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# Human Perception of Stages of Successional Forest

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## ABSTRACT

Two experiments investigated perception of landscapes associated with the practice of successional forest management. Perception in both studies was assessed by participant's ratings of landscapes on six scales measuring environmental affordances and on six scales measuring aesthetic value.

Experiment one involved participants from four types of local communities. These were (a) agricultural (N=97), (b) oil extraction (N=87), (c) forest (N=93) and (d) professional (N=101). Each participant rated a set of eight large size color prints displayed on the walls of a portable gallery. Two equivalent sets of forest photographs were used. Photographs in each set showed (a) original forest, (b) original forest disturbed by an access road, (c) 30 year regrowth, (d) 15-20 year regrowth, (e) 5-8 year regrowth, (f) clear cut and (g) forest destroyed by fire. Participants viewed sets and types of succession forest following a randomly determined sequence. Data showed presence of a reliable order of preference independent of community. On both sets of scales, original forest and 30-year regrowth were rated most favorably. Burned forest, clear cut and 5-8 year regrowth were perceived least favorably. Within the least liked landscape, forest community participants rated clear cut scenes more favorably than participants from other types of communities. Experiment one also investigated how opposing arguments regarding forest (conservation versus industrial harvest) might affect perception of forest. Arguments in favor of conservation versus industrial harvest were found not to affect ratings differentially.

Experiment two was conducted in six forest communities. Acting independently, the town manager of each community assembled a group of 12-15 participants representing a cross section of citizens significant in that community. Assembled participants rated slide projections

of four of the forest scenes of experiment one on the six scales of affordance and six scales of aesthetic value used in experiment one. Data confirmed results obtained in experiment one. Experiment two also investigated how type of forest management might affect perception. Prior to rating, participants were told that the four forest scenes to be shown reflected a particular kind of forest management. Forest attribution was made either to management by the community alone or community-industry together or industry alone. The management structure to which participants were exposed was described in detail and prior to ratings. Participants evaluated the effects of that particular structure in terms of self, family and community futures. Data showed landscape preferences were not changed by type of forest management responsible for the forest scenes even though strong preference for the consultative form of forest management was expressed.

In sum, ratings revealed a highly structured perceptual response to forest landscapes existed within all communities tested. Perception was not perturbed by ethical argumentation pitting conservation against industrial harvest. Neither did differing kinds of forest management procedures affect perception even when communities clearly distinguished between the desirability of differing management alternatives. Outcome is consistent with the possibility that perceptions of successional stages of forest occurred as a phenotypic expression of gene/vegetation interactions that were minimally affected by learning.

## INTRODUCTION

In the 17$^{th}$ Century Alexander Baumgarten was inspired by the philosophies of René Descarters and Gottfried Leibnitz to establish a theory of art complimentary to these philosopher's treatment of mathematics. In the process of doing this Baumgarten invented a field of rational inquiry called "aesthetics" that aimed to explain the essence of "beauty" exactly.

Less than a century later, the study of beauty flowered in the hands of Augustan humanists. One of them, Edmund Burke, gave the study of landscape a central position in his theory of beauty (Fussell, 1965). After the Augustan humanists, interest in natural landscape shifted toward symbolic interpretation and representation of landscapes in the arts (Schama, 1995). Then, from the 19th Century onwards, aesthetic theory was developed almost exclusively in relation to music, poetry, formal gardens, and other fine arts.

Burke, has been credited with inaugurating the first analysis of landscape from a non-utilitarian viewpoint (Appleton, 1975). He made beauty a form of perceptual cognition and approached its understanding through rational analyses. Also, Burke used rhetoric to communicate aesthetic theory to landowners wishing to "improve" the appearance of their estates. He believed he was giving birth to a new art form that was to use natural growth to cultivate taste for beauty and, thereby, foster moral development in viewers (Fussell, 1965).

Burke distinguished between "sublime", "beauty", and "social passion" in forming his aesthetic arguments. But, more to the point here, was that his definition of beauty was couched in terms of perceptual cognitive qualities, such as "small", "smooth", "clear", "delicate", and "pleasurable"(Appleton, 1975). Identical and very similar terms are still used in psychological measurement of response to stimuli. For example, semantic differential scaling (Osgood, 1953) make Burke-type factors available to experimental analysis of vegetated environments in ways that are quite apart from aesthetic theory. And, such separation seems a happy one given the uncertain status of aesthetics. Eaton (1998) reviewed the topic of aesthetics for the Encyclopedia of Philosophy and was unable to identify a satisfactory theory of aesthetics ("Aesthetic concepts are learned in contexts where – roles – are learned" pg. 58). Also, the review of Budd (1998) denied the existence of an aesthetic attitude that would govern

perceptions of artistic expressions ("Hence, the aesthetic attitude is either a myth or of little interest" pg. 54). However, notwithstanding unsettling issues in the field of aesthetics, the significance of aesthetic ideas about beauty can be investigated by measuring the extent to which aesthetic qualities apply to specific instances of landscape.

At an opposite extreme, ecology potentially furnishes alternative ideas about the way human perception is linked to landscape. Be that as it may, ecological research paid scant attention to mutual relations existing between humans and environments over the years and this has retarded understanding. In closing decades of the 20th Century this changed abruptly as concern with effects of human intervention in the natural world mounted. For the first time in human history, limitations in exploiting original environments became obvious and, more disturbing, unwanted effects from agricultural and industrial activities were discovered to be relatively permanent rather than merely temporary.

In the wake of concern with utilitarian degradation of the environment, curiosity arose about how humans relate themselves to environments. The long years Homo species evolved in close proximity to treed wildernesses can be reasonably assumed to be registered in present perceptions of landscape. And, indeed, this has become a topic for study in biology, geography and psychology. Basic perceptual dimensions proposed have included a continuum anchored at "biophilia" and "biophobia" which are considered to reflect innate disposition to direct attention to life and life-like events (Wilson, 1993).

From another direction the geographer, Appleton (1975) classed landscape in terms of habitat providing varying degrees of protection from predation. The basic dimensions are "prospect" which is "an environmental condition, situation, object or arrangement conclusive to the attainment of a view" (pg. 270) and "refuge" which is "an environmental condition, situation,

object or arrangement conducive to hiding or sheltering" (pg. 270). Other features of importance are contained in natural symbols of hazards and refuges.

Psychological contributions have been made by Kaplan and Kaplan (1989) who defined landscape in terms of (a) "legibility" which measures the extent to which it can be easily understood, (b) "complexity" that makes reference to the number and variety of things in the perceptual environment, (c) "coherence" which refers to harmonious interrelation of features and (d) "mystery" that is the condition where a landscape is seen to provide incomplete information. Also, Gibson (1979) has directed interest to his evolutionary outlook on perception which heavily favors innate determination. He has hypothesized, that humans come into the world scripted to detect useful functions of things in the environment and to avoid dangerous conditions and objects. Gibson has asserted that the concept "affordance" provides a key to understanding the perceiver's experience of landscape. Perception of affordances is driven by motivation to seek information about what the ambient environment ". . .offers the animal, what it provides or furnishes, either for good or ill" (pg. 127).

The studies that follow measured the extent to which six affordances were perceived to be present in different stages of successional forest. Affordance and companion measures of aesthetic value were made utilizing semantic differential type scales. Secondary experimental purposes were to discover (a) the extent to which perception would be perturbed either by opposing kinds of rational arguments about forest use, and (b) whether alternate rational provisions for managing forests would affect perceptions of resulting forest landscapes.

## STUDY ONE

### Hypotheses

We report an investigation of aesthetic awareness involving perception of forest landscapes representing different successional states. The following possibilities were tested. One was that preferential response will displace an ordinal form that is independent of the adult populations being sampled. This is consistent with the proposal made by Wilson that "the brain evolved in a biocentric world, not a machine regulated world" (pg. 32). He argues that the genetic code laid down by Homo erectus and sapiens ancestors still operates in an essentially unaltered manner. Knopf (1987) assembled evidence that suggested that environmental preferences have an innate foundation which he summarized as "Humans, so the argument runs, are best suited for acting in the environment that wrote the script." (pg. 785) Two was that strength of aesthetic response will be related to cultural differences. Specifically, forest communities would differ from non-forest communities in the same locale in strength of aesthetic response to visual representation of different successional forest stages. This followed from the proposal that human aesthetic perception is mediated by the biological slate. Three was that preferences would be sensitive to ethical statements that rationalize forest scenes from instrumental (industrial) versus ecological (conservational) standpoints. It was expected that the scenario stressing instrumental values would lead to higher ratings of successional forest landscapes than the conservational since five of the eight landscapes showed forest tended by humans. Experimentation proceeds on the premise that ratings of color transparencies representing forest landscapes correlate highly with on-site ratings (Kaplan and Kaplan, 1989).

# METHOD

## Participants

A total of 378 adults served as participants in the study. Participants were obtained at summer fairs, festivals and public markets held in five Alberta population centres. The two Alberta forest industry communities (Hinton and Edson) provided 93 participants. The three non-forest industry communities included Vegreville (agriculture), which provided 97 participants, Leduc (petroleum extraction) which provided 87 participants and St. Albert (professional) that provided 101 participants.

## Materials

There were eight successional coniferous forest conditions shown in Figure 1. These represent in two equivalent sets of 8x10 inch color photographs depicting (a) undisturbed old growth forest (original forest), (b) seedlings 5-8 years old (seedlings), (c) uncut original forest disturbed by dirt access road (roadway in old growth), (d) fire disturbed area showing regrowth (regrowth after forest fire), (e) an area of clear cut (clear cut), (f) regrowth forest 30 years old (old regrowth), (g) an area recently disturbed by fire (forest fire), (h) regrowth forest 15-20 years old (medium regrowth). Figure 1 shows photographic content.

A 12 item rating questionnaire was used to record responses. Each item was accompanied by a 7-point rating scale anchored by “not at all” and “extremely well”. Figure 2 shows the questionnaire. Note that this questionnaire is divided into two parts. Items 1-6 measure the extent to which six different conditions of ‘fecundity’ are perceived. Fecundity is represented by statements referring to differing types of environmental ‘affordances’– natural occurrences affecting human adaptation and survival in a new environment (Gibson, 1979). Specific items are: 1) plenty of dry wood for a fire, 2) plenty of fruit and berries to eat, 3) good protection from

the wind, 4) good quality/tasting water, 5) plenty of birds and small animals, 6) good view of surrounding environment.

Items 7-12 are semantic differential type items (Osgood, 1953). The semantic differential provides for the allocation of a concept to an experiential continuum defined by a pair of polar terms. The semantic differential scales measure the extent to which concepts associated with visual attractiveness are detected. The specific items used here are: 7) dying – living, 8) inactive – active, 9) ugly – beautiful, 10) rough – smooth, 11) sick – healthy**,** 12) unpleasant – pleasant.

Persuasive reasoned positions were presented as one-page statements prepared with the help of forest industry advocates in one case and environmental advocates in the other. Statements appeared in similar formats and were expressed in non-technical language (see Figure 3).

**Procedure**

All data were collected in a self-supporting tent awning enclosed by portable walls. The white interior of the walls provided surfaces used to attach the experimental viewing materials.

Participants were self-selected. Each voluntarily approached the experimental gallery and accepted the invitation to participate in a study requiring them to rate scenes showing landscapes in different conditions. After volunteering, participants were formally briefed by an experimenter regarding the general purpose of the research. Experimental expectations were not revealed.

In each locale, half of the participants were randomly selected for pre-experimental exposure to one of two persuasive reasonings that could be applied to the successional forest stages to be viewed. After briefing, participants were asked to read either the industry or the conservation position statement. Experimenters clarified the position stated when participants requested this. Participants were then given a questionnaire, Scantron sheet, pencil and paper

with numbers 1-8 listed in a random order unique to that participant. Photos were numbered and the list referred to the order in which 8x10 inch colored photographs were to be visited.

Interaction between participants and the experimenter was discouraged. Time limits were not imposed on participants for completion of ratings. Once participants completed the ratings, occupation and place of residence were recorded, participants were thanked for assisting data collection and dismissed.

## RESULTS

Analysis of variance (ANOVA) was applied to the rating data for each of the 12 scales. Analysis tested for significant effects ($p$ <.05) from 2 levels of community (forest and non-forest), 8 levels of successional forest stage (seedling, medium regrowth, old regrowth, clear cut, roadway, regrowth after forest fire, forest fire and original forest) and 2 levels of ethical reasoning (industry advocacy and conservation advocacy).

The first five scales of fecundity shown in Figure 2 produced significant $F$s between .050 and .000 for variables of community, successional forest stage both separately and in interaction. The outcome for the sixth scale (‘view’) was consistent except that a significant interaction was lacking. From this, we concluded that both the successional stage of forest and the community’s relationship to the forest industry were factors entering into aesthetic response and that these affected each other in some way.

Results for the group of scales measuring aesthetic meaning produced a similar outcome. $F$s for stages of succession forest were significant ($p$<.000) for each of the six meaning dimensions. Community made a significant contribution ($p$<.01) to ratings on ‘dying – living’, ‘inactive – active’ and ‘sick – healthy’. Interaction between succession forest stage and community were significant ($p$<.000) for the same three semantic scales plus the scale

'unpleasant – pleasant'. The conclusion was, again, that the successional stage of the forest and community relationship to the forest industry were factors determining strength of the aesthetic experience.

The possibility of an order of preference for forest stages was basic to hypothesis one. Inspection of mean ratings for the eight successional forest scenes suggested existence of an aesthetic order. For example, the picture of undisturbed mature forest noted as 'Original forest' occupied the highest endorsement on 10 of the 12 aesthetic dimensions. Scenes named 'Medium regrowth' and 'Old regrowth' also vied for top position. At the bottom of aesthetic preference were 'Forest fire' followed by 'Clear cut' and 'Seedlings'. The order of preference for stages of successional forest appeared to be essentially the same for each type of community on all rating dimensions.

In order to test the appearance of ordinality statistically, overall ANOVAs were followed by the application of the Duncan Multiple Range test. Analysis used data collapsed over community. Post-hoc analysis results were consistent with the presence of an aesthetic order for the eight stages of successional forest. Specifically, undisturbed old growth forest (original forest) always occupied the most positively rated position of the set of photographs, either standing alone or standing in first place along with old regrowth and, less frequently, medium regrowth. The most negatively rated photos once more were forest fire and clear cut. The aesthetic impression of the landscapes called seedlings, roadway and regrowth after forest fire combined in clusters falling between the extremes. Figure 4 referring to affordance 'plenty of birds and small animals' provides an example of ratings made by 'forest and non-forest participants.

Hypothesis two was confirmed by reliable ANOVA differences between forest and non-forest communities. However, inspection of means suggested only small differences except for clear cut and forest fire where the non-forest communities were more negative in their ratings. Forest and non-forest community ratings differed 1 scale unit in each case. Community differences were slight at the positive extremes of the scale. Mature old growth forest (original forest) and old regrowth were rated at essentially the same levels by all communities. Figure 5 shows ratings elicited by forest and non-forest communities to the aesthetic dimension 'unpleasant – pleasant'.

Types of ethical reasoning did not exert a reliable effect on any scales independently or in interaction as predicted in hypothesis three. It appears that aesthetic experience was not disturbed by brief cognitive intervention immediately before the natural landscape was experienced.

The range of mean ratings on the 7-point scales indicated sensitivity of the particular scale to the set of landscapes shown. In general, the larger the range of responses, the more suitable the particular scale was for measuring differences in the intensity of aesthetic experience. Rating ranges that were in excess of 4 units on the 7-point scale include wind protection, dying – living, unpleasant – pleasant, sick – healthy, ugly – beautiful and inactive – active. However the remainder of the scales should not be rejected as irrelevant to aesthetic experience on this basis alone. Poor showing may have resulted from a poor match between the scale and the scenes of successional forest selected. The worth of the scale item to register preference might have changed if the landscapes were otherwise. For example, participants were required to rate each scene in terms of 'plenty of good tasting water' in the absence of water in any scene. The presence of a brook or stream could have become highly relevant to the aesthetics

of any of the successional forest stages and this would have been registered on the ‘plenty of good tasting water’ scale.

Evidence of reliable differences in ratings between the alternative sets of forest landscape photographs serving as stimuli were absent. The two sets of stimuli functioned alike.

## DISCUSSION

Preferential values of the eight forest landscapes were ordered in the same way along 10 of the 12 dimensions. Every term of the semantic different scales compatible with biophilia supported visual preference for undisturbed mature forest. Affordance scales suggested the aesthetic appeal of the original forest landscape was in terms of favorable affordances – firewood, fruit and berries, protection from wind, water, birds and animals – environmental circumstances favorable to sustaining life. But mature forest is not perfect. It failed to provide the best ‘view’ of the surrounding environment. Mature forest hid the sun and blocked viewing of landmarks useful for direction orientation. Also, tree branches and understory were sufficient to hide large preditors from view and so increase probability of challenging such animals when they engaged in feeding or encountering females protective of their cubs or pups or kittens. On the other hand, it can be argued that the reduced view was accompanied by reduced chance of any encounter taking place because large prey concentrate at the boundaries of forests and open areas.

There was one difference between forest and other communities. Participants from forest communities perceived clear cut slightly but significantly more favorably than participants from other types of community. This was not surprising because clear cut represents forest community competence everywhere. However, it is the case, too, that every community rated clear cut very low in absolute terms, i.e. clear cut occupied the identical low ordinal position in forest

community rankings that it did in non-forest communities. The seemingly poor response forest communities made to the work they perform aroused suspicion that the self-selection method of recruiting participants could have created bias toward recruitment of 'industry critical' persons in every community tested. Such individuals might well lean toward approval of a conservation as contrasted to a forest harvest ethic and so view removal of original tree cover negatively. A separate investigation involving new groups was required to test this possibility.

Also, bias toward conservation might be invoked to explain why different arguments about the ethical use of forestland failed to affect ratings. It could be argued that self-selection resulted in participants committed to resource conservation and indifferent to arguments in favor of forest harvesting. This possibility was investigated in a second study which employed scenarios that presented alternative procedures for establishing forest management policy. Participants selected by town managers were divided into three groups, each was made familiar with one of three policy structures that would determine forest harvesting. Immediately afterwards participants would rate forest scenes as if a consequence of forested lands being managed in the way described.

## STUDY TWO

### Hypotheses

This investigation used a different method for participant selection. Town managers of six northern forest communities each assembled a participant group consisting of 12-15 individuals considered leading citizens in that particular town. It was assumed each of these groups would consist mainly of individuals who had strong identification with the values attached to industrial harvest of forest.

Two possibilities were tested with the six groups. The first was whether these groups would perceive scenes showing clear cut differently than did previous participants. The second was whether scenarios proposing radically different methods for setting forest management policy would be reflected in aesthetic perception of forest affected by these policies.

More specifically, the first hypothesis was that leading citizens residing in towns having major dependence upon forest harvesting would rate scenes showing clear cut more positively than scenes showing other successional stages of forest. This prediction is based upon the concept of competency motivation (Deci, 1975; White, 1959). That is, residents of forest communities routinely engage in cutting of forest and moving felled trees from the harvest area which then becomes a clear cut forest. Therefore, the clear cut scene the participant views and evaluates aesthetically stands for or symbolizes the basic competence of the community to perform the work necessary to support its citizens, families, businesses and public services.

The second hypothesis was tested by exposing participants to a cognitive intervention prior to rating. This procedure was followed in the interest of learning more about how knowledge affects aesthetic perception of forestland. Three forest management scenarios were prepared for use as pre-experiment interventions. They were, in sum, constructed to play upon the desire of each forest town to diversify their economic base and shield residents from economic factors that threaten the health and permanence of isolated resource dependent communities (Nelson et. al., 2000). The contents of each scenario was suggested by Beckley and Korber (1996) and are outlined in Figure 6.

Previous research (Nelson et. al., 2000) provided evidence of greater preference by forest communities for the ‘Industry-Government with Community Advisory’ and least for ‘Industry-Government’. On this basis, hypothesis two was that participants would rate destruction of forest

by clear cut least objectionable in an aesthetic sense when it occurred as a consequence of the most highly endorsed type of forest management.

## METHOD

### Participants

Twenty-six northern forest communities were invited to participate in an investigation involving perceptions of forestlands and forest communities. The letter of introduction stated that:

> The project we are engaged in requires that we get together with cross-sections of persons significant in northern communities. We would like to meet with such persons, females as well as males, and record their perceptions of practices that are related to assuring sustainable forest resources. Specifically, we are prepared to meet with 12-15 people as a group, explain a forest management procedure to them, and have them look at four pictures of forests in various stages of development in order to evaluate them.

Indications of possible interest were followed-up until 6 communities agreed to participate. At this point town managers in each community working independently recruited 9-13 persons. This provided 60 participants in total.

### Procedure

Each of the six groups of participants was assembled in a public hall in their local community. The general nature of the investigation was explained in the same way in each community. The same rating scales were presented in the same order in each community. Type of management scenario was randomly assigned to communities such that two communities received the ‘Industry-Government’ scenario, two the ‘Industry-Government with Community

Advisory' scenario, and two received the 'Community-Industry with Government Advisory' scenario. The content of each scenario represented a unique combination of management responsibilities to be assumed by the local community, the forest industry, and the provincial government as outlined in Figure 6.

After a short discussion period focusing on procedure, participants read the management scenario assigned to their community. Participants were instructed to imagine that the scenario was actually in force in their area and that they should answer questions from this perspective. After this, it was pointed out that the management procedure provides for management functions involving data gathering and analysis, short-term planning (5 years), long-term planning (20 years), harvest allocation decisions, implementation, enforcement of regulations and monitoring. Following this, participants were provided a reference copy summarizing their respective management scenario.

The experiment began with the rating of the four forest scenes. Participants were instructed to consider each scene to be a result of practicing the type of forest management described in the scenario they had just read. The scenes showed original forest, medium regrowth, clear cut and burned over forestland (Figure 1). Each slide was rated on 12 dimensions. The first six ratings were made using 7-point rating scales anchored at "not at all" and "exceptionally well". These six scales measured perception of 'affordance'. Gibson (1979) defined affordance as what an environment "offers the animal, what it provides, furnishes, either for good or ill --- it implies the complementary of the animal and the environment" (p 127). The specific measures were 1) plenty of dry wood for a fire; 2) plenty of fruit and berries to eat; 3) good protection from the wind; 4) good quality/tasting water; 5) plenty of birds and small animals; and 6) good view of surrounding environment. Scales 7-12 measured visual impact of

the environment employing 7-point semantic differential type scales (Osgood, 1953). The specific polarities used were 7) dying – living; 8) inactive – active; 9) ugly – beautiful; 10) poor – rich; 11) sick – healthy; and 12) unpleasant – pleasant. These scales were taken from Nelson and Taerum (1999) and item 'smooth – rough' was replaced with 'poor – rich'.

## RESULTS

Hypothesis one and hypothesis two were not confirmed. In respect to the second of these, MANOVA analysis failed to find a reliable difference on any rating dimension that could be ascribed to exposure to a particular cognitive intervention. The different provisions for forest management found to significantly affect belief about self, family and community futures (Nelson et. al., 2000) did not register in visual perception of forest.

MANOVA analysis bearing on hypothesis one is summarized in Table 1. It was found that ratings made on all 12 scales differed reliably across the four forest scenes but not in the expected way. Aesthetic judgments represented in the semantic differential scales had a very strong movement upwards (see Figure 7). That is, burned forest is least beautiful followed in order by clear cut at the 'ugly' and 'unpleasant' ends of the scale and mature forest almost 3 scale units closer to 'beautiful' and 'pleasant'.

The basis of aesthetic preference for mature forest and 15 year regrowth is related to affordance ratings. Clear cut was rated lower on four of the six resource dimensions. The presence of water and biophilic objects such as berries to eat and birds and small animals were positive surrogates of beauty (see Figure 8). It is only on the dimensions 'good view of surrounding environment' and 'plenty of dry wood' that clear cut exceeds. The basis of the first endorsement has been explored. In respect to 'plenty of dry wood', the burned forest scene and clear cut are highly regarded leading to the conclusion that the ratings arise from waste wood in

the clear cut and burned forest pictured. However, the good view and presence of dry wood appear not to impact upon aesthetic judgments. Possibly in the case of dry wood the need for a fire was not suggested and in the case of 'good view', signs of large preditors were lacking.

## DISCUSSION AND CONCLUSIONS

This research into environmental perception revealed that the forest scenes shown evoked strong emotional response in participants. The emotional connection was both positive and negative and, importantly, it was monolithic. For every segment of the population tested, intact mature natural forest was experienced as more bountiful and attractive than forest in any other stage of successional development. At the opposite pole, clear cut and burned over forest ranked as the most impoverished and ugly. Emotional connection was not perturbed by rational argumentation. Neither ethical argumentation favoring forest conservation versus industrial use nor proposals that would shift control over forest harvest to the community from forest company hands influenced aesthetic perception.

The overall impression emerging from studies one and two is that perception of forest at different stages of successive growth as beautiful or ugly is indeed a robust phenomenon. Because this is so, it is possible to state tentatively principles that seem to structure aesthetic perception of successive stages of forest.

One, mature natural forest such as that pictured in Figure 1 evokes the most positive experience. This represented a highly biodiverse and complex system of life forms which has been linked by others to aesthetic experience (Berlyne, 1971). There is also present a high degree of novelty or mystery (Kaplan & Kaplan, 1989) in different directions. As one moves through this environment the environment is not open to casual understanding. What can be perceived are life forms that are abundant, diverse with elements interacting in a shifting mosaic with

components uneven in occurrence from place to place. This is felt consciously as an awareness of ambient health (Parsons, 1991) and as an attractive balance of serenity, stimulation, happiness, order, solitude and is pleasant in tone (Schroeder, 1991). Two, any degree of repetition overlaying in a natural carpet of vegetation, such as that introduced into tree stands by mechanized planting or by reforestation in laid out rows decreases the aesthetic appeal of the forest by producing an industrial look. Biodiversity is partially sacrificed and monotony increased. One life form is emphasized at the expense of others at the expense of novelty and mystery. The 'Medium regrowth' shown in Figure 1 has this anti-aesthetic character.

Three, forest lands that are in natural state can be distinguished at an aesthetic level. A canopy where foliage is dense in relation to branches connotes a fecund environment (Nelson et. al., 2000). Forest scenes showing larger trees are preferred to those with smaller trees and indications of former human presence in the forest are responded to positively (Rodrigues et. al., 1996). In respect to affordance, scenes showing restricted understory and few lateral branches near ground level suggest free movement and are rated highly (Nelson et. al., 1996). Four, clear cut and recently burned forest are negations of life. Both are perceived to be deficiency environments where view is optimal for both prey and predator and refuge for either is minimized. Fecundity is lacking almost entirely. These are environments devoid of beauty for even those who make a profit from harvesting. New regrowth such as seedlings, improves acceptance of the landscape but the area continues to be perceived as a deficiency environment for many years.

Homo sapiens existed exclusively as hunter-gatherers for hundreds of thousands and Homo erectus for 2 million years. The transition to farming and herding happened less than 10, 000 years ago and then only in isolated areas. Other animals have a hereditary understanding of

vegetation – the new born of common white-tailed deer (Odocoileus virgunamus) instinctively bed in concealing grass and await the periodic return of the doe to nurse. Fox seem to know about dens and birds about trees. It does not require romantic idealization to conclude that the human who has been demonstrated to have genetic preparation to 'attend' to the human face, recognise facial expression, avoid a precipice, naturally attend to focal colours, etc. should fail to be prepared in some way for acting automatically in a vegetative environment. The main role for biophilia – biophobia in the perception of trees and natural landscape has been established by Ulrich (1993), Heerwagen and Orians (1993) and Bixler and Floyd (1997). A heredity propensity to learn about things that genetic structure specifies as important is proposed by Wilson (1993).

This approach may be too excessively biological in the traditional sense. The perception of a forest by a nature photographer or hunter or forester are each tinged differently by the mindset with which culture has endowed them. Also, limits of personal experience in our environment and the extent to which each has sampled archival knowledge related to the enviornment help to structure perception of the environment. The real question is not whether biophilia – biophobia is a perceptual disposition but how behaviour with respect to the environment is modified by cultural mindset, personal experience and formal education. The integrative process is as interesting and profound as genetic dispositions. The human is the only animal with an attitude!

We propose a concept named 'The Biological Slate' which recognizes biophilia as a foundation of aesthetic experience but makes room for effects from instrumental and cognitive acts that become as integral parts of human life as biophilia - biophobia. The biological slate may be needed to rid ourselves of polarizing attitudes about the environment. The 'slate' serves as a

means for investigating the real processes underlying divergences in attitudes that are so much in evidence.

A puzzle remaining is why forest communities seem to devalue their own activities. Felling trees to make lumber seems not radically different from felling trees to create farm land. Re-planting clear cut with trees seems similar to sowing grain. Clear cut opens the environment to benefit wildlife just as clear cut sowed to grass aids grazing domestic stock. Yet, the forest community judges its clear cut negatively and the farm community regards their clear cut positively.

Perhaps forest communities need to develop a moral outlook suited to what they set themselves to accomplish as a community. To do this, the forest community may need to redefine its relationship to clear cut. This could require development of mind sets directed to beneficiating clear cut in ways additional to forest replanting. For example, a new clear cut could be treated so that it improves wildlife habitat and enhances recreational opportunities for persons residing in the local community at the same time it is planted in seeding trees. This merits investigation.

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Table 1

**Mean ratings of forest scenes on affordance and aesthetic dimensions**

| Scale Type | Forest Scene | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | CC | | FF | | MR | | OF | |
| | M | σ | M | σ | M | σ | M | σ |
| **A. Affordance*** | | | | | | | | |
| 1. plenty of dry wood for a fire | 5.42 | 1.96 | 6.03 | 1.95 | 2.12 | 1.51 | 3.75 | 1.68 |
| 2. plenty of fruit and berries to eat | 2.82 | 1.80 | 1.30 | 1.11 | 2.35 | 1.63 | 5.07 | 1.55 |
| 3. good protection from the wind | 1.97 | 1.21 | 1.85 | 1.49 | 3.00 | 1.66 | 6.17 | 1.22 |
| 4. good quality/tasting water | 2.68 | 1.47 | 1.80 | 1.33 | 2.90 | 1.77 | 5.27 | 1.78 |
| 5. plenty of birds and small animals | 3.28 | 1.55 | 1.88 | 1.40 | 3.82 | 1.90 | 5.65 | 1.63 |
| 6. good view of surrounding environment | 5.50 | 1.52 | 3.37 | 2.20 | 4.77 | 1.80 | 3.80 | 2.02 |
| **B. Aesthetic*** | | | | | | | | |
| 7. dying – living | 2.58 | 1.72 | 1.28 | 1.83 | 3.92 | 2.15 | 4.40 | 2.19 |
| 8. inactive – active | 2.98 | 1.66 | 1.57 | 1.82 | 3.73 | 2.02 | 4.67 | 1.86 |
| 9. ugly – beautiful | 2.05 | 1.63 | 1.08 | 1.57 | 3.30 | 1.71 | 4.98 | 1.74 |
| 10. poor – rich | 3.40 | 1.44 | 2.60 | 1.74 | 4.32 | 1.57 | 5.53 | 1.86 |
| 11. sick – healthy | 2.80 | 1.62 | 1.82 | 1.91 | 4.18 | 1.73 | 4.75 | 1.70 |
| 12. unpleasant – pleasant | 2.37 | 1.76 | 1.18 | 1.62 | 3.58 | 1.84 | 5.23 | 1.48 |

*Forest scenes differed significantly on all scales by a MANOVA, $p < .05$
CC = Clear cut; FF = Forest fire; MR = Medium regrowth; OF = Original forest

Figure 1

**Succession forest stages shown**

**Original forest**

**Seedlings**

**Roadway in old growth**

**Regrowth after forest fire**

**Clear cut**

**Old regrowth**

**Forest fire**

**Medium regrowth**

Figure 2

**Affordance and aesthetic rating scales**

**Instructions:**
For items 1-6, rate the image on a 7-point scale demonstrated in the following example:

| | NOT AT ALL | | | | | | EXCEPTIONALLY WELL |
|---|---|---|---|---|---|---|---|
| There is good water | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
| the setting is beautiful | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |

**Affordance scale**

| | | NOT AT ALL | | | | | | EXCEPTIONALLY WELL |
|---|---|---|---|---|---|---|---|---|
| 1) | plenty of dry wood for a fire | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
| 2) | plenty of fruit and berries to eat | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
| 3) | good protection from the wind | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
| 4) | good quality/tasting water | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
| 5) | plenty of birds and small animals | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
| 6) | good view of surrounding environment | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |

**Aesthetic scale**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7) | dying | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | living |
| 8) | inactive | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | active |
| 9) | ugly | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | beautiful |
| 10) | rough | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | smooth* |
| 11) | sick | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | healthy |
| 12) | unpleasant | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | pleasant |

*Item ‘rough – smooth’ replaced with ‘poor – rich’ in Study Two.

Figure 3

**Persuasive forestry and environmental position statements**

## Position statements

### Forest industry

It is important to support the forest industry for the following five reasons:

1. Wood is a valuable commodity with a wide variety of uses, from public buildings to guitar tops. We use wood and wood-based products every day, and often take them for granted.

2. The forest industry is a source of income for the provinces through Tree Harvesting Licenses. The province collects a premium for each tree cut.

3. The forest industry provides material for export and international trade in the form of wood fibre and pulp. British Columbia alone produces 30% of all softwood lumber exports in the world.

4. Direct and indirect employment for thousands of Canadians is provided by the forest industry. It is estimated that over 200,000 Canadians rely on this industry for employment.

5. The industry's harvesting practices mimic natural disturbances such as fire, pestilence and disease, and these encourage the renewal of aging forests.

### Environmental preservation

It is important to preserve the forests for the following five reasons:

1. The earth's forests contain most of our plant and animal species. The old-growth forests of western Canada are inhabited by over eighty species of mammals, birds, reptiles, and amphibians, including several endangered species. We must protect their homes which are our forests.

2. For many people, the forest is home and a place of recreation and rejuvenation. Forests connect us to our natural world and provide us with retreats from crowded cities.

3. Forests provide livelihoods for thousands of people. The challenge is to achieve a balance between ecology and economics, to take what is needed in a non-intrusive manner and to keep our forests intact.

4. The earth's forests act as lungs for our planet, converting carbon dioxide to life-giving oxygen.

5. Forests are peaceful and spiritual, and provide a refuge from the demands of urban life. Unfortunately, they are being decimated at a rate of 200,000 cubic metres per day.

Figure 4

**Mean rating of affordance dimension 'plenty of birds and small animals' by type of community.**

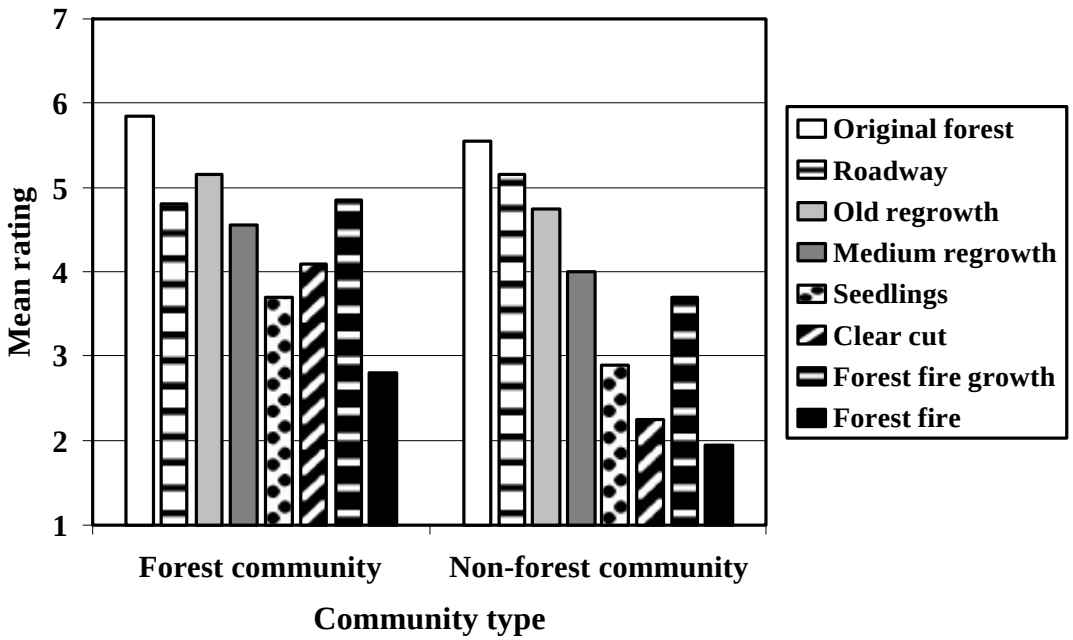

Figure 5

**Mean rating of aesthetic dimension 'unpleasant – pleasant' by type of community.**

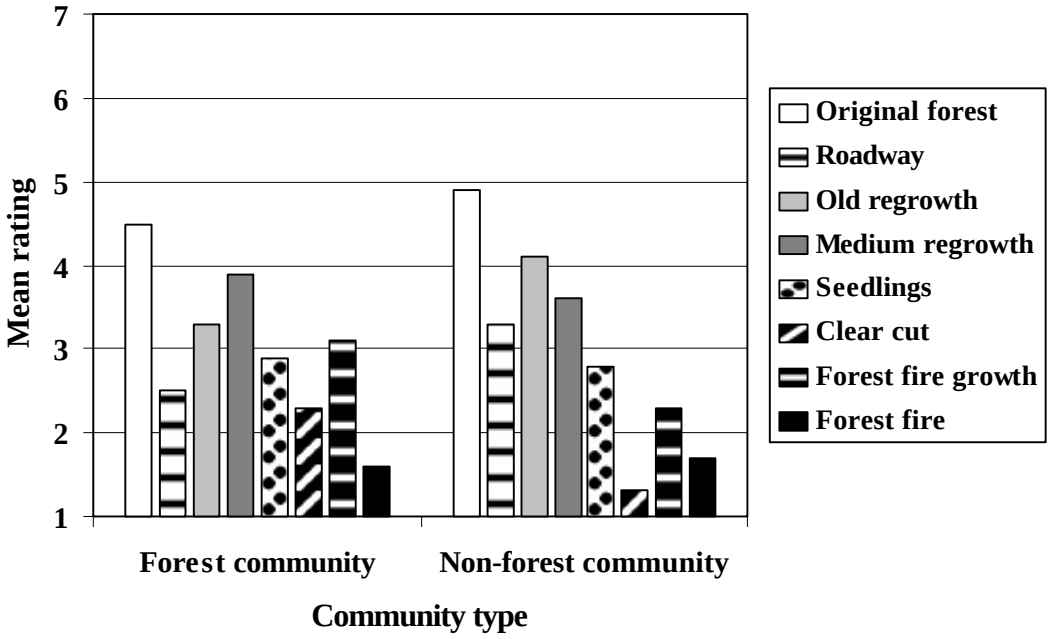

Figure 6

**Three forest management arrangements**

| Management arrangements | Reference group | | |
|---|---|---|---|
| | **Local Community** | **Forest Industry** | **Provincial Government** |
| **I. Industry-Government** | | | |
| Data gathering and analysis | **IN** | P | P |
| Short-term planning (5 years) | **IN** | A | P |
| Long-term planning (20 years) | **IN** | A | P |
| Harvest allocation decisions (how much) | **IN** | A | P |
| Implementation (annual operating plans) | **IN** | P | A |
| Enforcement of regulations | **IN** | IN | S |
| Monitoring | **IN** | IN | S |
| Policy decision-making | **IN** | A | P |
| **II. Industry-Government with Community Advisory** | | | |
| Data gathering and analysis | **IN** | P | A |
| Short-term planning (5 years) | **IN** | A | P |
| Long-term planning (20 years) | **IN** | A | P |
| Harvest allocation decisions (how much) | **A** | IN | P |
| Implementation (annual operating plans) | **IN** | P | P |
| Enforcement of regulations | **IN** | IN | S |
| Monitoring | **P** | IN | S |
| Policy decision-making | **A** | IN | P |
| **III. Community-Industry with Government Advisory** | | | |
| Data gathering and analysis | **P** | IN | A |
| Short-term planning (5 years) | **P** | A | A |
| Long-term planning (20 years) | **P** | A | A |
| Harvest allocation decisions (how much) | **P** | A | IN |
| Implementation (annual operating plans) | **P** | A | IN |
| Enforcement of regulations | **IN** | IN | S |
| Monitoring | **P** | P | S |
| Policy decision-making | **P** | A | IN |

IN = indirect or no role, A = advisory role, P = primary responsibility, and S = sole responsibility

Figure 7

**Mean rating of aesthetic dimension 'unpleasant – pleasant' by forest management practice.**

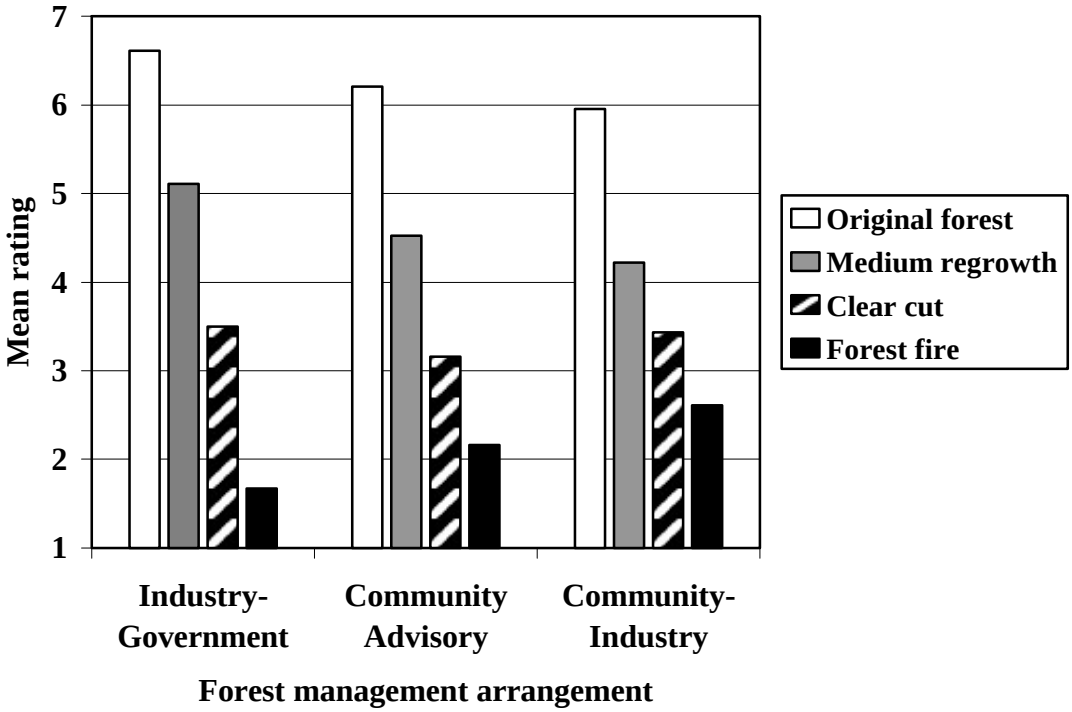

Figure 8

**Mean rating of affordance dimension 'plenty of birds and small animals' by type of forest management practice.**