3. AMENITY VALUE OF TREES

3.1 Concept of Amenity

Amenity is defined by the Shorter Oxford English Dictionary as “the quality of being pleasant or agreeable.” The protection and enhancement of amenity, particularly residential amenity, is a core objective of planning. The Development Act 1993 (S 4(1)) defines amenity thus:

> “’amenity’ of a locality or building means any quality, condition or factor that makes, or contributes to making, the locality or building harmonious, pleasant or enjoyable.”

Although the Native Vegetation Act 1991 does not define amenity, the NVC’s Information Sheet No 3 describes it in the following terms:

> “Amenity value means 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.”

This description combines the characteristics of the tree with the extent to which can be viewed by the public, thus it covers both the tree and its setting. This approach is appropriate to the concept of amenity which combines both the quality and its contribution to making the locality pleasant for people.

The contribution that a tree makes to the landscape quality of a scene however is not dependent on the extent that it is viewed by people. For example, there are many localities which are of outstanding landscape value but are rarely seen. Clearly their degradation and disfigurement should not be permitted merely because few will see them. If this argument applied to biodiversity then very little would be protected. The same principle applies to landscape quality, another environmental attribute. Moreover, the extent to which a particular scene is accessible and is viewed varies over time and should not be the determinant of landscape quality.

Thus while the concept of amenity is taken in this context to refer primarily to the visual amenity provided by trees, this is a narrower concept than landscape quality as it is contingent on the degree to which the scene is visible to people.

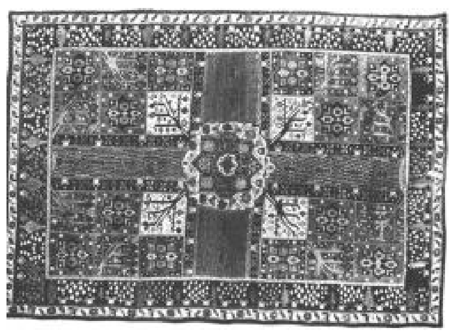
It is assumed that amenity is as valued by the community, i.e. the public, not just the landholder who would be very familiar with their entire property. The accessibility of the site to the community should not be determinant of the extent to which the trees are valued by the community. It should not be judged on the basis of visibility from public roads as people visit an area for many reasons including walking, horse riding, mountain bike riding, off road vehicles, bird watching, shooting, land care, painting and photography etc.

Thus the assessment of the amenity value should assume that the trees can be valued by the community in whatever location they are situated, and not be restricted by considerations of vehicular accessibility.

3.2 Origins and Significance of the Pastoral Landscape

The subject of this project, *scattered and isolated trees*, often comprise landscapes which are termed *pastoral landscapes*. Pastoral scenes have held a special place in human history and were often associated with parks. “The pastoral ideal was a Golden Age of youth and of antique man” (Shepard, 1967). It formed the basis of dramas of Arcadia, and generations of poets and writers referred to the pastoral landscape in philosophy, theology and allegory. It was place in which to discuss, to think, to make music and dance and make love. In Persia, parks of pastoral appearance were described as paradises.

The Persians created extensive walled parks in which they confined animals for hunting. Persian rugs commonly incorporated stylized scenes of trees, rivers and gardens and were patterned on the ground plan of the parks (Figure 1). These rugs brought the garden into the house.



Source: Thacker, 1979
Note: Central water source, four rivers. Plane trees mark intersections. The garden is protected by trees.
Figure 1 Persian Carpet Scene of a Garden

The Greeks and Romans continued the Persians love of parks and established many in their cities and towns. In Greece, the Lyceum was a public park set aside for meditation, walking and discussion and the Academy in Athens was a park adjacent to a gymnasium and philosophers’ school. Many parks were established in Rome and villas were surrounded by extensive gardens modeled on parks. Emperor Hadrian’s Villa d’ Este at Tivoli was a vast palace with extensive parks and gardens which linked directly with the surrounding agricultural land without any dividing wall to separate the “ideal” landscape within from the functional landscape without.

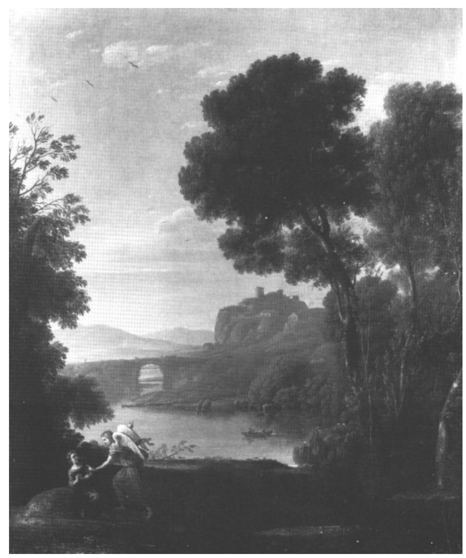
During the Middle Ages, Christian monasteries often established pleasure gardens that simulate the Garden of Eden. By the 12th century the pastoral ideal was rediscovered and informed a new sensitivity towards nature:

> "…(the) pastoral fancy still tended to bring the loving soul in touch with nature and its beauties… Out of the simple words of exultation at the joy caused by sunshine and shade, birds and flowers, the loving descriptions of scenery and rural life gradually develops." (Huizinga, quoted by Shepard, 1967)

By the 15th century, rich Lords established hunting parks which appeared relatively natural with well spaced trees providing glades and vistas with grass grazed by deer or rabbits to meet the needs of the hunt.

Idealised pastoral landscapes were created by the 17th and 18th century painters Claude Lorraine, Salvatore Rosa and Nicolas Poussin, each of whom bathed in a golden haze their scenes of trees, lakes and classical images (Figure 2). Such paintings had a major influence in Europe and England in shaping the aesthetic ideal, in particular the development of the picturesque.

Painting by Nicolas Poussin, Summer



Painting by Claude Lorraine, Hagar and the Angel

Figure 2 Paintings by Nicholas Poussin and Claude Lorraine

Their paintings subsequently provided the template for the landscape gardeners of the 18th and 19th centuries including Capability Brown and Humphrey Repton. They sought to capture the peace, tranquility and idyllic feeling associated with the classic pastoral scene with large scattered trees, extensive grasslands or lawn, with contented stock and people enjoying the ambience of the scene.

Contemporary public parks and gardens and even home gardens often reflect the pastoral symbols of trees and grass. Balling and Falk (1982) ask:

> "Are many of the parks and backyards people have so assiduously created wherever they have lived in part an expression of an innate predisposition for the savanna?"

The savanna, comprising scattered trees on extensive grasslands, is a more contemporary term for the pastoral landscape.

3.3 Theories about the Preference for Pastoral Landscapes

Why has the pastoral landscape persisted in such strength through human history? Theories of landscape quality which seek explanations of why humans like what they like generally derive from an evolutionary perspective and contend that preferred landscapes are survival enhancing – in other words, humans like what enhances their ability to survive as a species in the environment.

One such theory is the habitat theory of G.H. Orians, an evolutionary biologist, building on the accepted idea that humans evolved in the East African savanna. Such habitats are dominated by grasslands and scattered trees with water in close proximity, and so this became the preferred visual landscape for humans. These more open landscapes provide the best shelter, hunting and disease-free environments (Williams & Cary, 2002). According to Orians (1986), the:

> "savannas of tropical Africa have high resource-providing potential for a large, terrestrial, omnivorous primate … In savannas … trees are scattered and much of the productivity is found within two metres of the ground where it is directly accessible to people and grazing and browsing animals. Biomass and production of meat is much higher in savannas than in forests".

Based on this, Orians suggested that:

> "savanna-type environments with scattered trees and copses in a matrix of grassland should be highly preferred environments for people and should evoke strong positive emotions."

and

> "tree shapes characteristic with environments providing the highest quality resources for evolving humans should be more pleasing than shapes characterizing poor habitats" (Heerwagen & Orians, 1993)

The specific tree shape of the savanna is characterized as having "canopies more broad than tall, trunks that terminate and branch well below half the height of the tree, and a layered branching system." (Summit & Sommer, 1999).

G.H. & E.N. Orians photographed African savanna trees, in particular the *Acacia tortulis* and selected trees varying in height/width ratio, height of branches, and extent of canopy layers. Photographs were selected to test four hypotheses:

- trees with lower trunks should be more attractive than trees with high trunks

- trees with moderate canopy density should be more attractive than trees with low or high canopy density
- trees with a high degree of canopy layering should be more attractive than trees with low or moderate degrees of layering
- the broader the tree canopy relative to its height, the more attractive the tree should be (Heerwagen & Orians, 1993, 158)

Measures were taken of each tree canopy's width and height, tree height and trunk height. These were converted into ratios of canopy width/height, canopy width/ tree height, and trunk height/tree height. Respondents rated attractiveness of photographs (in black and white) of the trees on a 6 point scale. The study found that trunk height, canopy layering and canopy width/tree height ratio significantly influenced attractiveness scores, however the canopy width/canopy height did not have a significant effect.

The most attractive trees (Table 1) had highly or moderately layered canopies, lower trunks, and higher canopy width/tree height ratio. Factors such as broken branches, deformed trunks, and highly asymmetrical canopies, indicators of resource depletion, depressed attractiveness scores.

Table 1 Comparison of Most & Least Attractive Trees

	7 most attractive	7 least attractive	*t*	*p*
Mean attractiveness score	3.91	2.9	12.58	.000
Trunk height/ tree height ratio	0.17	0.33	8.24	.000
Canopy width/tree height ratio	1.93	1.53	5.89	.000
Canopy width/ canopy height ratio	3.63	3.56	0.20	.83

Source: Heerwagen & Orians, 1993. 6 point scale

Interpreting their results, the authors noted that "a low trunk is easier to climb than a high one; a broad umbrella-like canopy affords greater refuge from sun or rain than a narrow, high canopy." (Heerwagen & Orians, 1993).

Orians and Heerwagen also compared the forms of African savanna trees with maple and oak trees found in Japanese parks and gardens. Comparing three morphological differences - height vs canopy width, trunk height vs total height, and canopy depth vs canopy width - they found close similarities:

> "Garden conifers are highly modified by pruning them to grow broader than tall; trunks are trained to branch close to the ground; foliage is trimmed to produce a distinct layering similar to that of a number of savanna species." (Heerwagen & Orians, 1993).

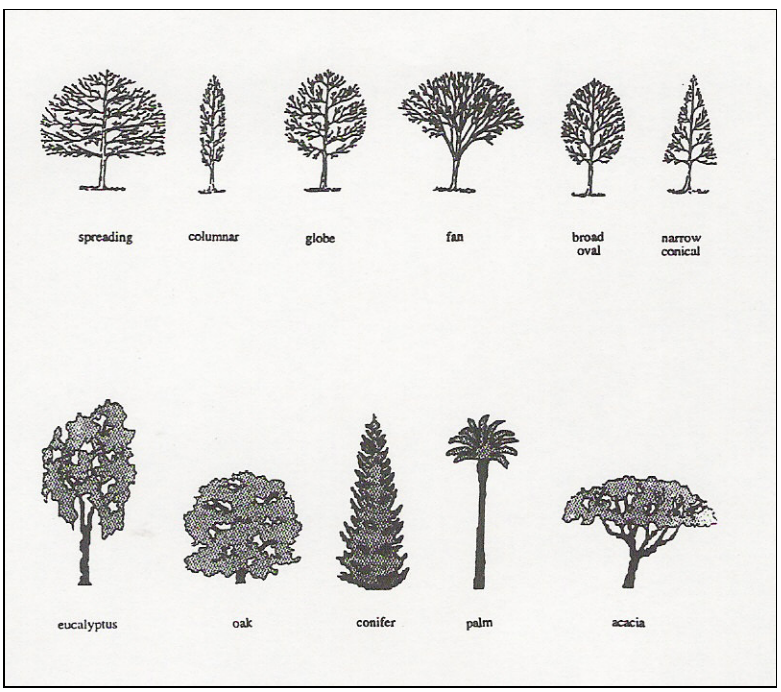
While suggesting that achieving a growth form similar to that of savanna trees was a criterion subconsciously employed by Japanese gardeners, Orians recognised that many other factors also have had an influence (Orians, 1986).

According to Sommer and Summit, research on tree preferences in Argentina, Australia and United States found:

> "respondents preferred canopies to be moderately dense and trunks that bifurcated near the ground. Trees with high trunks and skimpy or very dense canopies were considered to be least attractive by all these groups, findings considered to be consistent with the savannah hypothesis" (Sommer & Summit, 1995).

Sommer and Summit used computer drawn images of tree shapes to test preferences with variations in height and width. They found preferences for large canopies (χ^2 = 195.7, p<0.001), low trunk height and thin trunk thickness (both p < 0.001), the first two properties being consistent with savanna hypothesis and the third (trunk thickness) irrelevant.

Later, Summit and Sommer carried out further experiments on preferred tree shapes using drawings of their forms. They did this to isolate the trees from their context which can influence preferences. They examined six tree exemplars based on generic tree forms (Figure 3). They varied the heights and width ranges for each tree and also the canopy density. They also included simplified diagrams of a city, suburbs, rural and wild context as background. Various combinations of each were assessed.



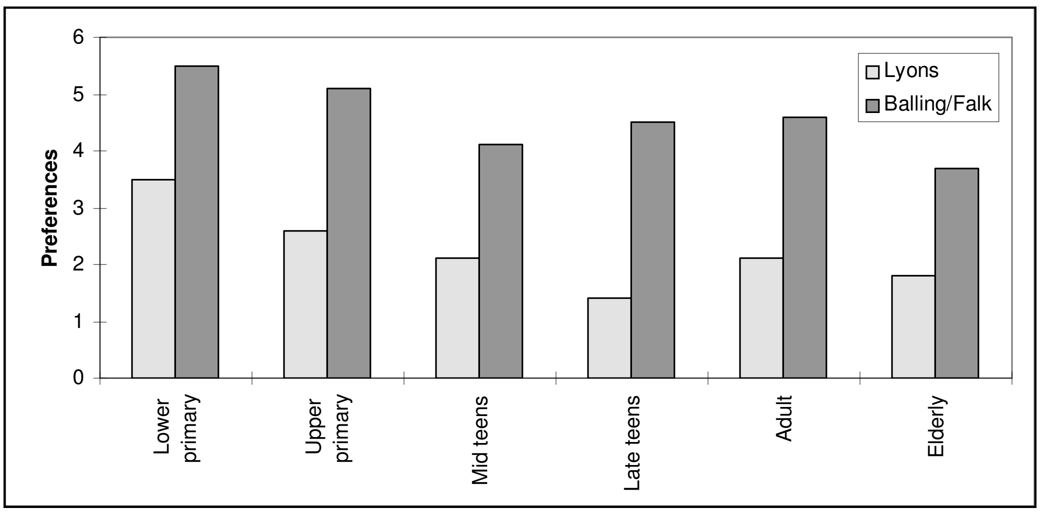
Source: Summit & Sommer, 1999.

Figure 3 Generic Tree Forms (top row) and Species Exemplars (bottom rows)

Overall, participants preferred the acacia over other trees followed by the oak, palm and eucalypt. The low preference for eucalypts may reflect a lack of familiarity with its random form compared with the symmetry of the other species. Generally, shorter trees were preferred over taller trees and wide canopies over narrow canopies. As trees became taller, participants tended to prefer wider canopies. Canopy density had little effect on preferences. All species were preferred in a wild setting, however preferences for the acacia were high across all context settings.

Both Balling and Falk (1982) and Lyons (1983) assessed the preferences for a range of environments illustrating savanna, deciduous forest, coniferous forest, tropical rain forest and desert. Both found savanna to be the most preferred of the five biomes. They found that preference for savanna was highest among the 8 - 11 year olds after which it slipped behind deciduous and rain forest and, in Lyons' study, behind rain forest. Balling & Falk found that overall preference for natural environments changed as a function of age.

Figure 4 indicates the shift in preferences for savanna with age. While the scores differed between the studies, the pattern was similar: high scores among the young that fell progressively with age, stabilising in adulthood.



Source: Balling & Falk, 1982; Lyons, 1983.
Note: Lyons study results significant at $p < 0.05$; Balling & Falk at < 0.001

Figure 4 Comparison of Preferences for Savanna by Age

Both found the preference for savanna was strongest when a lush green savanna was used in preference to a drier African-like savanna. The difference was so striking that Lyons dropped the lush green savanna. The use of the greener savanna in the Balling and Falk study probably accounted for the higher ratings.

While Balling and Falk believed the results provide "limited support for the hypothesis that people have some innate preference for savanna-like environments", Lyons disputed this on the basis that the preference for savanna could be related to its familiarity for children who play in savanna-like parks and backyards.

Woodcock (1982) examined preferences for three biomes: rain forest, savanna and mixed hardwoods and found the hardwood to be the most preferred (rainforest 2.83, savanna, 3.06, dense hardwood with underbrush, 3.04, open hardwood with open ground, 3.7) (5 point scale)). It was also possible that this may have been due to familiarity as suggested by the Kaplans (1989).

Schroeder (1991) studying preferences for scenes in an arboretum in Chicago found natural deciduous wood scenes, large trees, and water attracted the highest ratings but scenes of trees and lawn - the classic pastoral landscape, were less preferred.
Other researchers have also identified preferences for savanna landscape with survivability. Such environments enable a person to see predators and prey without being seen (Appleton, 1975) and to find one's way easily through the landscape (Kaplan, 1991).

The contribution that trees make to landscape quality is examined in the following section.

3.4 Contribution to Visual Amenity by Trees

Trees are among the most familiar elements in landscapes and generally their contribution to scenic quality is positive. There have been a large number of studies in which the contribution of trees to landscape or scenic quality have been assessed. Because many of the surveys were conducted by foresters in the United States, the majority focused on how forest management can affect scenic quality. These are summarized below.

- Anderson (1978) aimed to develop a reliable approach for assessing visual forest resources and found foresters more amenable to scenes of clear cutting, poorly stocked areas and new growth of cutover stands than were residents or students.

- Arthur (1977) related landscape quality with various forest management treatments and found that large trees, high contrasts and heavy canopies enhanced scenic quality while the amount of slash (ie piles of unmarketable wood) affected it adversely.

- Brown (1987) combined assessments of scenic beauty of pine plantations with management costs to identify efficient combinations for producing scenic beauty and the tradeoffs with timber, forage & water benefits.

- Buhyoff with colleagues undertook a series of studies of the influence of southern pine beetle on the scenic preferences of forest landscapes in the US. These showed that preferences varied inversely with the proportion of visible forest damaged by beetles (Buhyoff & Leuschner, 1978), and that knowledge about beetle damage adversely affected preference ratings (Buhyoff, Leuschner & Wellman, 1979; Buhyoff & Riesenman, 1979). A model was derived for pines over 9 years old which found that stand age, the diameter of trees and the stocking density of trees were all positively related to scenic quality (Buhyoff, *et al*, 1986) The study also found that scenic quality was optimal for trees of around 1100 - 1200/acre after which scenic quality decreased and also that thin stemmed trees were regarded negatively.

- Cook (1972) evaluated walker's preferences for hardwood forest trees and the extent by which these accorded with timber quality and found generally a good correlation. Favoured characteristics included balanced form, straight trunk and thick crown, however crooked trunks, leaning trees and even lopsidedness were also favoured.

- Daniel & Boster (1976) developed their Scenic Beauty Estimation method in the ponderosa forests of Arizona. Daniel & Schroeder (1979) applied it to derive a model of scenic quality in a forest landscape, while Daniel, *et al* (1978) used the SBE method to map the spatial scenic beauty of forest landscapes.

- Following early efforts to assess temporal change in the scenic beauty of forests by Hull, Buhyoff & Cordell (1983), Hull & Buhyoff (1986) developed their Scenic Beauty Temporal Distribution method, based on the SBE method, to assess the effects of forest management over time. By including the stand age in their regression equation for scenic beauty, as well as tree density and size, they were able to predict the changes to scenic beauty with time. Decreasing stand density, less productive sites, and increasing stand age increased scenic beauty.

- Schroeder & Daniel (1981) extended Arthur's (1977) study to develop a valid and useful model for predicting scenic beauty of forest landscapes through including a range of forest mensurations of overstorey, understorey, ground cover and downed wood. The relationship between SBE values and physical forest features provided the basis for the scenic beauty prediction model. The model, derived in Arizona, was applied to another forest in Colorado and performed reasonably well.

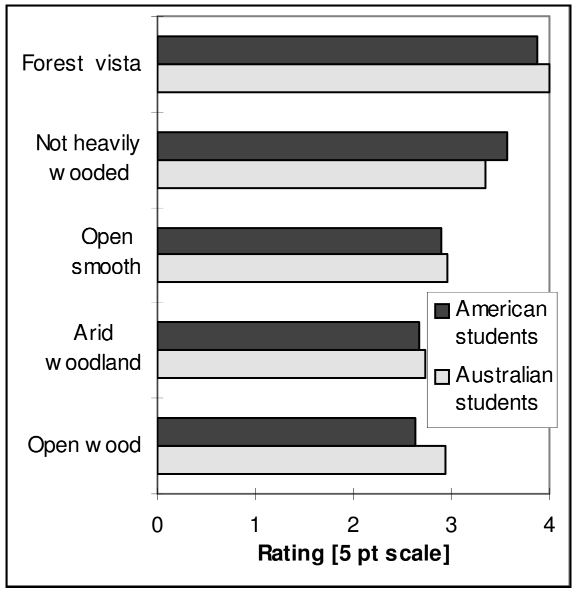
- Schroeder & Brown (1983) tested a range of mathematical forms of scenic beauty regression models and found the nonlinear forms (i.e. log & square root) performed only slightly better than the linear forms.

- Vining, *et al*, (1985) evaluated landowner perceptions of hardwood forest management. They found that the amount of dead and downed wood had a strong negative influence on preferences. Clear cut areas and heavily thinned areas were the lowest in scenic preferences while the lightly thinned stands were comparable with the natural stands.

Other studies not involving forests regarding the contribution of trees to scenic quality included the following.

Abello, *et al* (1986) found from their analysis a preference for images which exhibit "simultaneously greater fertility, some pattern or rhythm, and a certain structural legibility" (ibid, 168). The authors believed the findings supported a socio-ecological interpretation of landscape aesthetics as the dominant characteristics have survival promoting meaning.

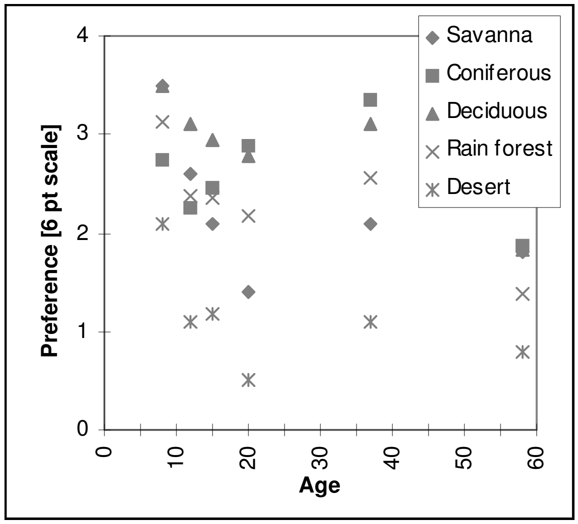
Kaplan, R. and Herbert (1987) assessed the preferences of students in Western Australia and Michigan for WA jarrah forests. Figure 5 summarises the findings for these students (5 point scale) and indicates a close agreement.



Source: Kaplan, R. & Herbert, 1987

Figure 5 Preferences for Australians & Americans for Jarrah Forests

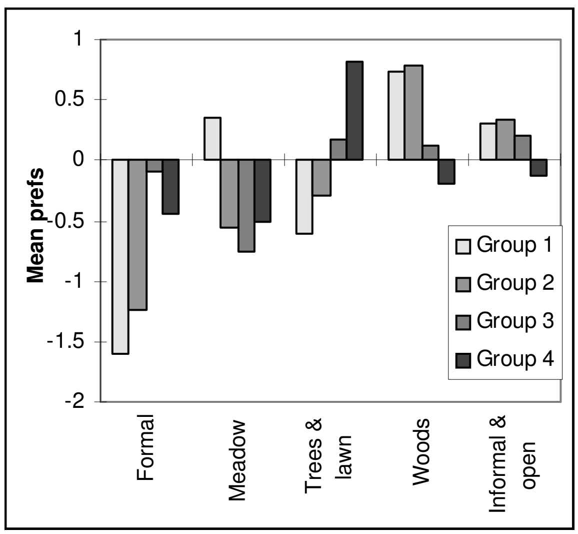
Lyons (1983) examined how preferences for five biomes changes with age and found that among adults, the most preferred were coniferous forest closely followed by deciduous forest (Figure 6). Preferences for rain forest were next and the savanna and desert attracted the lowest preferences. The high ranking attributed to conifers is understandable in the northern hemisphere where they are ubiquitous but would be unlikely in Australia and New Zealand where conifers are generally regarded as inferior to native hardwood forests (Brown, S., 1985; Kaplan R. & Herbert, 1987).



Source: Lyons, 1983

Figure 6 Preferences for Biomes by Age

Schroeder (1991) assessed the preferences of people familiar with the Morton Arboretum near Chicago and, using cluster analysis, identified four groups or clusters of raters (Figure 7). Overall there was a strong preference for natural scenes but a distinctive sector of the community who preferred the more formal scenes.



Source: Schroeder, 1991

Figure 7 Preferences of Groups for Arboretum Scenes

Shafer, *et al* (1969) developed their model for predicting scenic preferences based on 100 photographs of landscapes taken throughout the United States. All were photographed when the trees were in foliage. The regression equation derived (Table 2) included three out of the six factors relating to the vegetation:

- perimeter of immediate vegetation
- perimeter of distant vegetation
- area of intermediate vegetation

Table 2 Shafer's Predictive Model of Landscape Preferences

$$Y = 184.8 - 0.54x_1 - 0.09x_2 + 0.02(x_1 . x_3) + 0.00055 (x_1 . x_4) - 0.0026(x_3 . X_5) + 0.0016(x_2 . x_6) - 0.008(x_4 . x_6) - 0.0004(x_4 . x_5) + 0.00067x_1^2 + 0.00013x_5^2$$

Where x_1 = perimeter of near vegetation
x_2 = perimeter of middle distant vegetation
x_3 = perimeter of distant vegetation
x_4 = area of near vegetation
x_5 = area of any kind of water
x_6 = area of distant non-vegetation

Note: Negative items contribute positively, while positive items contribute negatively; i.e. the lower the score the higher the landscape quality.

Shafer found that factors having a positive influence on the landscape's aesthetic appeal were the:

- perimeters of near and middle distant vegetation
- perimeter of distant vegetation multiplied by the area of water
- area of middle distance vegetation multiplied by the area of distant nonvegetation
- area of middle distant vegetation multiplied by the area of water.

The findings have been criticized by some as being non-sensical.

In an early study of public preferences, Yarrow (1966) assessed the British public's attitudes about afforestation practices of the Forestry Commission. Interestingly he found "large majorities" in favour of afforestation of areas such as Snowdonia and the Lake District, findings which would probably be very different today. While conifers were supported for upland areas, deciduous trees were preferred for the agricultural areas. Mixtures of conifers and deciduous trees, deciduous trees of mixed heights and conifers of even height were favoured. Hard edges of woods were not favoured, and most preferred borders of deciduous and/or mixed trees rather than a continuous border of trees.

Table 3 summarises the key positive and negative aspects of vegetation as derived from the studies reviewed in this section.

The results suggest preferences for substantial trees with height, thickness of trunk, and breadth of canopy, trees that have a significant impact on the landscape. On the one hand, trees are preferred with order, balance, symmetry and a tidiness about them while on the other, possessing diversity and interest provided by mixed species, crooked trunks and age. Similarly the range of species preferred - native, deciduous, and in the US, conifers - suggest that any trees are preferred to none. Disliked are trees that lack boldness - scrawny, small, thin trees or those which have been changed artificially from a natural form by pruning.

Table 3 Summary of Positive and Negative Aspects of Trees

Positive Aspects	Negative Aspects
large trees	dead trees
large, heavy canopies	thin stemmed trees
thick trunks	small trees
straight trunks - but also crooked trunks	conifers (Australia)
balanced form	pruned shrubs
older trees	
mixture of trees	
trees along rivers	
foreground vegetation	
native trees	
deciduous trees	

3.5 Trees in the South Australian Landscape

The influence of vegetation on the quality of the South Australia landscape was examined in the author's PhD dissertation (Lothian, 2000). The findings are based on ratings by over 300 participants of 160 scenes of the South Australian landscape; the ratings were on a scale of 1 (low) to 10 (high).

The influence of vegetation was examined under the following attributes:

- presence of trees in various environments
- height of vegetation
- density of vegetation
- types of vegetation
- introduced versus indigenous vegetation

In summary, the presence of trees in a scene enhanced landscape ratings by up to 23.5% over four classes of tree significance. The presence of trees in scenes of crops and pastures increased ratings by up to 13%. Trees in scenes in the Mt Lofty Ranges increased ratings by up to 17%. Trees in scenes with vineyards increased ratings by 7%.

The height and density of vegetation present in scenes enhanced ratings, height moreso than density. Ratings increased by up to 30% depending on the vegetation height and up to 23% depending on the vegetation density (Figure 8).

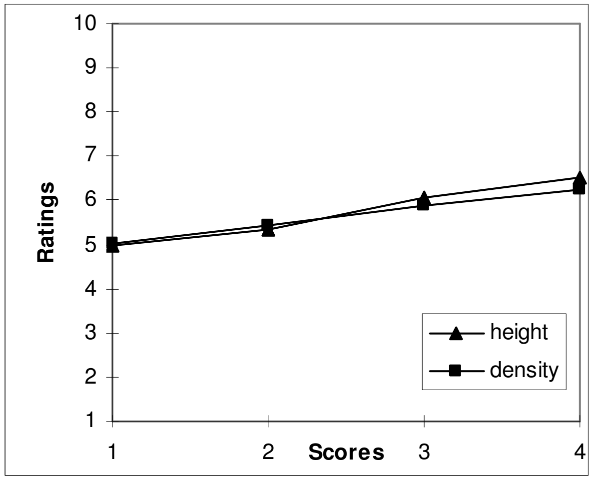


Figure 8 Relationship of Scenic Ratings with Tree Height and Density

Indigenous vegetation was preferred over introduced vegetation, the difference being 15.5% (Table 4).

Table 4 Rating of Indigenous and Introduced Vegetation

	Mean	Standard Deviation
Indigenous vegetation	6.11	0.95
Introduced vegetation	5.29	1.25

Pastoral scenes of large scattered trees with grass were middle rating, thus not providing strong support for the landscape theorists of savanna type landscapes. However the asymmetrical shape of Australian eucalypts may be an important detraction to their savanna quality compared with the support found using African acacia (Orians, 1986)

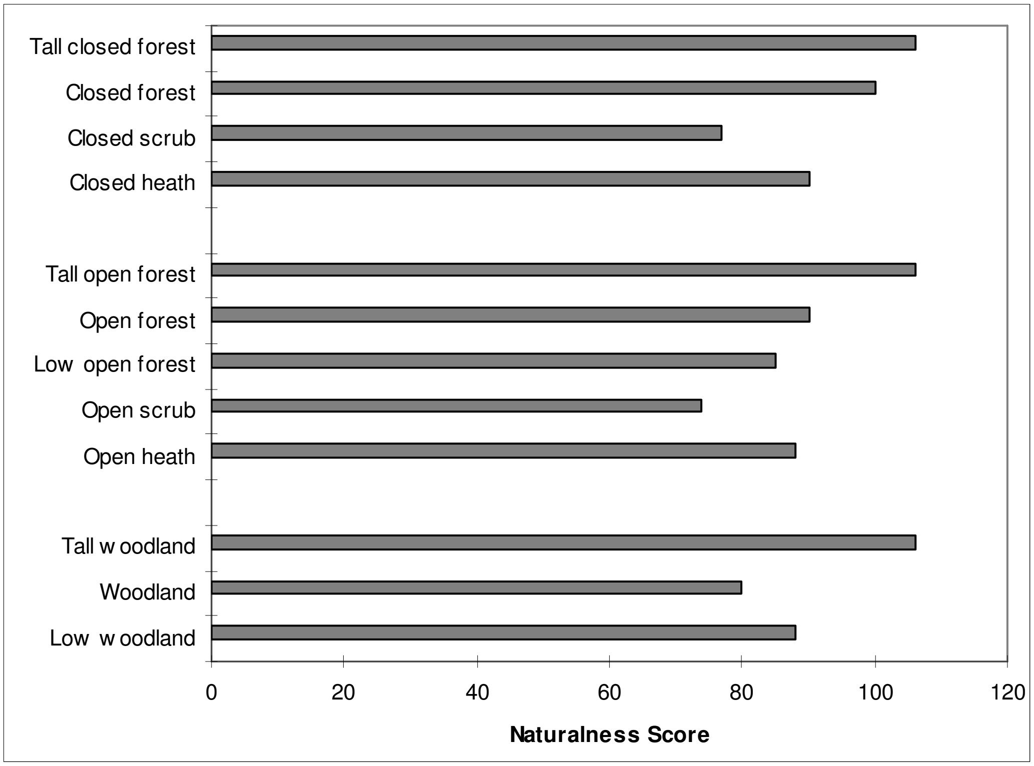
The type of vegetation appears however to have some influence on preferences, e.g. the discrimination of introduced pines, which indicates that the type of vegetation is important and that respondents do not treat all vegetation equally, nor judge them simply in terms of say height or density.

Scenes with isolated trees with grass ground cover, the classic savannah woodland scene, scored an average of 5.38.

3.6 Ecological quality versus landscape quality

The relationship between ecological quality and landscape quality has been examined by several researchers.

Lamb & Purcell (1990) found that ecological naturalness and perceived naturalness are related but are not equivalent. They examined the perception of naturalness associated with differing vegetation formations in New South Wales. Perception of naturalness increased with the height of vegetation and density of foliage cover (Figure 9). Vegetation with dominant trees of 10 - 30 m in height was judged more natural with dense foliage than medium cover. The interaction of height and density was important, not their separate contribution.



Source: Lamb & Purcell, 1990. Note: 3 groups were labelled Sparse (10 - 30%), Mid-dense (30 - 70%), and Dense (70 - 100%). Tall forest/woodland > 30 m.

Figure 9 Naturalness vs Foliage Cover & Height

The reasons for structural change included grazing, fire, weeds and dereliction due to failed agriculture. Fire was not regarded negatively which indicates the influence of familiarity with Australian biomes where fire is considered to be part of the ecosystem. Grazing and dereliction produced the greatest negative effects on naturalness. The resultant landscapes were “relatively open, park-like, and ordered yet the perceived naturalness is low” (ibid, 350). Based on this the authors suggested that preference and naturalness were not always equivalent.

Other researchers have found that environments managed for ecological quality tend to be less attractive than those managed for aesthetic outcomes (Thayer *et al*, 1976).

In a recent Australian study, Williams and Cary (2002) examined the preferences for a range of native vegetated landscapes and related this to their ecological quality and with landholders’ actions to protect biodiversity. The study examined the preferences of landholders and urban residents for a variety of native vegetation forms found in central Tasmania, western Victoria and the upper South East of South Australia.

Participants rated black and white photographs[1] on a 5-point scale (1 = like very much, 5 = do not like at all). Ecologists and botanists rated the ecological quality or integrity of the vegetation contained in the 36 photographs, again on a 5-point scale. Cues indicative of ecological quality included presence of understorey plants, leaf and wood litter and a range of age classes of trees. The study found that urban respondents preferred the two vegetation types with lowest ecological quality – pleasant park-like environments which had been grazed. In contrast, rural respondents preferred grazed woodland and dense woodland, the first being ecologically poor, the latter ecologically superior. Respondents rated black & white photographs of native vegetation characteristic of the three study areas (Table 5).

Table 5 Australian Vegetation Preferences

Vegetation	Verbal descriptives	Rural preferences	Urban preferences
Dense euc. woodland	Natural undergrowth vegetation	3.30	3.26
Open grazed woodland	Open grazed cleared	3.25	3.28
Buloke woodland	Fire dense natural	2.84	2.80
Grassy woodland	Grass native open	3.36	3.34
Sheoke woodland	Rocks, rocky dead, dry	2.96	2.84

Source: Williams *et al*, 1998

Overall the study found higher preference for the eucalypt dominated woodlands than for the buloke and sheoke vegetation. Respondents also tended to prefer more open woodland with a smooth or lightly textured understorey. Rural respondents had a higher preference for the sheoke vegetation than did urban respondents. Urban respondents had a higher preference for open heavily grazed vegetation than rural participants.

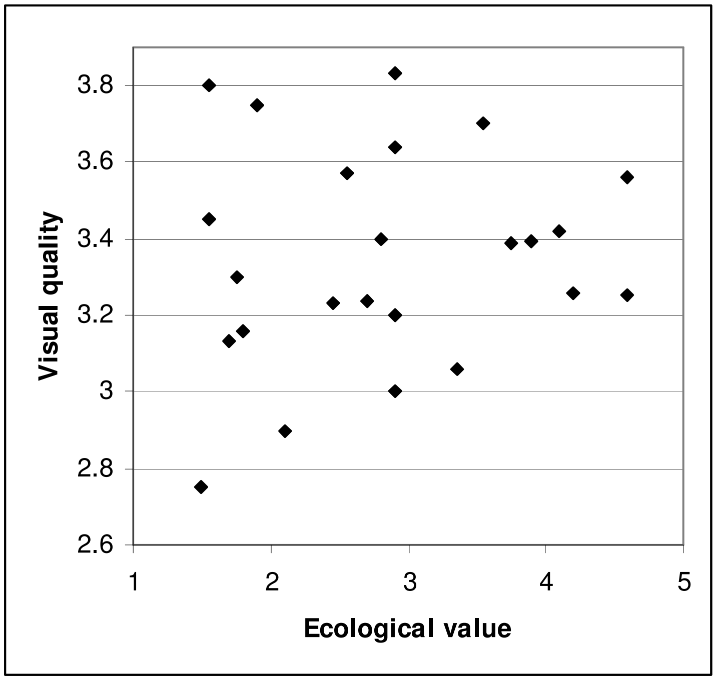
When the landscape preferences were plotted against ecological quality, no relationship was apparent[2] (Figure 10).

The authors concluded that there was no evidence that ecological quality is a negative predictor of human landscape preferences, in contrast to the findings of Gobster (1995) and others.

Recently Keith Davis (2002) carried out a study of vegetation in Adelaide parks to assess their ecological and landscape quality. While not finding any significant relationship between visual quality and ecological integrity, he did find a significant correlation between visual quality and vegetation structure.

[1]. Most studies use colour photographs as being more representative of the landscape. Black and white photographs emphasize their formalist qualities (line, texture etc). As this survey was posted to over 1000 addresses, the use of black and white photographs may have been a cost measure.

[2]. A relationship can be detected: landscape quality increases slightly with ecological quality. However the relationship is slight: $y = 0.04x + 3.2$, and the correlation coefficient is very small: $r^2 = 0.02$.



Source: Williams and Cary, 2002.

Figure 10 Preferences and Ecological Quality of Eucalyptus Woodlands

Using 21 sites covering forest, woodland and shrubland vegetation structures, Davis classified their condition as a surrogate of their ecological integrity and had over 100 participants rate two photographs of each location for visual quality. He found a 0.01 correlation between ecological integrity and visual quality, a lack of relationship reinforced by the ANOVA (F = 0.084, df 2, 29, p = 0.92). The mean visual preference scores for the three types of vegetation structure were:

- Forest (6 scenes) 5.93 (1 – 10 scale, low – high)
- Woodland (9 scenes) 5.88
- Shrubland (6 scenes) 4.68

Davis concluded that these figures indicate a "general preference for treed structures over low vegetation types" (p 131).

In summary these studies of the relationship between ecological quality and landscape quality found:

- Ecological quality and perceived naturalness were related but not equivalent (Lamb & Purcell, 1990)
- Environments managed for ecological quality tend to be less attractive than those managed for aesthetic outcomes (Thayer *et al*, 1976)
- A weak positive relationship between visual quality and ecological value (Williams and Carey)
- No relationship between ecological quality and visual quality (Davis, 2003)

This small number of studies indicates that if there is any relationship between visual quality and ecological quality, it is very slight, if it exists at all. The relationship between ecological quality and landscape quality will be examined in the present study as reflected by surrogates such as canopy form and tree health.