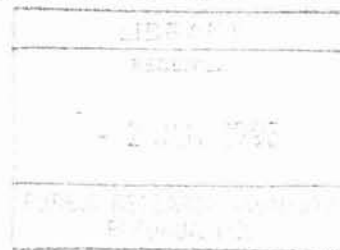


## VISUAL IMPACTS OF FOREST OPERATIONS : MEASURING CONCERN IN NEW ZEALAND



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### ABSTRACT

*Sample groups of Central North Islanders were questioned to determine their attitudes and concerns about forests and the visual impacts of logging. Visual impacts were of concern to a majority of those surveyed.*

*The study also quantified the respondents' judgements of scenic beauty, based on individual ratings of 30 colour slides of forest areas. Variables which explained the differences in scenic beauty included the percentage of vegetated area, presence or absence of conspicuous clearances, roads, felled wood and indigenous forest.*

### INTRODUCTION

Logging and other forest operations affect the landscape, particularly in terms of visual change. Visual impacts are of concern because people's perceptions of the environment are primarily visual in origin and negative perceptions prompt criticism of forest management policies.

The importance of moderating visual impacts is recognised in the New Zealand Forest Code of Practice (FCP) which states that scenic quality is to be



Figure 1 - Slide 7 - Scenic Beauty  
Estimate (SBE) = 116



Figure 2 - Slide 12 - SBE = 262

maintained as far as practicable (Vaughan, 1990). The FCP also indicates that "plantation forests are accepted as man-made, renewable and more robust environments [than indigenous forests]. Because of this, people tend to accept greater degrees of visual impact within [plantation forests]. They will react to change if they observe careless, wasteful or unnecessarily destructive management practices."

This statement is vague; how much visual change will New Zealanders tolerate in plantation forests? What factors and what levels cause people to react negatively? A section of the FCP offers suggestions for evaluating and minimising negative visual impacts of forest operations, but these suggestions are based on general assumptions rather than quantitative analysis of landscape perception in New Zealand. Consequently, New Zealand forest planners have no quantitative data with which to compare the visual impacts of alternative plans for logging and silviculture in visually sensitive areas.

A preliminary study of visual impacts was recently completed (Killerby, 1992). The study had three objectives:

- (1) Evaluate New Zealanders' attitudes regarding plantation and indigenous forests in order to verify the assumptions in the FCP.
- (2) Determine the levels of New Zealanders' concerns regarding the visual impacts of logging operations. This would show whether there is a need to further consider visual impacts.
- (3) Quantify New Zealanders' judgments of the visual impacts of forest operations. This would help in selecting alternatives which minimise impacts.

## ACKNOWLEDGEMENTS

*LIRO acknowledges the assistance of all those involved in the survey.*

## APPROACH

Questionnaires were completed in 1991, by individuals in several sample groups of New Zealanders based in the Central North Island. The questionnaire had two components:

- (1) a series of closed and open questions to ascertain attitudes about forests and the level of concern about visual impacts.
- (2) a section in which the observer rated a set of 30 colour slides of forested landscapes around New Zealand, on the basis of the amount of perceived scenic beauty.

Since the emphasis of the study was on plantation forests, 80% of the slides were images of plantation forests and associated harvesting (Figures 1 and 2). The slides were taken from distances of 800m to 5km from the forest, on the assumption that the majority of people observe forest operations from a distance. The slides were projected under controlled conditions to the sample groups.

Questionnaires were completed by 213 people. A low response rate (n=16 respondents of 150 invited) was obtained from the first group, selected at random from the Hamilton East Main Electoral Roll, so the bulk of the survey was conducted among several "captive audiences"; undergraduate students in the Resources and Environmental Planning programme at the University of Waikato in Hamilton (n=101), members of the Waikato, Hamilton and Te Aroha tramping

clubs (n=53), the Rotorua Toastmasters (n=23), and staff at the New Zealand Forest Research Institute (FRI) in Rotorua (n =22).

## RESULTS AND DISCUSSION

### Impressions of Forest Landscapes

The first two questions in the survey asked the observers to select adjectives, from a

supplied list of 26, which best described their overall impressions of indigenous and plantation forests in New Zealand. For indigenous forests, the terms in Figure 3 were chosen by over half of the individuals. Using the same list of terms, the respondents selected different words for describing plantation forests. The common terms for plantation forest are listed in Figure 4.

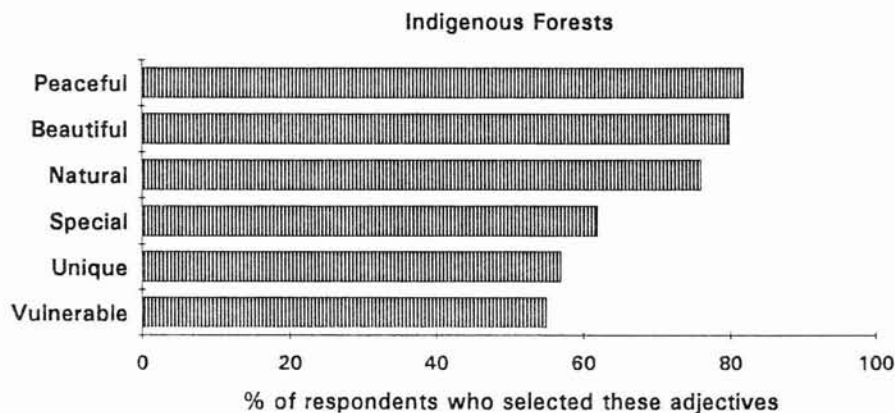


Figure 3 - Adjectives most frequently selected for describing indigenous forest landscapes

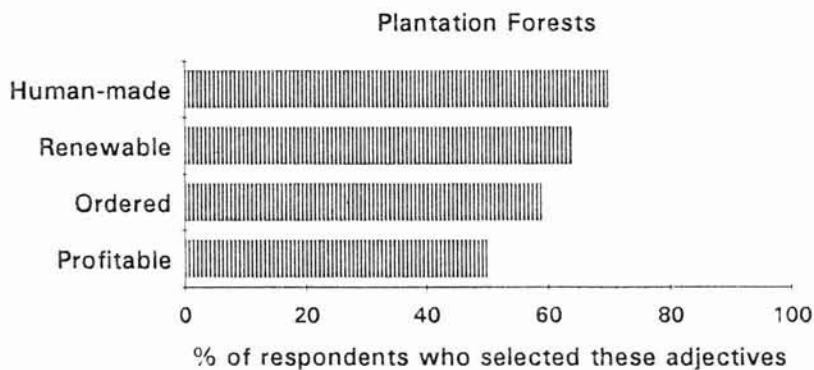


Figure 4 - Adjectives most frequently selected for describing plantation forest landscapes

Statistical analysis showed that indigenous forests were significantly more frequently described as beautiful, interesting, fragile, natural, non-renewable, sacred and dynamic than plantation forests. In contrast, plantation forests were more frequently described as ugly, disruptive, untidy, ordered, renewable, common, profitable and static, so it appears that New Zealanders do indeed have distinctly different attitudes about indigenous and plantation forests.

### Concerns

The next two questions in the survey asked how individuals rated the importance of each of five factors in unharvested and harvested plantation forest landscapes. Each factor was rated on a scale of 1 (very low concern) to 5 (very high concern); results are displayed in Figure 5. While economic considerations rated highest for unharvested forests, visual impacts were of primary concern in harvested

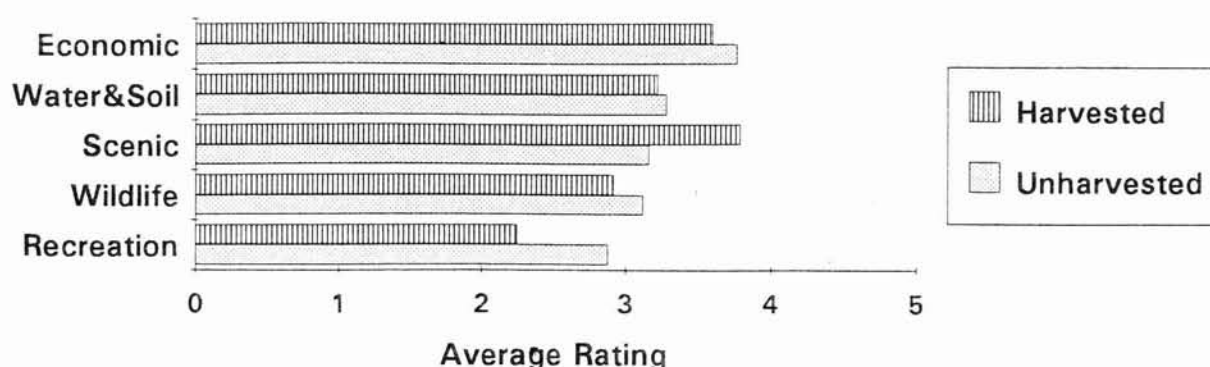


Figure 5 - Levels of concern for values in harvested and unharvested plantation forests

landscapes. (The FRI sample group gave a significantly lower rating to visual impacts of harvesting. This result supports the FCP assumption that people in the forestry sector are more tolerant of visual impacts).

Respondents were then asked to select one of three terms describing how concerned they were about the visual impacts of harvesting plantation forests (Figure 6). Despite the fact that unharvested plantation forests did not have a high level of visual appreciation compared to indigenous forests (only 25% of respondents described plantation forests as "beautiful" in the adjective selection question), a majority of those surveyed did express concern about visual changes caused by harvesting.

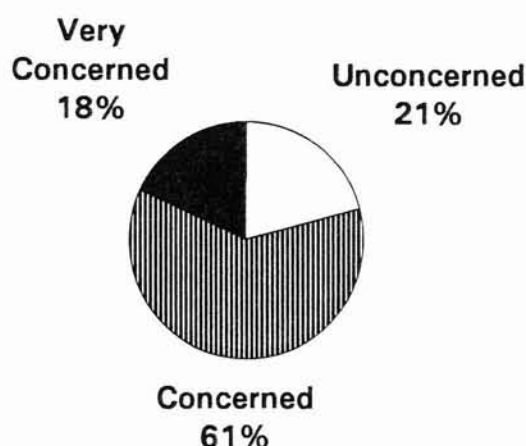


Figure 6 - Level of concern regarding the visual impacts of exotic timber harvesting

An open-ended query asked the respondents to describe their reasons for

the level of concern indicated in the previous question. After reviewing the responses, they were classified into the following general categories of reasoning:

Reason	% of Total
Non-scenic concerns	34
Importance for tourism, national image	21
No concern	20
Importance of scenic resource (in own mind)	12
Felt harvesting was wrong	7
Ugliness of harvesting	6
	100

### Measurement of Visual Impacts

Each of the 30 slides was rated on a scale of 1 (very low beauty) to 10 (very high beauty) by each individual. Using an averaging and adjusting process developed by Daniel and Boster (1976), all the ratings for each slide were transformed into a single Scenic Beauty Estimate (SBE) for that image. Due to the transformation process, the SBEs had a different range (0 to 400) than the original ratings but can be interpreted in the same way; higher values indicate higher beauty. The SBEs for the images in Figures 1 and 2 are indicated in the figure captions.

Multiple regression analysis was used to identify the relationship between the SBEs (the dependent variable) and a number of measurable landscape components (the independent variables). It was possible to



quantify two components on continuous scales:

- Vegetation % - percent of the total slide area (excluding sky) that was vegetated. Any vegetation - young or mature trees, shrubs, grasses and natural regrowth on cutovers - was included.
- Brown % - percent of the total slide area (excluding sky) that was coloured brown. This included bare soil and brown-coloured vegetation.

Other components were evaluated using "indicator variables". These signify whether the components are present in the image; the variable has a value of 1 if the corresponding component is present, 0 if absent. Indicator variables were used to represent:

- Visible clearances
- Conspicuous clearances; visible clearances where colour, form or design did not blend harmoniously with the surrounding landscape
- Visible roads
- Visible felled wood; down trees and/or slash were considered felled wood
- Visible standing wood; stems of trees visible on a cut face
- Indigenous forest; when the image was of indigenous trees rather than plantation
- Visual variety; defined as present when more than 20% of the area of the slide was different from the rest in terms of vegetative cover
- Texture; considered present when more than 50% of the image was in tall dense trees

The regression model including all effects which were significant at the 95% level was:

SBE	=	200	+	0.92 x vegetation %
		- 102	x	conspicuous clearances indicator
		- 53	x	visible roads indicator
		- 39	x	visible felled wood indicator
		+ 54	x	indigenous forest indicator
( $r^2 = 0.92$ , $n = 30$ )				

As might be expected, beauty estimates were high for images with high percentages of vegetation, and higher for images of indigenous forest than for plantation forest. Conspicuous clearances caused the estimate of beauty to drop, as did the presence of visible roads or felled wood.

The model indicates the relative importance of various differences between forest landscapes. Conspicuous clearances caused the SBE to drop twice as much as did roads and nearly three times as much as the presence of visible felled wood. The difference in beauty between plantation and indigenous forest was similar to the difference between two scenes in which roads were and were not visible. A reduction in vegetated area of approximately 40% had an equivalent impact on SBE as did the inclusion of felled wood. It is also important to note the variables which had no significant effect. The presence of visible clearances, standing wood, variety, texture and brown area had little impact on the perceived beauty, given that the variables in the regression model were held constant.

These results can be used to look at trade-offs between alternative ways of carrying out forest operations. For example, it appears that effort would be better spent in ensuring that clearances are not

conspicuous, rather than in completely screening either clearances or roads.

On average, different groups had very similar preferences. The Resources and Environmental Planning students might be considered more conservation-minded due to their study emphasis at university, yet the regression model for their scenic preferences was not significantly different than that for the rest of the sample pool.

The current SBE model is based on a small number of slides and was not able to consider the effects of different amounts of roading or different types of vegetation. Future work may increase the usefulness of SBE models. Later efforts might also consider differences in silvicultural practice, for example v-blading versus non-mechanical site preparation. Because of the concern about tourism, it would appear worthwhile to include tourists in future studies to see whether their perceptions differ from those of resident New Zealanders. Recognising that landscape change is inherent in production forests, work is also needed to identify how the rate of change can be varied to reduce visual impact.

## CONCLUSIONS

The survey questions seemed to verify the assumptions in the FCP regarding New Zealanders' attitudes about forest landscapes. In contrast to indigenous forests, plantation forests are regarded as human-made and renewable. Although scenic beauty was only considered moderately important as a factor in unharvested forests, respondents considered loss of scenic value to be the most important factor when viewing a harvested tract.

There was a wide range of opinions about visual impacts. Some respondents expressed little concern because they reasoned that the changes were temporary

and logging was necessary. Others were upset by barren landscapes and the loss of trees. Between the two extremes were many individuals with moderate levels of concern. The importance of tourism was one of the most commonly cited reasons for focusing on visual impacts.

The results show a need to consider the visual impacts of forest operations in frequently seen areas, e.g. close to cities or along major tourist routes.

Despite the wide range of opinions, quantitative preferences were relatively consistent. The regression model explained 92% of the variance in aggregate SBEs for those surveyed. The model could be useful in planning forest operations in highly visible areas.

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