



AMENITY VALUE OF SCATTERED AND ISOLATED TREES

**Report to the
South Australian Native Vegetation Council**

**Dr Andrew Lothian
Principal, Scenic Solutions**

2004

© Dr Andrew Lothian, Principal, Scenic Solutions

AMENITY VALUE OF SCATTERED AND ISOLATED TREES
Report to the South Australian Native Vegetation Council

Scenic Solutions
PO Box 3158, Unley, South Australia, 5061

ABN 55 275 407 146

Email: lothian.andrew@gmail.com

AMENITY VALUE OF SCATTERED AND ISOLATED TREES
Report to the South Australian Native Vegetation Council
Dr Andrew Lothian, Scenic Solutions

SUMMARY

Aim of project

In response to an application, the Native Vegetation Council awarded a grant to Dr Andrew Lothian, Scenic Solutions, to assess the visual amenity provide by scattered and isolated trees. The defined purpose was to provide the basis for assessment of the visual amenity provided by these trees for consideration in applications for their clearance.

Amenity and human preferences for trees

Amenity of trees has been described by the Council as the degree by which trees are regarded by the community as part of the local landscape. While this combines the quality and the contribution the trees make to the pleasantness of the locality, it is important to appreciate that the trees do not necessarily need to be accessible or viewable in order to be regarded as visually significant.

Pastoral landscapes, which scattered and isolated trees comprise, have a long history of providing pleasing environments for people. From the creation of parks in Persia, Greece and Rome through the monastic gardens of the middle ages and the hunting parks of the 15th century, to Capability Brown's landscaped gardens created in the image of Claude Lorraine's pastoral landscape paintings, and finally, the public parks and gardens and even home gardens of modern times, the idealised image of pastoral landscape of scattered trees amidst grass may be found.

Theorists speculate that the human preference for pastoral landscapes derives from their qualities of enhancing the survival of the human species. Tree shapes typical of the acacia trees of the African savannah have been shown to be preferred. Many studies have shown human preferences for substantial trees with height, thickness of trunk, and breadth of canopy, trees that have a significant impact on the landscape. A South Australian study showed that trees enhanced landscape quality significantly and that indigenous trees were preferred over introduced species.

Various studies have sought to determine whether a relationship existed between landscape quality and ecological quality but the results have been inconclusive, suggesting that any relationship that exists is very weak.

Gaining the data

The project involved photographing scattered and isolated trees in various regions, classification of the trees, selection of 112 photographs for the survey and preparation of the survey for the Internet. The survey was conducted over five

week period in April and May 2004. A total of 619 participated and of this 440 completed surveys were useable.

Participants

Survey participants differed significantly to the South Australian community in respect of their education and age but their gender balance and birthplace were not significantly different. Ratings were analysed across these characteristics and found to be very similar, suggesting that although the participants differed from the community, this made little difference to their ratings. The ratings differed significantly only in respect of education.

Extensive comments on the survey were obtained from participants. The main theme was concern regarding the lack of understorey to the isolated trees, the degraded, over-grazed fields, the age of trees and lack of regeneration, and the importance of naturalness in the ecosystems. Many participants appeared to have training in life sciences and land management fields.

Fifty scenes of South Australian landscapes were included to balance the scenes of trees. These had been previously rated in an earlier study and the differences in ratings indicated that while natural scenes rated more highly, those of barren fields, overgrazed and degraded areas rated poorly. This indicated that some participants were influenced by the botanical integrity of the scenes.

Analysis of tree characteristics

Detailed analysis across the categories of nine tree characteristics (e.g. height, canopy form, species) and two context (terrain, land use) characteristics quantified the contribution of each to the ratings of scenes. It found that preferences increased markedly with the greater number and density of trees, healthier trees, and height of trees. For the other characteristics however ratings did not change appreciably across them. There was some supporting evidence for a relationship between ecological health and landscape quality but it was not definitive.

Multiple regression analysis of the ratings of tree characteristics was used to define a predictive model of scenic amenity of scattered and isolated trees. The model defined was:

$$Y = 2.98 + 0.24 \text{ height} + 0.30 \text{ verticality} - 0.17 \text{ canopy density} + 0.40 \text{ health} - 0.21 \text{ species} + 0.35 \text{ number}$$

The model was tested against the 112 scenes and found to be accurate to an average of within 1%. Based on this, a workbook was developed to calculate the scenic rating in the field. The project achieved its aim of developing a model for assessment of scenic amenity of scattered and isolated trees.

CONTENTS

SECTION	PAGE
SUMMARY	i
Contents	iii
List of Tables	v
List of Figures	vi
Acknowledgements	viii
1. INTRODUCTION	1
2. BACKGROUND	2
3. AMENITY VALUE OF TREES	4
3.1 Concept of amenity	4
3.2 Origins and significance of the pastoral landscape	5
3.3 Theories about the preference for pastoral landscapes	7
3.4 Contribution to visual amenity by trees	11
3.5 Trees in the South Australian landscape	16
3.6 Ecological quality versus landscape quality	17
4. ACQUIRING THE DATA	22
4.1 Project methodology	22
4.2 Photography of trees	
4.3 Classification of trees	24
4.4 Selection of scenes	27
4.5 Preparation of Internet survey	30
5. ANALYSIS OF RESULTS	37
5.1 Participation in survey	37
Number of participants	37
Time to complete survey	39
5.2 Participant characteristics	39
Age	40
Gender	40
Education	40
Birthplace	41
Comparison of survey participants with S.A. community	41
Participant comments	43
5.3 Rating of South Australian landscapes	46
5.4 Overall ratings and regional ratings	49
Overall findings	49
Regional ratings	52
5.5 Analysis of tree characteristics	53
Height of trees	53
Trunk height	54
Trunk diameter	55

Trunk verticality	56
Canopy form	57
Canopy density	58
Tree health	60
Tree spacing	61
Number of trees	62
Species	64
Terrain	64
Land use	65
Summary of ratings of tree characteristics	66
Ecological health and landscape quality	66
6. DEVELOPMENT OF A PREDICTIVE MODEL	69
6.1 Tree characteristics	69
6.2 Correlations	69
6.3 Multiple regression model	71
6.4 Testing the model	72
7. DEVELOPMENT OF WORKBOOK FOR EVALUATING SCENIC AMENITY OF ISOLATED AND SCATTERED TREES	77
7.1 Identification of scene to be assessed	77
7.2 Assessment of the scene	78
7.3 Coding of the assessment	81
7.4 Calculation of the rating	82
8. CONCLUSIONS	83
9. REFERENCES	84
APPENDIXES	
1. Feedback comments on tree amenity survey	86
2. Application of model to 112 scenes	91
3. Summary of scene ratings and scores of landscape factors	92
4. Tree scenes used in survey	97

LIST OF TABLES

Table	Title	Page
1	Comparison of most and least attractive trees	8
2	Shafer's predictive model of landscape preferences	15
3	Summary of positive and negative aspects of trees	16
4	Rating of indigenous and introduced vegetation	17
5	Australian vegetation preferences	19
6	Distribution of photographs by region	23
7	Classification of variables	25
8	Frequency of scenes by variable	26
9	Correlation coefficients in characteristics of scenes between regions	27
10	Distribution of survey photographs by region	29
11	Frequency of scenes per variable	29
12	Correlation coefficients between regions	30
13	Participation in Survey – number of scenes rated	37
14	Age Distribution of Participants	40
15	Gender of Participants	40
16	Educational Attainment of Participants	40
17	Birthplace of Participants	41
18	Ratings by Participant Characteristics	41
19	Distribution statistics	51
20	Regional means	52
21	Influence of Tree Height on Ratings	53
22	Influence of Trunk Height on Ratings	54
23	Influence of Trunk Diameter on Ratings	56
24	Influence of Trunk Verticality on Ratings	56
25	Influence of Canopy Form on Ratings	58
26	Influence of Canopy Density on Ratings	59
27	Influence of Tree Health on Ratings	60
28	Influence of Tree Spacing on Ratings	62
29	Influence of the Number of Trees on Ratings	63
30	Influence of Type of Eucalypt on Ratings	64
31	Influence of Terrain on Ratings	65
32	Summary of Mean Ratings for Factors	66
33	Summary of the Influence of Factors on Ratings	66
34	Summary of Characteristics	69
35	Correlations between Characteristics	69
36	Multiple Regression Models	71
37	Summary of test ratings	73

LIST OF FIGURES

Figure	Title	Page
1	Persian Carpet Scene of a Garden	5
2	Paintings by Nicholas Poussin and Claude Lorraine	6
3	Generic Tree Forms and Species Exemplars	9
4	Comparison of Preferences for Savanna by Age	10
5	Preferences for Australians & Americans for Jarrah Forests	13
6	Preferences for Biomes by Age	14
7	Preferences of Groups for Arboretum Scenes	14
8	Relationship of Scenic Ratings with Tree Height and Density	17
9	Naturalness vs Foliage Cover & Height	18
10	Preference and Ecological Quality of Eucalyptus Woodlands	20
11	Project Methodology	22
12	Pie Chart of the Number of Scenes Completed	38
13	Elapsed times for completed surveys	39
14	Time taken to complete survey – by Internet connection type	39
15	Boxplot of ratings by participant characteristics	42
16	Histogram of thesis means	46
17	Histogram of survey means	46
18	Survey ratings compared with thesis ratings	46
19	Histogram of Participant Mean Ratings	50
20	QQ plot of Participant Mean Ratings	50
21	Tree Scene Mean Ratings	50
22	QQ Plot of Tree Scene Mean Ratings	50
23	Distribution of Respondent Mean Ratings	51
24	Respondent Mean Ratings vs SDs	51
25	Distribution of Tree Scene	51
26	Tree Scene Mean Ratings vs SDs	51
27	Ratings of Tree Scenes Arranged in Ascending Order	51
28	Boxplot of Regional Means	52
29	Influence of Tree Height on Ratings	53
30	Trend line for Tree Height	53
31	Influence of Trunk Height on Ratings	55
32	Trend line for Trunk Height	55
33	Influence of Trunk Diameter on Ratings	56
34	Trend line for Trunk Diameter	56
35	Influence of Trunk Verticality on Ratings	57
36	Trend line for Trunk Verticality	57
37	Influence of Canopy Form on Ratings	58
38	Trend line for Canopy Form	58
39	Influence of Canopy Density on Ratings	59
40	Trend line for Canopy Density	59
41	Influence of Tree Health on Ratings	61
42	Trend line for Tree Health	61
43	Influence of Tree Spacing on Ratings	62
44	Trend line for Tree Spacing	62
45	Influence of Number of Trees on Ratings	63
46	Trend line for Number of Trees	63
47	Influence of Type of Eucalypt on Ratings	64
48	Influence of Type of Eucalypt on Ratings (boxplot)	64
49	Influence of Terrain on Ratings	65
50	Trend line of Terrain	65
51	Summary of Factors which Influence Ratings	67
52	Tree characteristics with highest influence on scenic amenity ratings	68
53	High correlations between tree characteristics	70
54	Comparison of model results and original ratings	74
55	Difference between rating and model results	74
56	Percentage difference between rating and model results	74
57	Histogram of differences	75

58	QQ plot of normality of differences	75
59	Examples of negative outlier scenes	75
60	Examples of positive outlier scenes	76
61	Hand held viewing scope	77

ACKNOWLEDGEMENTS

The assistance of the following is acknowledged with appreciation.

Mary Barnes, Statistician, CSIRO Mathematical & Information Sciences
Ian Colquhoun, Native Vegetation Council Secretariat
Tim Croft and Peter Copley, Tree species identification, Native Vegetation Branch
Kylie Lange, Statistician, Flinders University
Craig Whisson, Manager, Native Vegetation Branch
David Whiterod, Planning SA (sub-consultant)

All participants in the Internet survey.

1. INTRODUCTION

In this report the development, implementation and findings of a study to assess the visual amenity of scattered and isolated trees are described.

The Native Vegetation Council sought advice on considering the amenity value of scattered and isolated trees in reaching its decisions on clearance applications.

The report provides the background of the study and then examines the concept of visual amenity and in particular, that provided by trees. The methodology for the project is outlined and its conduct described. The results of the study are then analysed, a predictive model developed, and guidelines for the field assessment of amenity from scattered and isolated trees described.

The report fulfills the requirement of the Native Vegetation Council to report on the results of a Council funded project.

The report has been prepared by Andrew Lothian Dip. Tech. (Town Planning), M.Sc. (Environmental Resources), PhD. Dr Lothian is Principal, Scenic Solutions, an Adelaide-based environmental consultancy.

2. BACKGROUND

Controls over the clearance of broadacre vegetation were introduced in South Australia on 12 May 1983 and have operated under statute since 1985. Since 1991, clearance of broadacre vegetation ceased and in 2002 was banned. However the clearance of scattered and isolated trees is sought to enable agricultural development, particularly pivot irrigation which requires cleared land for the movement of irrigation equipment, and for vineyard development. The rapid growth of vineyards over recent years has seen the loss of considerable numbers of remnant isolated trees, especially red gums in localities in the South East and the Clare Valley. Over the period, 1994/95 and 2001/02, 21,394 ha of scattered trees were approved for clearance (Native Vegetation Council secretariat).

On 28 June, 2003, the Native Vegetation Council invited applications for funding projects and research concerned with the preservation, enhancement and management of native vegetation. Included among the list of research priorities established by the Council was "research into ... amenity value of scattered and isolated trees".

S29(1) of the Native Vegetation Act 1991 requires the Council to have regard to relevant principles of clearance of native vegetation and to not make a decision seriously at variance with those principles. The principles (Schedule 1 of Act) cover eleven matters including:

(g) "it (i.e. the native vegetation) contributes significantly to the amenity of the area in which it is growing or is situated"

The NVC's Information Sheet 3, *Assessing the Value of Scattered Native Trees* defines amenity value as meaning:

"how highly the trees are regarded by the community as part of the local landscape. This can be difficult to judge, but if a tree is large or otherwise distinctive and is at a location readily viewed by the public, it is of amenity value and should not be cleared."

Dr Lothian submitted a proposal to develop a model for the field assessment of the visual amenity provided by scattered and isolated trees that are subject to clearance applications under the Native Vegetation Act. The anticipated budget for the project was \$16,680 covering:

- Photography of trees in Mt Lofty Ranges, Barossa and Clare Valleys, and the South East
- Selection of scenes and presentation to participants to rate the scenes on basis of scenic amenity
- Analysis of data
- Development of guidelines and their field testing
- Report preparation

On 10 October 2003 the Secretariat of the Council advised Dr Lothian of the Council's approval of funding assistance of \$10,000 (GST inclusive) to carry out

the project. Dr Lothian advised the Secretariat by letter (19 October) of his acceptance of the grant. Because the amount provided was 60% of that sought, the project was modified mainly by deletion of the field testing. This change was considered by the Council and the author was notified by the Secretariat of its acceptance of the proposal on 12 February 2004. Completion of the project was required by 1 December 2004.