidimensional measure of individual differences in environmental values (Kaiser, Wölfing, & Fuhrer, 1999; Schultz and Zelezny, 1999).

[1] It may be noted that the concept of 'environmental values' as used in this paper is a combination of the concepts of 'values of nature' and 'images of relationship' as distinguished by Van den Born et al. (2001) and Van den Born (this volume).

The Present Study and Hypotheses

Thus far, the links among images of nature, environmental values, and individual differences in landscape preferences have received little empirical attention. The present research aimed to fill this void. Students from three different educational disciplines (agriculture, psychology, and biology), evaluated natural landscapes with varying degrees of human influence on several dimensions, including scenic beauty and degree of human influence. Separate measures of the students' images of nature and environmental values were obtained to investigate possible links between visions of nature and landscape preferences.

It was expected that students from different educational disciplines would differ in their landscape preferences as well as in their images of nature and environmental values. Students of agriculture, because of their interest in and expert knowledge of farming, were expected to prefer natural landscapes with a high degree of human influence, and to have relatively anthropocentric images of nature and environmental values (González Bernaldez & Parra, 1979; Arcury & Christianson, 1990; Yu, 1995; Vogel, 1996). Biology students, because of their interest in and expert knowledge of nature, were expected to prefer natural landscapes with a low degree of human influence, and to have relatively ecocentric images of nature and environmental values (e.g., Dearden, 1984; Kaplan & Herbert, 1987; Arcury, 1990). Psychology students were primarily included in the study as a control group, with few distinctive characteristics as regards their landscape preferences and cognitions about nature.

In a more exploratory vein, the current study sought to examine the possible mediational role of images of nature and environmental values in group differences in preferences for natural landscapes. Thus, it was investigated whether group differences in the preferred balance between spontaneous and human-influenced patterns in natural landscapes could be explained by corresponding group differences in images of nature and environmental values.

Method

Participants

Participants were students from three different educational disciplines: 20 students of a school for secondary vocational agricultural training (16 males and 4 females; mean age 20 years), 20 psychology students (14 males and 6 females; mean age 20 years) and 20 biology students (13 males and 7 females; mean age 20 years). Both psychology and biology students were undergraduates at the University of Groningen. One participant, a student of agriculture, was excluded from the analyses because of missing values. Participants received 7 Euro for taking part in the study.

Stimuli

The stimulus set consisted of 36 color slides drawn from an initial collection of 42 slides. A first criterion for the initial selection of slides was that these should represent the different groups of natural landscapes as they can be found in The Netherlands. These groups of landscapes are described in the handbook of target nature types in The Netherlands (Bal et al., 1995; see also Ministry of Agriculture, Nature Management & Fisheries, 1996). In this ecological handbook, natural landscapes are classified into four broad groups (the so-called 'target nature types') according to the intensity of nature management activities that are required to maintain these landscapes: (a) 'approximately natural units', (b) 'guided natural units', (c) 'semi-natural units', and (d) 'multifunctional units'. A second criterion was that the slides should cover the major physical-geographical regions of The Netherlands, including sandy areas, clay areas, river areas, and peat areas. A third criterion was that all slides should have been photographed at eye-level; thus, slides depicting landscape details or bird's eye views were not included. As a last criterion, none of the slides should depict intrusive signs of human influence, such as buildings or farming machinery.

Each scene was classified by three ecologists (all experts on nature management) into one of the four target nature types. These classifications were used to select a final set of 36 slides, consisting of 18 managed natural landscapes that were developed through active nature

management strategies, such as fertilizing, grazing and ploughing (i.e., scenes classified as 'semi-natural' or 'multifunctional' by at least two experts, see Figure 1 for an example) and 18 unmanaged natural landscapes that had developed spontaneously without active human intervention (i.e., scenes classified as 'approximately natural' or 'guided natural' by at least two experts, see Figure 2 for an example). Agreement between the experts was adequate, with Cramer's V coefficients ranging from .62 to .84.

Slide Ratings

All participants rated each of the 36 slides for beauty and a number of other characteristics, including degree of human influence. Perceived degree of human influence was assessed on two scales, one scale ranging from “not at all manicured” to “very manicured”, and another scale ranging from “not at all rough” to “very rough”. Average landscape ratings on these two scales were strongly negatively correlated, $r = -.95$, $p < .001$, suggesting that the scales measure the same underlying dimension. Ratings on the “manicured” scale were used as a measure of human influence in the analyses presented in this paper[2]. All ratings were given on nine-points scales ranging from 1 = 'not at all' to 9 = 'a great deal'. Each scene was presented as a 'landscape' plus index number.

Images of Nature and Environmental Values

After rating the slides, participants filled out several questionnaires, among which were measures of images of nature and environmental values. Images of nature were assessed using a methodology based on the work of Rosch and her colleagues on cognitive schemata (Rosch & Mervis, 1975; see also Purcell, 1987). Participants judged 33 descriptions of instances of nature according to their typicality for the category of 'nature'. The nature instances represented eleven 'images of nature' listed by the Dutch Nature Conservation

[2] We also analyzed the data reported in this paper using the roughness ratings as a measure of human influence. The results of these analyses were highly similar to the results of the analyses with the “manicured” ratings.

Council on theoretical and experiential grounds (Nature Conservation Council, 1993). Instructions were similar to the instructions used by Rosch & Mervis (1975, p. 588) and Purcell (1987, p. 73). Participants were asked to rate the extent to which an instance represented their idea or image of nature on scales ranging from 1 to 10. Scale extremes were labeled 1 for 'worst example' and 10 for 'best possible example'. Table 1 below lists the final selection of 25 of the 33 instances used.

Environmental values were assessed using a Dutch translation of the original 12-item New Environmental Paradigm (NEP) scale by Dunlap and Van Liere (1978). Participants were asked to indicate their agreement with each item on 5-point scales. The items were coded so that high scores corresponded to high ecocentrism. The reliabilty of the scale was adequate, Cronbach's Alpha = .78.

Procedure

All instructions and questions were presented on Apple MacIntosh computers. Each session included three to six participants, who were each seated behind a computer. Slides were projected on a screen in random order that remained the same across all sessions. Two scenes classified as diffuse were used as filler slides at the beginning and the end of each session to avoid start and end effects. The average time for completing the study was approximately one hour.

Statistical Analysis

Data were analyzed using a combination of conventional statistical techniques, such as analysis of variance, and a technique called ‘multilevel analysis’ that may be unknown to most of our readers. We applied this latter technique because our research questions imply interactions between perceiver characteristics (visions of nature) and landscape characteristics (degree of human influence) in predicting landscape preferences. Standard statistical techniques for analyzing landscape preferences, such as ordinary (OLS) regression analysis, do not allow for the estimation of such 'cross-level' interactions (cf. Hull & Stuart, 1992).

Multilevel analysis, however, permits the reliable estimation of the combined influences of perceiver characteristics and landscape characteristics on landscape preferences (Bryk & Raudenbusch, 1992). Generally, multilevel analysis provides better estimates in answer to simple questions for which ordinary regression analysis is commonly used, and in addition allows more complex questions to be addressed (see Van den Berg et al., 1998, for a detailed description of the application of multilevel analysis to the study of landscape evaluation).

Results

Images of nature

Prototypicality judgments for 33 instances of nature were submitted to principal components factor analysis with varimax rotation. A scree-plot indicated that the eigenvalues started to level off after three factors. Thus, a three-factor solution yielded the best solution. Factorial composition was determined by including all items with a factor loading greater than .40 on a given factor. Table 1 provides an overview of the final three factors that resulted from the factor analysis.

The first factor was named Useful Nature. It included nine items describing instances of nature with a practical value to humans. Three of these items described instances of agrarian nature, another three items described nature as an environment for undertaking recreational activities, i.e., fishing, climbing, sailing, two items described instances of domestic nature, and one item described a genetically modified organism. This factor appeared to reflect and anthropocentric nature image.

The second factor was named Healthy Nature. It included eight items that described instances of nature's (re)generative power and healing properties. This factor appeared to reflect a mixture of anthropocentric and ecocentric images. On the one hand, it included instances of nature with practical values to humans, i.e., 'a medicinal herb', on the other hand, it included instances of nature with more intrinsic values, i.e., 'the biological growth of plants and flowers'.

The third factor was named Spontaneous Nature. It consisted of eight items describing instances of spontaneous nature. One half of these instances represented rather 'innocent' forms of spontaneous nature, i.e., coastal flats, a forest in autumn colors, a primeaval forest and a meadow bird, while the other half represented forms of spontaneous nature that are potentially harmful to humans, i.e., a dark, impenetrable forest, a river that overflows its banks, a swirling sea and coming face to face with wild animals. This factor appeared to reflect an ecocentric nature image.

Scores on the Useful Nature factor were significantly negatively correlated with NEP scores, $\underline{r} = -.58$ $p < .001$, while scores on the Spontaneous Nature factor were significantly positively correlated with NEP scores, $\underline{r} = .30$, $p < .05$. Scores on the Healthy Nature factor were not correlated with NEP scores, $\underline{r} = -.06$, $p > .65$. As the NEP scale is assumed to measure environmental values on a dimension ranging from anthropocentric to ecocentric, these findings support the interpretation of Useful Nature and Spontaneous Nature as, respectively, an anthropocentric and an ecocentric nature-image factor.

Perceived Degree of Human Influence

We first checked whether participants' ratings of perceived degree of human influence agreed with the expert's classifications. Table 2 shows that participants perceived the subset of landscapes that were classified as 'managed' by the experts as more human-influenced than the subset of landscapes classified as 'unmanaged'[3]. To examine the influence of educational discipline on ratings of human influence, ratings of human influence were subjected to a 2 (Landscape Type: Managed versus Unmanaged) x 3 (Educational Discipline: Agriculture, Psychology, Biology) mixed MANOVA with repeated measures on the first factor. This analysis revealed that educational discipline did not significantly affect ratings directly, nor in interaction with Landscape Type. In other words, the foregoing analyses revealed that ratings of perceived human influence were sensitive to expert-rated differences

[3] $\underline{F}\ (1, 56) = 183.71$, $\underline{p} < .001$.

in nature management strategies among the landscapes, and did not differ across participants from different educational disciplines.

Group Differences in Landscape Preferences

Table 3 provides an overview of the mean beauty ratings for the two subsets of managed and unmanaged natural landscapes in each of the three disciplinary groups. Inspection of Table 3 shows that students of agriculture rated managed and unmanaged natural landscapes about equally beautiful, while psychology and biology students rated unmanaged natural landscapes significantly more beautiful than managed natural landscapes. These results provide some preliminary support for the hypothesis that students from different educational disciplines would differ in their preferred degree of spontaneous to human-influenced patterns in natural landscapes.

To obtain a more precise estimate of the preferred degree of spontaneous to human-influenced patterns in natural landscapes among participants from the three educational disciplines, individual beauty ratings were regressed on the mean ratings of degree of human influence for each landscape. This approach is more appropriate than comparing the mean preferences for the two subsets of managed and unmanaged natural landscapes, because it uses the complete range of variation in perceptions of degree of human influence to predict individual beauty ratings. To control for dependencies in the data due to the fact that beauty ratings were nested within individuals, regression analyses were performed with the multilevel program MLn (Woodhouse, 1995). In Mln, a basic two-level regression model was specified with the individual beauty ratings as the dependent variable. Starting from this basic model, participants' mean ratings of degree of human influence for each landscape, and interactions between this variable and educational discipline, images of nature, and environmental values, were added and tested.

On average, perceived degree of human influence was found to be negatively related to perceived landscape beauty[4]. However, inspection of the random part of the model revealed that there was a substantial amount of between-individual variation in this relationship[5]. To investigate the role of educational discipline in this variation, dummy variables representing the effects of educational discipline, and product terms representing the interaction between these variables and perceived degree of human influence were added to the model. Results of this analysis revealed a significant interaction effect between educational discipline and perceived degree of human influence on perceived landscape beauty[6]. To aid in the interpretation of this interaction effect, predicted beauty ratings were generated for participants from each educational discipline using values of 2 standard deviations above and below the mean to represent high and low degrees of perceived human influence. Inspection of these predicted beauty ratings in Figure 3 shows that, as expected, perceived degree of human influence was positively related to beauty ratings of students of agriculture, while it was negatively related to beauty ratings of psychology and biology students.

Univariately, students of agriculture differed significantly from both psychology and biology students in the relationship between perceived degree of human influence and perceived landscape beauty. The difference between psychology and biology students in the relationship between perceived degree of human influence and perceived landscape beauty was only marginally significant.

Group Differences in Images of Nature and Environmental Values

To test for group differences in images of nature and environmental values, individuals' mean prototypicality scores for the three nature-image factors and their mean NEP scores were computed and summarized to group level. As can be seen in Table 4, participants from all three educational disciplines rated instances of Spontaneous and Healthy Nature as more typical than instances of Useful Nature. This indicates that images of nature

[4] $\underline{\beta} = -.16$, $\underline{\chi^2}(1) = 6.20$, $\underline{p} < .05$
[5] $\underline{\sigma^2} = .18$, $\underline{\chi^2}(2) = 138.36$, $\underline{p} < .001$

were generally ecocentric rather than anthropocentric. As expected, students of agriculture gave reliably higher prototypicality ratings to instances of Useful Nature than did participants from nonagricultural disciplines. Biology students, as compared to psychology students and students of agriculture, gave reliably lower prototypicality ratings to instances of Useful Nature. Except for the finding that students of agriculture gave higher prototypicality ratings to instances of Healthy Nature than did biology students, no group differences were found for the Healthy and Spontaneous nature-image factors.

Mean NEP scores were above the scale midpoint, indicating that, on average, participants from each group tended to have ecocentric environmental values. Mean NEP scores were significantly lower for students of agriculture than for psychology and biology students. Although mean NEP scores seemed to be higher for biology students than for psychology students, this difference did not reach significance. Thus, the predictions concerning group differences in images of nature and environmental values were partially supported.

Relations between Visions of Nature and Landscape Preferences

To study relations between visions of nature and landscape preferences, participants' scores on the Useful, Healthy, and Spontaneous nature-image factors and the NEP scale, as well as product terms representing the interactions between these variables and degree of human influence, were simultaneously added to the basic multilevel model. Results of this analysis showed that only the scores on the Useful nature-image factor were significantly related to landscape preferences[7]. As expected, beauty ratings of participants with high scores on the Useful nature-image factor were positively related to perceived human influence, while beauty ratings of participants with low scores on the Useful nature-image factor were negatively related to perceived human influence. Scores on the Healthy and Spontaneous

[6] $\chi^2(2) = 21.07$, $p < .001$
[7] $\chi^2(1) = 6.36$, $p < .05$

nature-image factors, and scores on the NEP scale, were not significantly related to landscape preferences.

Mediational Analyses

Up to this point, our analyses have revealed (a) differences between the three student groups in the relationship between perceived landscape beauty and perceived human influence, (b) differences between the three groups in their scores on the Useful and Healthy nature-images factors and the NEP scale, and (c) relationships between scores on the Useful nature-image factor and landscape preferences. Thus, it appears that scores on the Useful nature-image factor qualify as a potential mediator of the group differences in the relationship between perceived landscape beauty and perceived human influence. Scores on the other two nature-image factors and the NEP scale do not qualify as potential mediators because they are not related to landscape preferences (cf. Baron & Kenny, 1986; Kenny, Kashy & Bolger, 1998; see also Van den Berg, Koole, & Van der Wulp, in press, for a more detailed explanation of mediational analysis).

Tot test for mediation, the effects of the Useful nature-image factor on the relationship between degree of human influence and landscape beauty were estimated in one multilevel model together with the effects of educational discipline on this relationship. Results of this analysis showed that scores on the Useful nature-image factor did not significantly influence the relationship between degree of human influence and landscape beauty when the influence of educational discipline on this relationship was statistically controlled for. At the same time, the effect of educational discipline on the relationship perceived degree of human influence and landscape beauty remained highly significant when it was estimated while controlling for the influence of the Useful nature-image factor[8]. Taken together, the current findings suggest that images of nature and environmental values cannot

[8] $\chi^2(2) = 12.97$, $p < .01$

provide an explanation for the group differences in the appreciation of human influence in natural landscapes.

Discussion

The present study explored systematic differences in images of nature, environmental values, and landscape preferences among students from different educational disciplines. As expected, students of agriculture preferred natural landscapes with a high degree of human influence, while psychology and biology students preferred natural landscapes with a low degree of human influence. These results provider further evidence that perceived degree of human influence plays a key role in the occurrence of group differences in landscape preferences (e.g., González Bernaldez & Parra, 1979; Schroeder, 1983; Dearden, 1984; Fenton, 1985; Kaplan & Herbert, 1987; Orland, 1988; Van den Berg et al.,1998).

An important objective of the present research was to measure group differences in images of nature. Participants were asked to rate the prototypicality of verbal descriptions of instances of nature with varying degrees of human influence. Subsequent factor analyses on these prototypicality ratings uncovered three nature-image factors. One factor, labeled Useful Nature, corresponded to an anthropocentric image of nature, another factor, labeled Spontaneous Nature, corresponded to an ecocentric image of nature, and a third factor, labeled Healthy Nature, appeared to reflect healing and regenerative properties of nature.

Participants from all three educational disciplines rated instances of Spontaneous Nature as more typical examples of nature than instances of Useful Nature. This suggests that participants' images of nature were generally more ecocentric than anthropocentric. As expected, there were differences in images of nature among participants from different educational disciplines. Students of agriculture rated instances of Useful Nature as relatively typical examples of nature, while students of psychology and biology rated instances of Useful Nature as relatively atypical examples of nature. This finding suggest that students of agriculture have broader and more anthropocentric images of nature than students from nonagricultural disciplines. There were also some differences in images of nature between

biology students and the two other groups. Most importantly, biology students perceived instances of Useful Nature and Healthy Nature as less typical examples of nature than the other groups did. These results are consistent with findings of previous studies, in which environmental knowledge has generally been found to be positively associated with an ecocentric vision of nature (Arcury 1990)

A further objective of the present research was to investigate group differences in environmental values. Environmental values were measured by means of the NEP scale (Dunlap & Van Liere, 1978). Like images of nature, participants' environmental values were generally more ecocentric than anthropocentric. This finding is consistent with sociological analyses which have argued that the ecocentric view of nature as measured by the New Environmental Paradigm has become the dominant belief system in Western societies (Catton & Dunlap, 1980). As expected, students of agriculture displayed less ecocentric environmental values than psychology and biology students.

Images of nature and environmental values did not have any explanatory power with regard to group differences in the relationship between perceived landscape beauty and perceived human influence. More specifically, Spontaneous Nature did not qualify as a mediator, because there were no group differences in the perceived typicality of this nature-image factor. Healthy Nature and the NEP scale also did not qualify as mediators, because they were not related to landscape preferences. Useful Nature qualified as a potential mediator, because perceived typicality of this nature-image factor differed across educational groups, and was systematically related to landscape preferences. However, mediational analyses showed that differences in landscape preferences between students of agriculture and the other two groups could not be explained by differences in perceived typicality of Useful Nature between these groups. In sum, our hypothesis that group differences in the preferred balance between spontaneous and human-influenced patterns in natural landscapes could be explained by group differences in visions of nature was not confirmed by the data.

It is possible that the lack of explanatory power visions of nature was caused by measurement error, as there was little variation in ecocentrism in the present research; even

the students of agriculture scored relatively high on our measures of images of nature and environmental values. As several authors have pointed out, acceptance of ecocentric ideas may have become so widespread that new measures are needed to capture more subtle differences in people's cognitions regarding the relationship between humans and nature (e.g., Gooch, 1995; Scott & Willits, 1994). Thus, the finding that group differences in the relationship between perceived landscape beauty and perceived human influence were not mediated by visions of nature could be the result of errors in our quantitative measures of visions of nature.

Alternatively, it could be that group differences in the relationship between perceived landscape beauty and perceived human influence are mediated by other, non-cognitive, psychological processes. In particular, these differences may reflect the influence of more affective processes, such as people's motivational orientations (Koole & Van den Berg, 2002). According to a motivational explanation, people who are guided by defensive motives may prefer nature that is more visibly controlled by humans, because it provides better possibilities for safety and protection. Conversely, people who are guided by expansive (i.e., growth oriented) motives may prefer nature that is untouched by humans, because it provides better possibilities for personal growth and development. In the present study, students of agriculture were probably more driven by defensive motives than biologists and psychology students, because of their (family's) greater dependency on the natural environment as a main source of income. Therefore, a motivational explanation may also be relevant to the group differences in landscape preferences found in the present study. Future studies may further explore the relative explanatory power of cognitions and motivations with respect to group differences in preferences for natural landscapes with varying degrees of human influence.

Results of the present study extend the results of a previous field study by Van den Berg et al. (1998). Because of differences in participants and procedures, results are difficult to compare across studies. Nevertheless, one interesting discrepancy deserves mention. Farmers included in the field study displayed a much stronger dislike of unmanaged natural landscapes than the students of agriculture in the present study. This may be due to

differences in the stimulus material, or to differences in participant characteristics, such as the fact that students of agriculture were younger, and had less experience with rural landscapes than the farmers in the field study. Alternatively, farmers' judgments in the field study may have been influenced by the planned-change context in which the study was conducted. More specifically, the farmers in the field study may have perceived the natural landscapes as a threat to the status quo, which may have reduced their beauty judgments. Consistent with this interpretation, Van den Berg & Vlek (1998) have found evidence that unmanaged nature scenes are rated less beautiful when they are presented as planned changes in an agricultural area, than when they are presented as existing landscapes. For a further discussion of contextuality, see Davies (this volume).

The present findings have several practical implications. First, the results indicate that group differences in the preferred degree of human influence in natural landscapes can be found even when the landscapes under evaluation do not represent planned changes. This suggests that such differences cannot be entirely attributed to consequences of the planned-change context, such as “resistance to change”. Furthermore, the finding that group differences in landscape preferences were not mediated by cognitive images and values suggests that persuasion attempts aimed at changing people's abstract images and nature values may not automatically change their preferences for concrete natural landscapes. Finally, the finding that students of agriculture tended to have broader images of nature than did students from nonagricultural disciplines may have important implications with regard to policy strategies for increasing the natural values of agricultural areas by means of nature development (cf. Ministry of Agriculture, Nature Management and Fisheries of The Netherlands, 1996). Especially farmers may question the usefulness of such strategies, because, in their conceptions, the existing agrarian landscape already is sufficiently natural (cf. Nassauer, 1997). Thus, in addition to their aesthetic preferences, farmers' broader images of nature may constitute another source of negative responses to nature development plans.

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Table 1

Results of Factor Analysis of Prototypicality Ratings of Instances of Nature (N=59)

	Nature-Image Factors		
	Useful	Healthy	Spontaneous
a field with grain and vegetables	.84		
wind and water for the sailor	.80		
a meadow with cattle	.78		
a dog or cat as a pet	.74		
the waterside with a fisherman's spot	.69		
a mountain slope for a mountaineer	.65		
plants on the windowsill	.55		
a tree nursery with pines and poplars	.55		
a genetically modified organism	.42		
natural decomposition of materials		.84	
the biological growth of plants and flowers		.78	
natural purification of the air		.77	
a bird's nest		.65	
mist above a field		.60	
the healthy smell of woods		.60	
the natural cycle of nature		.54	
a medicinal herb		.53	
flats and/or a sand bar			85
a dark, impenetrable forest			.74
a forest in autumn colors			.69
a primeaval forest			.62
a river that overflows its banks			.57
a swirling sea			.52
encountering wild animals			.45
a rare meadow bird			.42
Explained Variance	22.9	16.9	9.0

Note. The results shown are the results of a rotated factor solution, using Varimax rotations. The number of factors was constrained to three. Only items with factor loadings greater than .40 are included.

Table 2

Perceived Degree of Human Influence (Scale Range 1 - 9) of Managed and Unmanaged Landscapes (According to Expert Classification), Standard Deviations in Parentheses

	Educational Discipline		
Type of Landscape	Agriculture	Psychology	Biology
Managed	5.99^{a} (.62)	6.11^{a} (.67)	6.28^{a} (.62)
Unmanaged	3.95^{b} (1.30)	3.83^{b} (1.39)	3.69^{b} (1.05)

Note. Means with unequal superscripts differ per column at $p < .01$.

Table 3

Perceived Beauty (Scale Range 1 – 9) of Managed and Unmanaged Landscapes (as Rated by Experts), Standard Deviations in Parentheses

	Educational Discipline		
Type of Landscape	Agriculture	Psychology	Biology
Managed	6.39 (.73)	5.69[a] (1.23)	5.91[a] (1.02)
Unmanaged	6.17 (1.27)	6.68[b] (.67)	7.02[b] (.76)

Note. Means with unequal superscripts differ per column at $p < .01$.

Table 4

Mean Prototypicality Scores (Range 1 - 10) for Nature-Image Factors and Mean NEP Scores (Range 1 - 5) , Standard Deviations in Parentheses.

	Nature-Image Factors			NEP score
Education	Useful	Healthy	Spontaneous	
Agriculture	5.3[a]	8.3[a]	8.3	3.49[a]
(N = 19)	(1.7)	(1.0)	(1.5)	(.58)
Psychology	4.3[b]	7.7[ab]	8.3	3.87[b]
(N = 20)	(1.2)	(0.9)	(0.7)	(.55)
Biology	3.3[c]	7.0[b]	8.3	4.02[b]
(N = 20)	(1.2)	(1.7)	(1.1)	(.43)

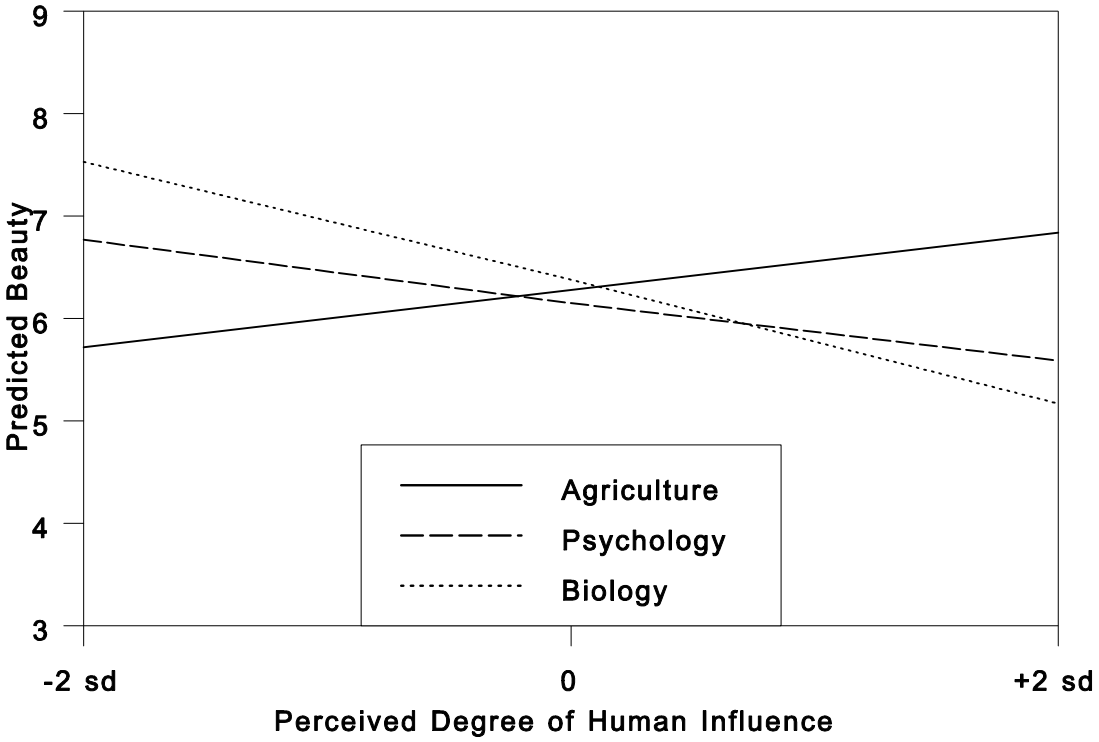
Note. Means with unequal superscripts differ per column at $p < .10$.

Figure Caption

Figure 1 Example of natural landscape with high degree of human influence.

Figure 2. Example of natural landscape with low degree of human influence.

Figure 3. Relationships between perceived degree of human influence and perceived landscape beauty in the three student groups


9
8
7
6
5
4
3
Predicted Beauty
Agriculture
Psychology
Biology
-2 sd
0
+2 sd
Perceived Degree of Human Influence