2.   STUDY OF AESTHETICS AND COASTAL LANDSCAPES

2.1   STUDIES OF COASTAL SCENIC QUALITY

Research was undertaken to identify any previous studies of coastal scenic quality, either in Australia or overseas. None were found which employed the community preferences method used here but a number of studies were identified using traditional landscape architecture approaches. These are summarised below.

2.2   AUSTRALIAN STUDIES

(1)   South Australia

An early exercise in coastal landscape assessment was by Petrus Heyligers of the CSIRO Land Use Research Division (1981). He examined the views from the roads around Lake Eliza in the south east of South Australia. The lake is situated within a kilometer or two of the coast and one of the perimeter roads passes through coastal dunes. Heyligers examined the extent that views were screened by vegetation, were confined, restricted or wide, and whether they included the lake. He then assessed the degree of contrast between adjoining views on a scale from no/slight contrast to major contrast. An example of the later is screened view followed by a wide view with a large body of water. Finally he linked the frequency of contrasts with the diversity of views.

As part of the studies of Coastal Protection Districts, officers of the Coast Protection Branch included consideration of the region's coastal landscape. Tony Wynne included a two class landscape assessment in his assessment of the Yorke Peninsula district (Figure 2.1). He based this on:

- Topographic variation
- The degree of impairment by buildings and other works
- The range and complexity of vistas in a particular area
- A degree of subjective judgement

Class A landscape included the toe and part of the sole of the Peninsula and class B much of the remainder although there were sections which were neither. Wynne described these as "mostly lowlying and swampy, or contain small dunes" and these have little visual appeal.
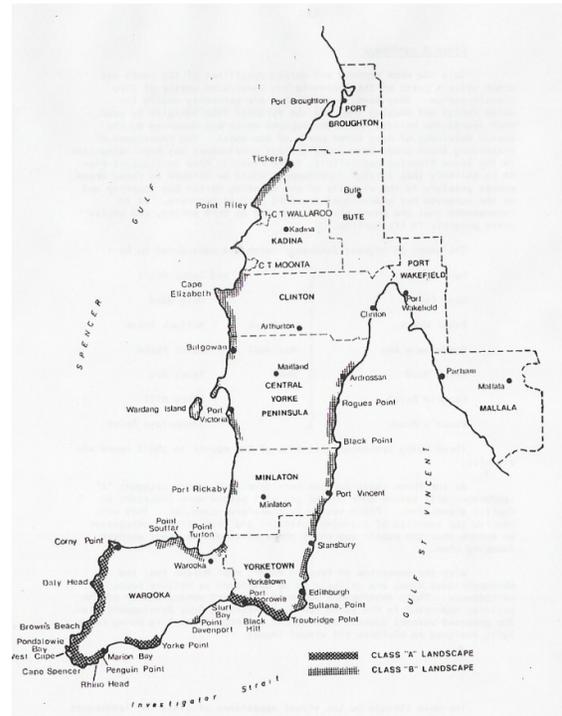
Source: Wynne, A.A., 1980. *Yorke Coast Protection District Study Report.* Coast Protection Division, Dept for the Environment.
Figure 2.1 Landscape Assessment of Yorke Peninsula

In 1987, Geoff Edwards carried out an assessment of the coastal landscape of Kangaroo Island as part of a study report of the Coast Protection District. Edwards built on a previous study by Social and Ecological Assessment P/L in 1984 which involved the rating of a given set of criteria for 45 coastal and inland locations on the Island. The 1984 report rated landscape values on a high, medium low scale for the following attributes:

- Panoramic/distant view
- Middleground views
- Restricted views
- Contrasting elements
- Diversity/richness
- Relief/scale
- Unity
- Naturalness
- Vegetation values
- Fauna values
- Structures
- Ephemeral effects
- Rarity

The ratings were added (high = 3, moderate = 2, low = 1) and overall scores derived. Aggregate scores of 0 – 16 were rated low, 17

– 25 were moderate, and 26 – 39 were high. Edwards commented: "generally the inland areas and low energy coastal areas scored a low value whereas a variety of coastal landscapes were accorded a high value".

Edwards examined the model by Brown, Itami and King (1979) based on earlier work by Stephen Kaplan (1979) which indicated the "essential landscape components corresponding to the key human responses" (Table 2.1). This is derived from research of human landscape preferences.

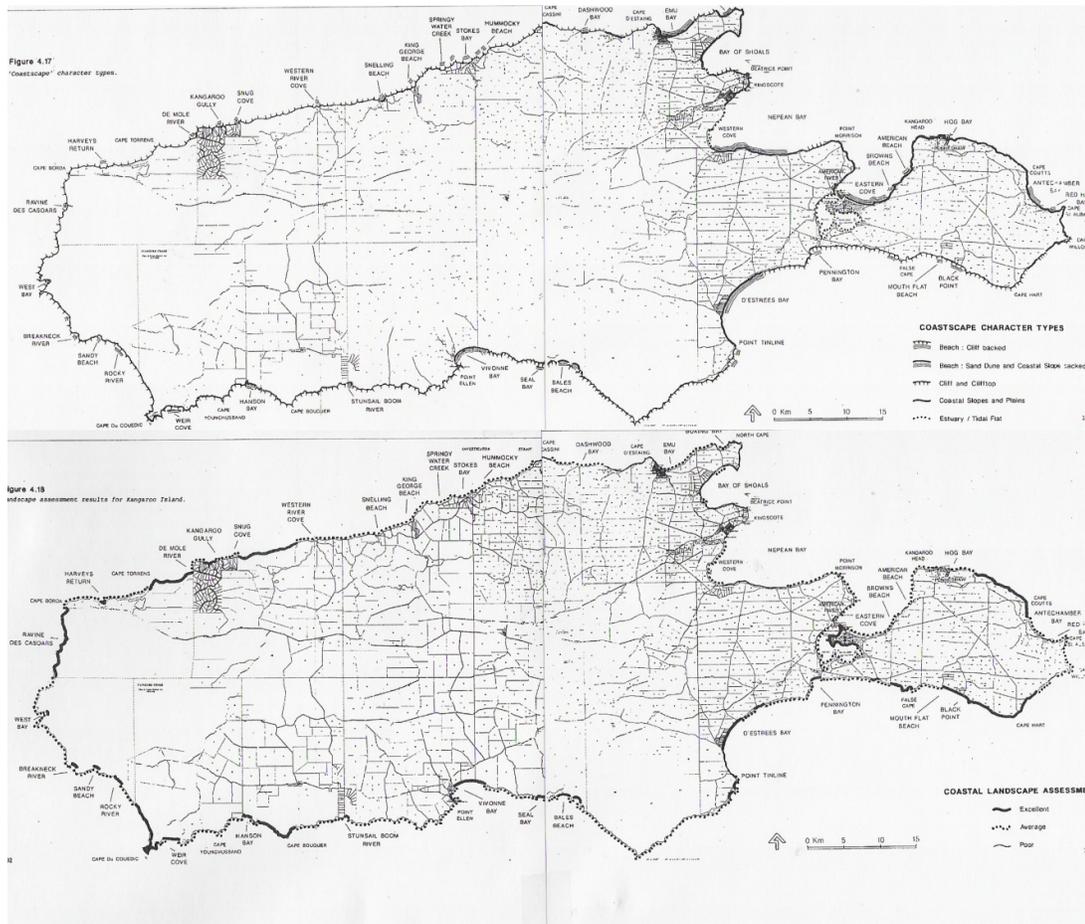Edwards identified and mapped five "coastscape" character types for Kangaroo Island (Figure2.2):

- Beaches backed by cliffs
- Beaches backed by coastal slopes and sand dunes
- Cliffs and clifftop areas
- Coastal slopes and plains
- Estuary and tidal flat areas

Table 2.1 Model relating scenic resource values to landscape preference components

	Making sense	Involvement
Land form	Slope	Spatial diversity
	Relative relief	Relief contrast
Land cover	Naturalism	Height contrast
	Compatibility	Internal variety

Source: Edwards, G., 1987. *Kangaroo Island Coast Protection District Study Report*, Coastal Management Branch, Dept for Environment & Heritage, p 107-8.
Figure 2.2 Kangaroo Island Coastscape Character Types (upper) and Coastal Landscape Assessment (lower)

Edwards assessed landscape quality on the basis of land form and land cover using the following components:

Land form
Relative relief – the change in elevation within the landform unit; the higher the relief the higher the landscape value. Thus height of 0 – 50 m above sea level scored 1, 51 – 100 m scored 2 and 101 + m scored 3.
Slope – the steepness of the landform with landscape quality increasing with slope.
Relief contrast – the differences in relief (undulation) between adjacent (landward) landform units; the greater the contrast the higher the landscape value. Flat land scored 1, moderate undulation 2, hilly undulation 3.
Spatial diversity – the variety or complexity of spaces created by the landform; the greater the diversity the higher the landscape value. This appeared to measure the horizontal undulation of the shoreline – the degree of indentation may be equivalent.

Land cover
Compatibility - the visual congruence, unity, harmony and balance of the landward land cover; the greater the compatibility the higher the landscape value. Land which had not been cleared, or comprised pasture scored 3.
Naturalism is the degree by which the land cover is affected by man; minimal impact, the higher the landscape value.
Height contrast – the difference in average height of adjacent vegetation; the greater the height contrast, the higher the landscape value. A pasture/sparse tree cover scored 3, ground cover/pasture 1.
Internal variety – the variability in the visual pattern and tone within land covers; the greater the variation the higher the landscape value. This was based primarily on the number of major colours present; up to 2 colours scored 1, 3 – 5 colours 2, 5+ colours 3.

The scoring of each of these was added and a weighting applied to each factor, it being recognized by Brown *et al* that the components were not considered of equal value. Higher weightings were accorded relative relief, slope, compatibility and naturalism. Edwards produced a map of the scores derived for Kangaroo Island (Figure2.2). This indicated only three categories, Excellent, Average, and Poor.

Using community rating of landscape photographs with over 300 participants, Lothian (2000) carried out a landscape quality assessment of South Australia including the coast.

This was at a broad state-wide level. Using a 1 (low) – 10 (high) rating scale, he found the '6' and '7' ratings together accounted for 89.2% of the total length of coastline. In contrast to the rest of the State, where the '7' rating covered only 0.5% of the State's area, on the coast it extended nearly 30%. The coast is thus one of South Australia's key regions in terms of landscape quality.

Table 2.2 Lengths of Landscape Quality Ratings Coast

Ratings	Length [Km]	%
3	72	1.94
4	18	0.50
5	17	0.45
6	2213	59.82
7	1088	29.41
8	292	7.88
Total	3700	100.00

Source: Lothian, 2000

Table 2.3 Lengths of Coastal Ratings by Region (km)

	Rating Scale								Total
	1	2	3	4	5	6	7	8	
West coast Nullarbor						155	210	225	590
W. Eyre Peninsula			5			255	410	100	770
E. Eyre Peninsula					10	510			520
Upper Spencer Gulf			30		20	140			190
Yorke Peninsula						430	105		535
Pt Wakefield - Sellicks			35			130			165
Fleurieu Peninsula						20	120		140
Coorong						20	160		180
South East						135	100		235
Kangaroo Island						180	210		390
Total			70		30	1975	1315	325	3715

Source: Lothian, 2000

Table 2.2 summarises the length of coastline for the different ratings. Table 2.3 details the ratings of coast by region. It indicates the high rating of the Nullarbor coast with its high cliffs, the west coast of Eyre Peninsula, the lower Yorke Peninsula, Fleurieu Peninsula, parts of Kangaroo Island, the Coorong and parts of the South East coast.

(2)   Queensland

During the 1990s, Alan Chenoweth, a Queensland planning consultant, developed a methodology to assess the scenic resources of parts of the Queensland coast. His Coastal Landscape Assessment (CLA) Methodology was developed for the Coastal Management Branch of the Department of Environment and Heritage. CLA "assessed a range of scenic and cultural landscape values associated with coastal settings, and identified significant landscapes as an input to coastal land use planning". The methodology was applied to four regions: South East Queensland, Wide Bay – Burnett, Mackay – Whitsundays, and the Wet Tropics.

CLA provided a comprehensive approach and involved the following components:

- Hierarchical assessment of (coastal) scenic resources, cultural themes and heritage values, followed by a regional analysis which provided the framework for smaller units;
- Cultural themes and associations were identified from coastal history, heritage registers, regional focus groups;
- Landscape setting units were defined comprising identifiable places bounded by viewsheds to provide basis for assessment, GIS, planning and management;
- Scenic quality indicators comprised naturalness, pattern, built form & activity, landform, vegetation & wildlife, and water & shoreline. These were based on the US Forest Service Scenic Management System. The indicators were assessed by landscape professionals for each landscape setting. The criteria had been validated by community focus groups but apparently not calibrated across assessment teams. Relative ratings (Very High to Low) were derived but not given arithmetic values;
- Landscape character and identify – the distinctiveness of the character and strength of identity;

- Land types at a local scale covering foreshore, island, foothills, plains etc. These were evaluated for landscape sensitivity, scenic integrity, positive and negative elements, and cultural heritage sites.

The products of the methodology were maps of landscape settings ranked according to their scenic significance – State, regional, local. Data were also provided of cultural significance and sensitivity and of landscape elements which contribute to scenic and regional identity.

The coast was divided into 58 individual coastal landscapes and classified into one of the following landscape character types: regional city, low intensity coastal plain, extensive coastal plain, coastal valley, steep coastal range, major peninsula and island groups, and major island groups.

Level 1 scenic quality landscapes (e.g. Whitsunday Islands, Port Douglas) were considered to be highly outstanding and distinctive. Criteria for their inclusion were:

- the landscape is recognised as having exception or unique statewide, national or international aesthetic values
- the landscape displays high visual quality indicators for landform, landcover and waterform

Chenoweth claimed the methodology was credible, repeatable and capable of yielding maps, data and recommendations for planning measures. Although it is comprehensive and used focus groups to review criteria, the derivation of scenic quality ratings was based on expert assessment, not community preferences. Fairly coarse categories of value (very high – low) were derived. The method does not provide ordinal quantification of scenic quality. Nevertheless it provided a comprehensive approach which relied on expert assessment and it attempted to go some way towards ensuring its replicability and validity.

EDAW (Aust) carried out an assessment of Queensland's scenic resources for the Coastal Management Branch of the Queensland Department of Environment in 1996 (EDAW, 1996) (see also www.epa.qld.gov.au/register /p00607af.pdf accessed 20/3/05). The methodology built on Chenoweth's work among others and involved three steps:

- Step 1 Identification of the coastal 'viewshed' and coastal landform types; this used physical criteria to identify viewsheds and the basic types of coastal landforms;
- Step 2 Identification of 'coastal landscapes'; this classified coastal landscapes of similar characteristics and carried out a field inventory of coastal landscapes;
- Step 3 Overall scenic amenity assessment and development of scenic quality criteria; this assessed scenic amenity by categories of visual quality and prepared scenic quality criteria for each landscape character type.

Step 1 mapped the coastal landscape into four landform types – coastal ranges, coastal lowlands, coastal plains, and coastal islands. These were mapped at 1:250,000 scale. The report noted that the coastal viewshed, which comprised all land seaward of the dominant coastal range, extended from two kilometers to several hundred kilometers on Cape York and the Gulf of Carpentaria.

Step 2 adopted Chenoweth's classification of the coastal landscapes: regional city, low intensity coastal plain, extensive coastal plain, coastal valley, steep coastal range, major peninsula and island groups, and major island groups. Step 2 also involved the videoing of the entire Queensland coast from the air using a low flying aircraft.

The scenic quality assessment of Step 3 indicated the relative distribution of scenic quality indicators in a number of categories. Chenoweth's four level classification of scenic qualities was used:

- Level 1 Highly outstanding and distinctive

- Level 2 Outstanding and distinctive
- Level 3 Somewhat distinctive or outstanding
- Level 4 Tend to be present in other parts of the coast

These grades of relative scenic quality were depicted on a map of the Queensland coast. These comprised blocks of the same level extending for a distance along the coast and inland for varying distances – to the nearest range. Based on this, a further map depicted relative scenic management priority – high, medium and low.

Tables containing the recommended scenic quality criteria for the eight landscape character types (i.e. regional cities, linear coastal strip etc) were defined. These comprised matrices of the level of scenic quality (high, moderate, low) across and landform, land cover and waterform down the matrix. Desirable scenic quality criteria were defined for the matrix. Part of one of these matrixes is provided by Table 2.4.

The resource inventory contained in the report provided detailed descriptions in the form of matrices of each of the 58 coastal landscapes.

This assessment required considerable resources to undertake and provided a detailed and comprehensive description of coastal landscapes. It used explicit criteria to classify and inventorise these landscapes. The derivation of scenic quality was based on an assessment of the data gathered. The classification provided of scenic quality into four grades was fairly coarse given the amount of information gathered. Mapping of scenic quality covered blocks of areas,

Table 2.4 Scenic Quality Criteria Matrix – Queensland Steep Coastal Ranges

	High scenic quality	Moderate scenic quality	Low scenic quality
Landform Type	Mountainous	Hilly – rolling	Undulating – plains
Landform features	Distinctive gorges & valleys	Minor valleys	Flat to gently sloping
	Strongly contrasting landforms such as localized mountains/ outcrops/ peaks/ headlands, particularly when adjacent to flatter areas or forming a backdrop to semi developed areas	Low rising hills with some contrast with adjoining areas	Minor rises with limited to no contrast with adjoining areas
Land cover	Strong/ dense patches of remnant vegetation particularly when contrasting with adjoining areas	Areas with significant vegetation such as open forest	Areas extensively cleared of vegetation
Water form	Major river systems, including wild & scenic rivers	Minor rivers and creeks	Absence of waterforms

Source: EDAW, 1996

thereby assuming the entire block to be of equivalent scenic quality from adjacent to the coast to inland – in some cases tens of kilometers from the coast. The descriptions of the 58 coastal landscapes provided a wealth of information but in a form which may be difficult to apply.

(3)   New South Wales

Planning NSW carried out the Comprehensive Coastal Assessment (CCA) over 2001 – 04 at a cost of $8.6 m. It aimed to identify, analyse and assess data and information on the physical, biological, social and economic values of the State's coastline. It included a visual assessment which mapped areas of high scenic quality that are important for preservation.

The Assessment described scenic quality as a resource:

> *Coastal visual resources not only make a major contribution to tourism and recreation but strongly influence the amenity of those who live, work and recreate within the coastal zone. Visual resources are particularly significant as most people are immediately responsive to them.* (Visual Project Summary)

Its emphasis on scenic quality as a resource is significant as it underlies much tourism and recreational activities. The study's objective was:

> *to characterise, assess and document the visual resources of the NSW coast to assist in the protection and effective management of that resource through well-informed decisions on conservation, development and management.*

The coastal visual assessment defined the extent and character of the coastal landscape, the extent of the visual catchment, identified management opportunities, and established a framework for local detailed visual assessment, planning and design.

Visual catchments enclosed landscapes which comprised the coastal viewing experience. They could extend up to 10 – 15 km inland to coastal ranges. *Viewing situations* defined locations from which the surrounding areas of landscape were viewed - e.g. roads, rivers, trails as well as from residential, commercial, industrial and agricultural areas. These were differentiated into primary and secondary viewing situations. *Seen areas* were those portions of the landscape that were visible from Primary Coastal Viewing Situations.

The concept of a *visual catchment* is a useful innovation, preferable to viewsheds. However the terms *viewing situations* and *seen areas* are rather clumsy.

The Visual Resource Management System for the NSW Coastal Landscapes had the following components (Figure 2.3):

<u>Landscape Management Structures</u> described at state and local levels

<u>Landscape Assessment</u> to determine what parts of the coastal landscape contribute to coastal landscape settings and classification of landscape systems and units on the basis of land form and land cover (vegetation)

<u>Landscape Analysis</u> which examined their visual features and qualities and visibility of the coastal landscape from significant locations. It defined Viewing Situations and Landscape Features which included landform, land cover and water features as well as ephemeral features such as light and atmospheric conditions. Visual Elements were the formalist features of form, shape, pattern, line, colour and texture. Visual Values assessed the landscape in terms of visual integrity, diversity/contrast, balance/harmony, distinctiveness, adjacent scenery, rarity, ability to accept change and visual quality. The landscape analysis was thus based on explicit descriptive information and qualitative judgements.

Landscape Management defined the level at which the visual resource of the landscape should be managed based on considerations of uniqueness, integrity and the visibility from regionally significant locations. Four management levels were defined:

1. Preservation – High visual quality + visible from viewing situation + high ecological or natural values
2. Conservation – High visual quality + visible from viewing situation
3. Modification – Low visual quality and low visibility from viewing situation
4. Restoration – Very low visual quality.

High quality landscapes visible from regionally significant locations were ascribed a preservation or conservation status while more common landscapes were ascribed as suitable for various development potentials. Degraded

landscapes (e.g. quarries) were ascribed a restoration prescription. This layer was the most difficult to describe as it has overlapping themes with conservation, agriculture and forestry, and geological features. By these means the visual management system defined the management needs of the coastal landscape to maintain visual quality.

The NSW Visual Resource Management System for Coastal Landscapes provided a comprehensive and resource intensive, assessment of landscapes. Objective data were used to describe the landscape and qualitative judgements used to describe its landscape quality attributes. This information will be of value to planning and management. Although the landscapes were described in qualitative terms: high, low, and very low, the derivation of these was not described. Like the Queensland study, the NSW approach provides a wealth of information about the landscape but was inadequate on the crucial element of establishing their quality. The Visual Resource Management System was applied to a 35 km section of the Tweed coast (northern NSW) as a pilot project.

The visual quality of a given unit was defined over five grades by a matrix of viewing situations and the four levels of visual management; thus the top grade comprised preservation and conservation areas in the foreground, middleground and background of primary coastal regional viewing situations.
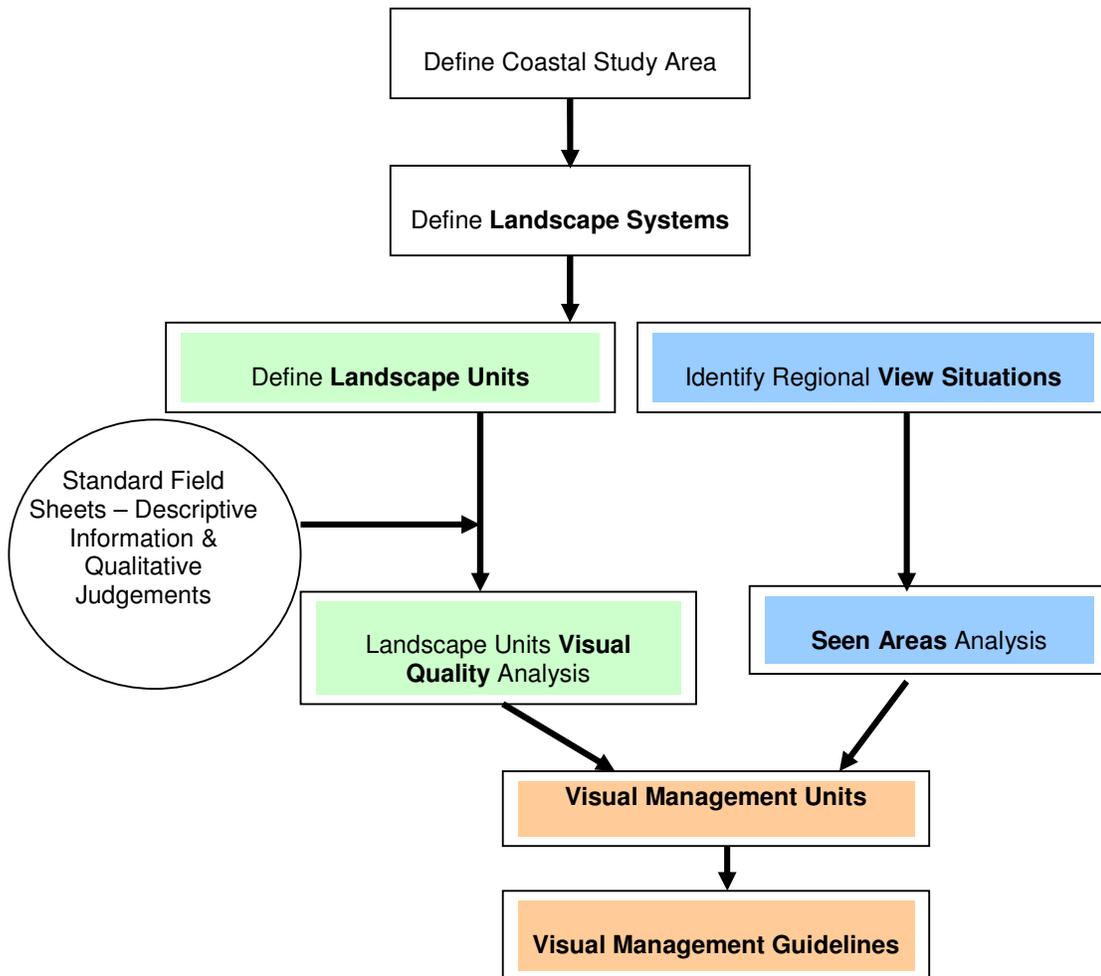

Figure 2.3 NSW Coastal Landscapes Visual Resource Management System

It identified and mapped 87 landscape units and classified their visual qualities by their visual integrity diversity/contrast, etc. Overlay maps of each were produced and combined into a single map of visual quality. The small scale and poor quality of the map made this difficult to interpret. Finally it defined a range of visual management strategies for application in this region.

(4)   Victoria

In 1998, Tract Consultants and Chris Dance Land Design prepared a report: *Landscape Setting Types for the Victorian Coast* as an input to the Victorian Coastal Strategy. The identification of landscape setting types was based on site and aerial field work. The following criteria were used to determine the zones:

- The landscape as viewed from a number of points, including the sea
- Natural systems (landforms/geomorphology/land cover)
- Cultural systems (settlements/structures)
- Stability or energy level of the landscape – exposure to winds/sea
- Capacity of the landscape to absorb change without creating visual impacts from prominent viewpoints
- Cultural influences and impacts, both Aboriginal and European
- Landscape character - climatic, experiential, visual, spiritual aspects of the coastal environment

Based on these, 34 setting types were identified and defined. These provided a brief description of the physical characteristics, viewing points including a diagram, and considerations relating to planning (see www.vcc.vic.gov.au/landscape/type3.htm).

In 2003, the consultants, Planisphere carried out *The Great Ocean Road Region Landscape Assessment Study.* The study assessed the landscape character of the region and the way in which various types of development can be managed in different landscape types. The study included an assessment of "distinctive landscape elements, features, characteristics, character, quality and extent of the landscape within the region, and their value or importance."

The study involved the confirmation of landscape character types defined in a preliminary assessment and the identification of additional landscape types, undertaking a "visual and sensory analysis from a professional outsiders' point of view", and the definition and delineation of precincts within each landscape character type.

The National Trust in Victoria has been active over many years in identifying significant coastal landscapes. The methodology employed appears rather *ad hoc* and descriptive; it does not appear quantitative or based on an overall assessment of coastal landscape quality.

(5)   Western Australia

A project is approaching finalisation to assist planners, local government, consultants and developers assess visual landscape character[1]. A method for visual impact assessment is also being developed. Details of the Western Australia project are scant but it appears to be based on a landscape architect approach to assessing landscape quality on the basis of defined criteria.

2.3   INTERNATIONAL STUDIES

(1)   New Zealand

In New Zealand, the Waikato Regional Council covers coastline in the northern part of the North Island including the attractive Coromandel Peninsula. The Council prepared a Regional Coastal Plan as required under the Resource Management Act 1991. Among its principles it stated:

> *Cultural, historical, spiritual, amenity and intrinsic values are the heritage of future generations and damage to these values is often irreversible.*

The Resource Management Act defined amenity values as:

> *those natural and physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes*

The Plan included a map delineating areas of national, regional and local significance. The criteria used in deriving these were described in *Revised Draft Conservation Management Strategy for the Waikato Conservancy* (1994).

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[1]. *Pers. comm.* Tara Cherrie, WA Dept of Planning & Infrastructure.

It appeared that they had been derived on the basis of explicit criteria rather than by community preference surveys.

(2)   United States

Californians acted in 1972 to "Save our Coast" and passed a voter initiative that:

> It is the policy of the State to preserve, protect, and where possible, to restore the resources of the coastal zone for the enjoyment of the current and succeeding generations

In 1976 the California Coastal Act was passed and the California Coastal Commission (www.coastal.ca.gov) established to plan and regulate development and natural resource use along the coast in partnership with councils.

"The coast is the scene of never-ending struggle among natural and human forces" stated the Commission in a description of its role. Protection of scenic landscapes and views of the sea were among the Commission's policies. The major focus of the CCC has been Local Coastal Programs which established the planning ground rules for development in the coastal zone of 74 cities and counties. Among the standards used by the Commission was the protection of scenic landscapes and views of the sea. The Coastal Act provided that:

> The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of the surrounding areas, and were feasible, to restore and enhance visual quality in visually degraded areas… (Sec 30251)

Although scenic quality was referred to in many hundreds of development decisions (see website), no survey of coastal scenic quality could be identified.

Interestingly, however, a report from the Commission's Executive Director in May 2004 addressed the protection of views from the ocean to the land. The paper recognised that with increasing numbers of boaters, fishers, kayakers, surfers and other ocean users, the view from the ocean should be taken into account in development decisions. It referred to the State of Maine which in 2003 had amended its coastal management program to protect views from water toward land.

In Oregon, the Statewide Planning Goals and Guidelines covered coastal shorelands (Goal 17). The policy included aesthetics in conservation, protection and development. It required inventories of shorelands including aesthetics "in sufficient detail to establish a sound basis for land and water use management". Based on the inventory, the comprehensive plan for coastal areas should cover shorelands which were to include "areas of exceptional aesthetic or scenic quality, where the quality is primarily derived from or related to the association with coastal water areas."

The Statewide Planning Goals and Guidelines also covered natural resources, scenic and historic areas and open spaces (Goal 5). This required local governments to adopt programs to protect these resources. Inventories of scenic views and sites were required and presumably these were to be undertaken at the local level.

Oregon's Natural Heritage Plan covered ecosystems including fauna and flora, and geological formations, but did not cover scenic values associated with natural areas including the coast.

In Washington State, the Department of Ecology operates the Shorelands and Environmental Assistance Program funded under the Federal Coastal Zone Management Act 1972. It provides grants and carries out conservation activities. The website illustrates coastal scenic quality by photographs (10,000 oblique aerial photographs) but scenic quality does not appear to have been surveyed. As indicated by its name, the Department has a strong ecological focus. The Washington Department of Natural Resources is largely concerned with forestry management but has responsibility for State-owned aquatic resources including the "bedlands" of Puget Sound, rivers and lakes. Again, although the State legislature recognised state aquatic lands as "a finite natural resource of great value and irreplaceable public heritage" there appeared to be no program to assess its scenic resources.

On the eastern coast of the United States, Rhode Island carried out a landscape inventory (see http://envstudies.brown.edu). The inventory had its origins in the 1980s with a law to inventory areas worthy of special designation as "scenic". The inventory was

undertaken in 1990. Rhode Island included coastal resort towns and a coastal plain. The planners who surveyed scenic values differentiated three ratings:

- <u>Distinctive</u> landscape which had the highest visual appeal and variety of form, line, colour and texture – 15% of the total area
- <u>Noteworthy</u> landscape which were scenic but of a lesser visual quality – 11% of the total area
- <u>Common</u> landscape covered the remainder of the Island – 74% of the total area

The results were used in planning and develop-ment assessment. The method used to classify the landscape by the planners was not described.

Interest in Massachusetts' scenic resources began with the 1933 Massachusetts Landscape Survey (see www.mass.gov/dem/ programs/Histland/landSurveys.htm). A set of categorical landscape types were chosen as "..kinds of Massachusetts scenery that are believed to have special character of outstanding value…". These included ocean beaches and dunes, moor and seashore uplands, and flooded lands in the coastal plain. Many of the areas identified were subsequently acquired as parks.

In 1980, the Department of Environmental Management initiated a further Statewide inventory of scenic landscapes. These were based on methodologies of the US Forest Service and Countryside Commission of Scotland. Physiographic regions were evaluated on the basis of a set of scenic feature guidelines. The inventory was published in 1982. More recently Massachusetts has embarked on a heritage landscape inventory program.

(3)   Canada

Nova Scotia in Canada has mapped scenic quality based on land form, land cover, land use and water (see http://museum.gov.ns.ca). Scenic quality was assessed on 10 X 10 km square blocks (which is a large area), the components rated separately and added to produce composite scores of 0 - 15. The method was based on many untested assumptions – e.g. that scenic quality increased with increasing land relief but at a declining rate, variety was more valuable than monotony, and the positive scenic quality of water declined only marginally when more water is seen. The addition of these

components assumed that each component was of equal worth, which is unlikely (e.g. land use and water). The resultant map indicated the areas of highest landscape value are "where prominent hills meet the ocean or where farming areas abut an indented coastline".

(4)   United Kingdom

The United Kingdom has a long tradition, extending back to after World War 2, of recognising and protecting its outstanding landscapes. Many of its Areas of Outstanding Natural Beauty (AONB) were defined by the 1949 National Parks Act and others have been designated in more recent years. More recently, the Countryside Agency has conducted landscape assessments of some 30 AONBs and other significant areas.

These landscape assessments covered the following:

- Description of physical and human influences that have shaped the landscape
- Review of the features contributed to special character of the area
- Classification of landscape into a number of distinct and recognizable landscape types including a description of the characteristics of each
- A review of the forces of change influencing the landscape now and in the future
- Information on the perception of the landscape over time
- A summary of the special character and quality of the area that makes it of national significance

These landscape assessments were largely descriptive as evidenced from their scope. Their purpose has been to raise awareness of the importance of the area and to guide planning policies. Their focus has been the characteristics of the landscape rather than its quality.

In an early study, Wallace (1974) described the character of 290 km of the Essex coast and extending up to 2.5 km inland. He based the evaluation of landscape quality on the following factors:

- Land form
- Land use
- Development present
- Special landscape features – hedgerows, eyesores

- Compositional effect – harmony, variety and interest
- Viewpoints
- Feeling of isolation and remoteness

Wallace sought to make a relative, rather than absolute, assessment of landscape quality and aimed to make a "subjective interpretation applied in a consistent and rational manner." Four evaluators were involved and produced four rankings of landscape quality: uninteresting, modest, important, and dominant & attractive. He mapped the resultant evaluation.

2.4   CONCLUSIONS FROM STUDIES OF COASTAL LANDSCAPE QUALITY

The studies examined above focused almost exclusively on the measurable – particularly features which may be objectively measured. This is akin to measuring the enjoyment that one may derive from a piece of music by numbering the notes it contains, the types of instruments used, the pitch and rhythm used – anything but the very attribute that one is interested in knowing.

The focus on the measurable may derive from a belief that objective measurement is a pre-requisite for qualitative assessment – that the knowledge of what the landscape contains and its characteristics will somehow provide a sound basis for the judgement of its quality. Again, using the music analogy, knowledge of the workings of instruments and of music form, though these may contribute to one's appreciation of the piece, definitely are not pre-requisites for the enjoyment of a piece.

Interestingly where judgements were made, the reports were almost apologetic for resorting to them. The judgements were made with little description of how they were derived. In a few cases where explicit criteria were used (e.g. EDAW's study of Queensland's coastal ranges) in which high, moderate and low scenic quality were defined, the results were not tested. Rather it was assumed that scenic quality increased with the height of land forms, the distinctiveness of land forms, the density of vegetation, and the extent and wildness of rivers present. Each of these attributes may contribute to scenic quality but not necessarily in the way or to the degree assumed. For example, from the author's studies, it was not just the extent of water but the indentation of the water/land interface that was an important determinant of coastal scenic quality. The factors selected derived from those features of the landscape which were measurable, regardless of whether they were really significant or not.

A related problem with these assessments is that they treated all factors on an equal footing – thus land forms and height might be rated along with vegetation, water, rocks and other features and the results added together as though they all have an equal influence on scenic ratings. In the author's study of South Australian landscape quality, factors such as diversity, naturalness and the presence of water were found to be far more important than some other factors.

The choice of characteristics included in expert assessments varied from expert to expert. Thus replicability of the results by other persons is not possible.

Underlying the approach which used measurements was the belief that anything that was measured was objective and defensible while aspects which required judgements were inherently subjective and lacked credibility. Certainly this is so where the judgement was based by one person, however if it was based on a sample of the community, then while still subjective, it is defensible and credible.

A further criticism of these studies is that they were based on a reductionist approach to the landscape, segmenting it into its component parts which were measured and added together in some unique way to provide its overall quality rating. However when a scene is viewed, one's appreciation of it is made holistically, based on its entirety, not by forensically dissecting it into its parts. It is a judgement that is reached instantly and without analysis.

The whole is not simply the sum of the parts; it is much more than this. The reductionist approach separates the components, rates these and adds the ratings but fails to consider whether the results reflect one's preferences. These methods do not test their findings by evaluation by the community, rather a method is asserted and applied and gains its standing by repeated use. Its validity is rarely questioned, perhaps because the methods appear logical and no alternative presents itself.

The alternative to expert assessment is to use the community rate their preferences. This is based on the premise that as landscape quality is a subjective quality, it is the

community who derive satisfaction from it and they should be involved in its assessment. The community view and rate scenes holistically, not by reductionism, and issues of the relative importance of their characteristics do not enter into the assessment. Surveys which aggregate the opinions of the community in a structured way amenable to statistical analysis can provide the basis for an objective assessment of this subjective quality. It is this approach which is applied in this study.

2.5   LANDSCAPE AESTHETICS

(1)   Affective Basis of Aesthetic Preferences

Following from the preceding review of studies of coastal scenic quality, the nature of aesthetics is described to assist in understanding why the approach proposed in this study was used, rather than the measurement system employed by many other studies.

At its core, aesthetics is not an attribute that can be measured in the way that physical characteristics of the landscape can be measured. This is because aesthetics is an affective quality. Dictionaries reinforce this in their definition of aesthetics: "things perceptible by the senses as opposed to things thinkable or immaterial (Shorter Oxford, 1973), and "pertaining to the sense of the beautiful or the science of aesthetics" (Macquarie, 1981).

Aesthetics derives from the affects or preferences of individuals. Affects do not derive from cognitive analysis. An individual's liking of a composer derives from their liking for their music, not from an analysis of the composer's competency as a composer, his or her use of instruments, his or her scoring for the orchestra etc. The individual knows immediately whether or not they like a piece of music, although sometimes a piece may grow on the individual and he or her comes to like it. But it still derives from the individual's preferences, not from cognitive analysis. Similarly a person's liking of another person derives from intuitive preferences, not from cognitive reasoning.

Preferences for landscape do change over time but are remarkably stable. The shift that occurred at the start of the 17th century transformed the Western view of mountainous landscapes, from features regarded as the haunts of devils, uncouth areas fit for the scrap

heap[2], to features in which we delight. In *Mountain Gloom and Mountain Glory*, Margaret Nicolson (1959) traced the revolutionary change that occurred in the space of a generation in Western attitudes to mountainous areas which lead to the contemporary love of mountainous landscapes.

More recently the wilderness movement has influenced landscape preferences by heightening an appreciation of natural areas compared with areas where human influence is evident. In my study of South Australian landscape preferences, naturalness was second only to diversity as a predictor of landscape preferences (Lothian, 2000).

The affective model of preference is based on the premise that emotional (i.e. affective) responses to landscapes occurred before cognitive information processing. With the development of cognitive psychology in the 1960s, affects were regarded as products of cognition, i.e. they were post-cognitive.

In a widely quoted paper, *Feeling and thinking, preferences need no inferences,* R.B. Zajonc (1980) argued against affect being post-cognitive and provided experimental evidence that discriminations [like-dislike] could be made in the complete absence of recognition memory. He argued that preferences preceded cognition. He concluded that affect and cognition were:

> "under the control of separate and partially independent systems that can influence each other in a variety of ways, and that both constitute independent sources of effects in information processing."

Preferences are registered extremely quickly which supports them being pre-cognitive. Herzog (1984, 1985) used scenes which respondents viewed for 20 milliseconds [i.e. 1/50 sec] or 200 milliseconds [i.e. 1/5 second] and compared the responses with 15 seconds. As Figure 2.4 indicates the ratings, though not identical, were very similar. The instantaneous rating of what we like and dislike is obviously a skill that everyone possesses.

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[2]. A typical description of the European Alps, by John Evelyn who cross them in 1644: "which now rise as it were suddainly … as if nature had here swept up the rubbish of the Earth in the Alps, to forme and cleare the Plaines of Lombardy." (Nicolson, 1959)
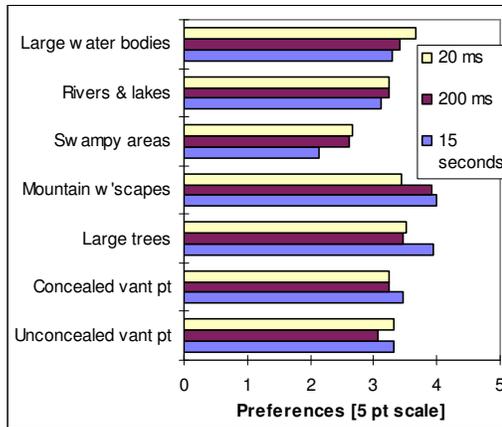
Source: Herzog, 1984 & 1985

Figure 2.4 Effect of Viewing Times on Preferences

(2)   Influence of Culture on Landscape Preferences

Cross-cultural studies of landscape have indicated that landscapes were rated similarly regardless of the cultural origins of the participants. Studies of the influence of culture on landscape preferences include the following.

Hull and Revell (1989) found the level of agreement regarding the scenic beauty of Bali among the Western tourists was significantly higher (0.86) than among the Balinese (0.79)

which was surprising given that they came from many countries. They considered that the Balinese who had been exposed to Western culture for decades might have adopted western values. Overall they concluded that despite the "enormous differences which exist between the Balinese and western culture" that "the results suggest that there was perhaps more similarity than difference between the two groups in their scenic evaluations" of the Balinese landscape.

Purcell *et al* (1994) compared the responses by Italian and Australian students to photographs of landscapes from both countries. Preferences by the Italian participants were generally higher than by the Australian participants but the differences were only slight (Figure 2.5).

Figure 2.6 indicates the preference values obtained by Tips & Savasdisara (1986) from people from a range of national backgrounds. They found, with some exceptions, a reasonable degree of similarity across different nationalities.

These and similar studies suggest that human preferences for landscape are deep seated, deriving from past human development. While culture has some influence, the core of our aesthetic preferences is innate.
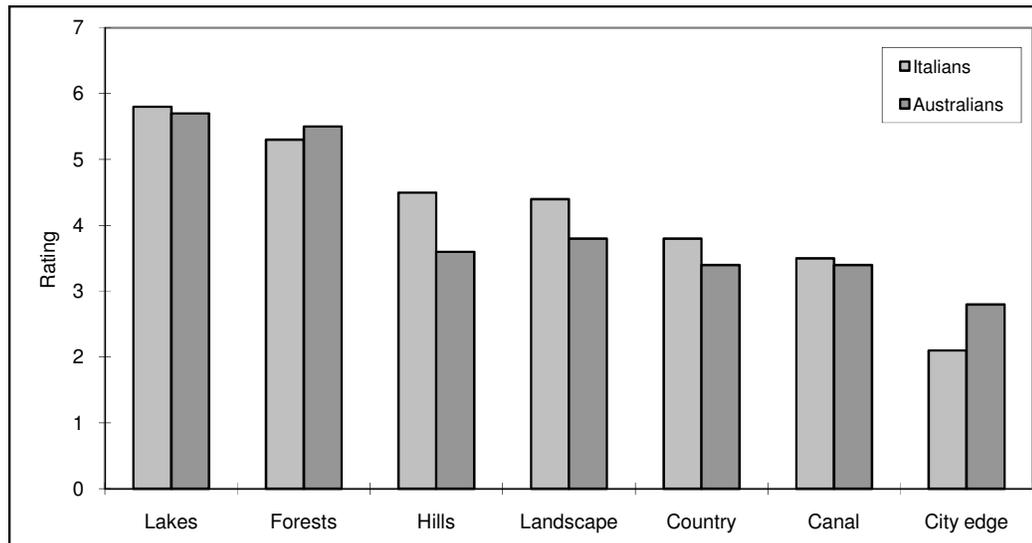
Source: Purcell *et al*, 1994.

Figure 2.5 Comparison of Italian and Australian Landscape Preferences
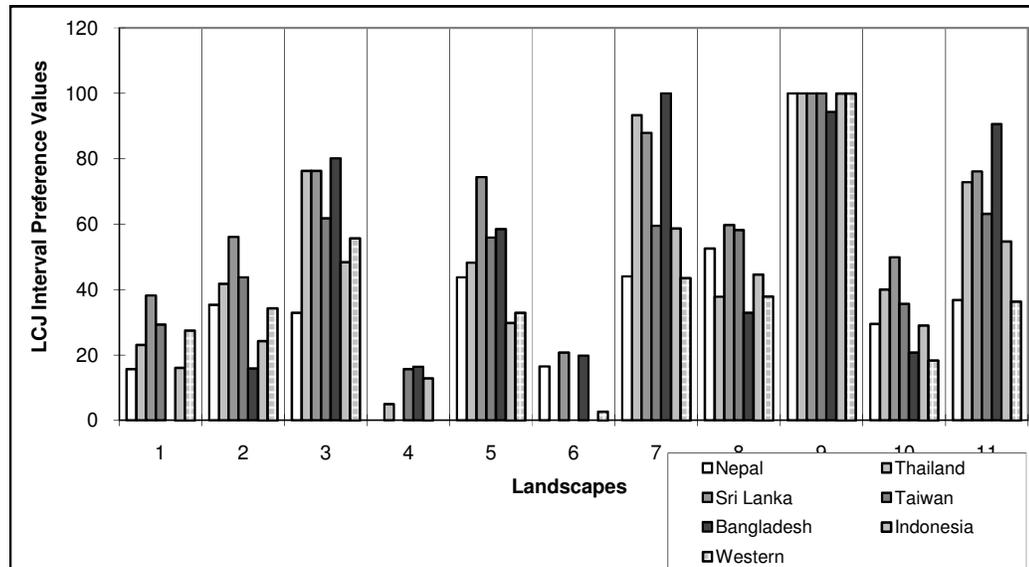
Source: Tips & Savasdisara, 1986
Figure 2.6 Preference Values for 11 Landscapes

(3)   Theories of Landscape Aesthetics

Theories of landscape quality, which seek to explain *why* we like what we like rather than simply describing *what* we like, all derive from an evolutionary perspective. These theories essentially argue that landscape preferences are survival enhancing: human preferences are moulded by what enhances our capacity to survive as a species. These theories are summarised briefly below.

G.H. Orians, an evolutionary biologist, proposed the *habitat theory* with the biological imperative for humans to "explore and settle in environments likely to afford the necessities of life …" (Orians & Heerwagen, 1992). He focused on the African savanna which contains scattered trees amongst extensive grassland and is believed to be the environment in which humans evolved. He argued that there would be a strong preference for this type of environment. Using the characteristic shape of the Acacia trees present he found strong human preferences for these trees. Similar environments are found in our public parks comprising extensive lawns and isolated trees and even own gardens and the ubiquity of this form reinforces Orians' case.

Jay Appleton proposed the *prospect-refuge theory* in which he proposed that landscapes are preferred which enable one to see without being seen; they provided places (prospects) where one could spy out game, the enemy or other objects, while also providing places

(refuges) in which to hide. However when these ideas were tested empirically, the proof has not been compelling. While prospects tend to correspond with the appeal of mountains and trees, refuges (e.g. caves) tend to be regarded negatively.

Roger Urlich proposed the *affective theory* in which natural settings and landscapes produce in their viewers, emotional states of well-being. Measured on a like-dislike dichotomy, it correlated closely with scales such as beautiful – ugly or scenic quality scales. A disciple of Zajonc's view that preference is pre-cognitive, Urlich provided supporting evidence from preference studies. He proposed that:

> "immediate, unconsciously triggered and initiated emotional responses - not 'controlled' cognitive responses - play a central role in the initial level of responding to nature, and have major influences on attention, subsequent conscious processing, physiological responding and behavior" (Ulrich, *et al*, 1991)

Using various physiological measures of brain activity and of feelings, Urlich has found that urban scenes without trees or natural objects produced negative feelings while scenes of nature provided positive feelings, and that these produced physiological benefits. In a study of hospital patients, for example, he found that those patients with a view of trees recovered more quickly and required fewer

	Understanding Making sense	Exploration Being involved
Immediate The visual array	**Coherence** Making sense now Orderly, "hangs together" Repeated elements, regions	**Complexity** Being involved immediately Richness, intricate Many different elements
Inferred Future, promised Three-dimensional space	**Legibility** Expectation of making sense in future Finding one's way there & back Distinctiveness	**Mystery** Expectation of future involvement Promise of new but related information

Source: Kaplan, Kaplan and Brown, 1989; Kaplan, 1979.

Figure 2.7   Kaplans' Predictor Variables
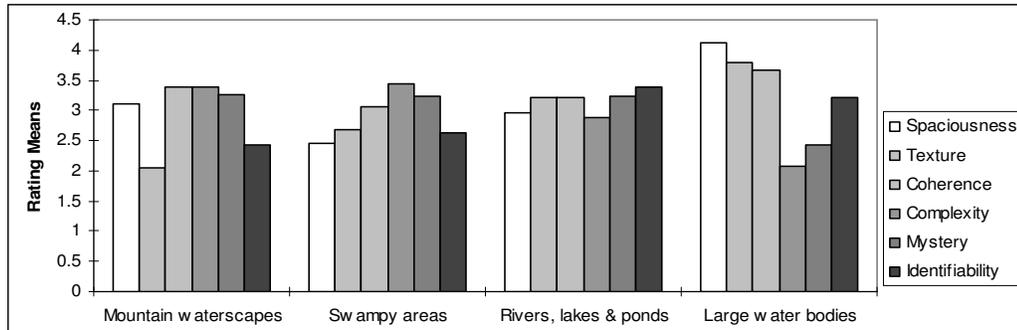
Source: Herzog, 1985

Figure 2.8 Rating of Waterscapes by Kaplans' Predictor Variables

analgesics than those without this view (Urlich, 1984).

The overarching theory of environmental perception is information processing theory which has been applied in the field of landscape aesthetics by Stephen and Rachel Kaplan. They suggested that in extracting information from the environment, humans sought to *make sense* of the environment and to *be involved* in it. They have identified four predictor variables: *coherence* and *legibility* help one understand the environment, while *complexity and mystery* encourage its exploration (Figure 2.7).

Coherence and complexity involve minimal analysis and are registered immediately while legibility and mystery require more time and thought. Research of these has found that coherence is the strongest predictor and mystery, the most consistent.

Among the many studies of the Kaplan model, Thomas Herzog, a colleague, carried out several. In a study of waterscapes, he used Kaplans' predictor variables and found (Figure2.8):

- spaciousness was, not unexpectedly, best shown in large water bodies; these also showed highest texture and coherence but lowest complexity and mystery - they are water bodies which lack interest and are easy to make sense of;
- by contrast the other water bodies are more interesting, being high in mystery and complexity yet being reasonably coherent; they thus reward immediate involvement yet hold out promise of more
- the distinguishing features of (1) mountain waterscapes are their low textures which suggest that they are difficult to navigate; (2) low spaciousness of swampy areas; (3) identifiability of rivers, lakes & ponds; (4) while large bodies of water have the most distinguishing features.

The studies of the Kaplans' information processing model that have been conducted provide support for its elements. There would appear however to be a fair degree of interpretation required of the application of these four predictor variables in the landscapes studied. The nebulousness of the concepts involved suggests that they are still evolving and this is likely to continue for some time.

Stephen Kaplan describes the theory as an evolutionary view based on habitat theory, with human preferences deriving from the adaptive value offered by particular settings (Kaplan, 1987). He regarded preferences as:

> "An intuitive guide to behavior, an inclination to make choices that would lead the individual away from inappropriate environments and towards desirable ones"

An evolutionary perspective, in which preference aids the survival of the individual, led Stephen Kaplan to conclude:

> "Aesthetic reactions reflect neither a casual nor a trivial aspect of the human makeup. Aesthetics is not the reflection of a whim that people exercise when they are not otherwise occupied. Rather, a guide to human behavior that has far-reaching consequences." (Kaplan, S., 1987)

Brown & Itami (1982) proposed a model which related scenic resource values to landscape preference components as defined by the Kaplan model.

Kaplan model:

	Making sense	Involvement
Visual array	Coherence	Complexity
3-D space	Legibility	Mystery

Brown & Itami model:

	Making sense	Involvement
Visual array	Slope	Spatial diversity
	Relative relief	Relief contrast
3-D space	Naturalism	Height contrast
	Compatibility	Internal variety

The Brown & Itami framework comprised two inter-related systems - the natural (land form) & cultural (land use). These described the physical components. Landform reflected the permanent "immutable" components and the cultural system was reflected by the land use and land cover pattern. This model was used by Edwards (1987) in his assessment of the Kangaroo Island landscape (Section 2.2).

Clearly a robust theory of landscape which provides an all encompassing framework with which to understand and to predict landscape preferences does not currently exist. What we have at present area a range of theories which offer explanations of aspects of landscape preferences but which fall well short of a definitive explanation.

**(4)   Individual Differences in Landscape Preferences**

Many studies have examined the influence of respondent characteristics such as age and gender on their landscape preferences and have generally found there to be little difference.

Among the findings:

- Age generally had little effect, the exception being young children whose preferences differed markedly from adults

- There were slight differences between genders in the types of landscapes preferred

- Education, employment and socio-economic status appeared to have nil or negligible influence on preferences

Three studies that the author has undertaken (Lothian, 2000; 2003; 2004) support these conclusions; overall the similarities in preferences across respondents were greater than the differences. This is illustrated by Figure 2.9 which indicates the similarity of average preferences across the differing age, gender, education and birthplace (i.e. inside or outside of Australia). Only in respect of education were the differences significant.

Familiarity is one component of observer characteristics which does appear to influence their preferences. Some studies have found a direct correlation between familiarity and preferences (e.g. Hammitt, 1979). Nieman (1980) examined the landscape preferences of residents near the Long Island coast and the Great Lakes shore and found they strongly preferred the environment with which they were most familiar (Figure 2.10). Similar results were found when respondents were asked which coastal area they would most prefer to live - in both cases, 82% preferred to live where they were rather than in the other location.
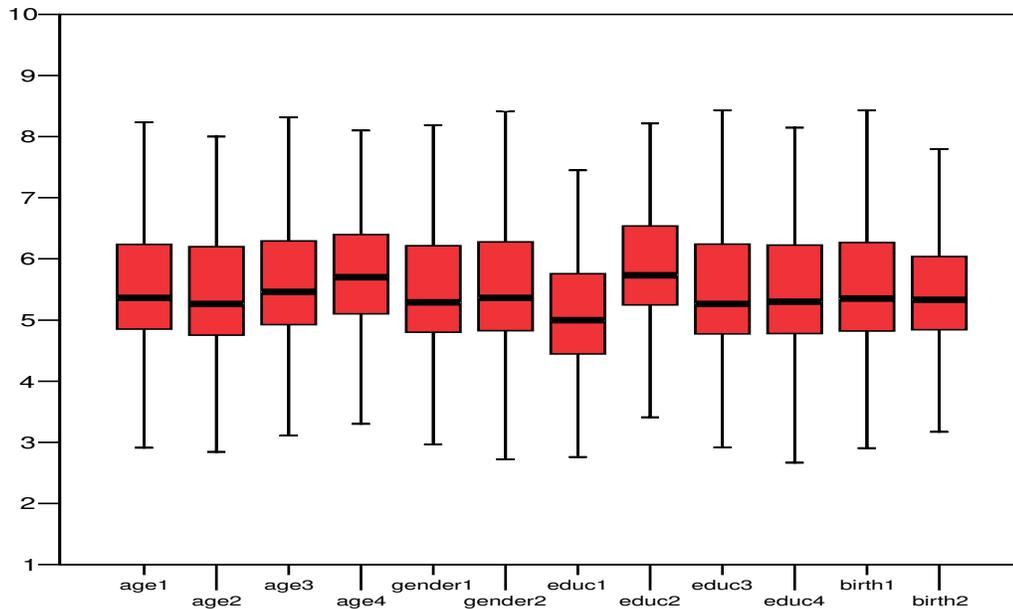
Source: Lothian, 2004

**Figure 2.9 Boxplot of Average Ratings by Participant Characteristics**
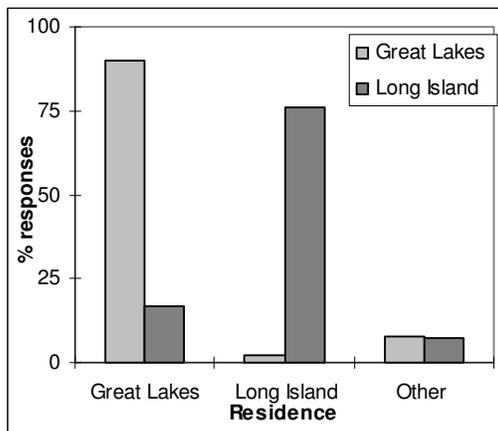
Source: Neiman, 1980

Figure 2.10 Preferences vs familiarity

I found in my study of South Australian landscape preferences that familiarity with the various regions had a small but marked positive influence on landscape ratings (Figure 2.11).

Generally if respondents do not normally respond positively to a scene, familiarity will not alter this, however where a scene elicits a positive response, this will be reinforced and even increased by familiarity.
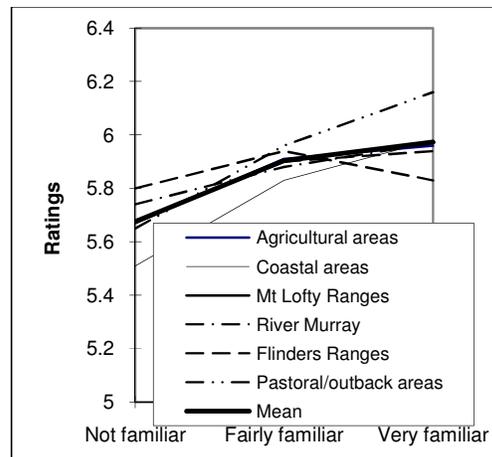
Source: Lothian, 2000

Figure 2.11 Effect on Ratings of Familiarity with Regions

(5)   Influence of Water on Landscape Preferences

Finally in this examination of landscape aesthetics, the findings relating to the influence of water on preferences are briefly reviewed. The defining characteristic of the coast is the close proximity of water, the sea. Many studies have shown that the presence of water has a significant and generally positive influence on scenic quality ratings.

The studies reported that scenic value increased with:

- Water edge (Anderson *et al*, 1976; Palmer, 1978; Whitmore *et al*, 1995)

- Water area (Anderson *et al*, 1976; Brush & Shafer, 1975)
- Moving water (Craik, 1972; Dearinger, 1979; Hammitt *et al*, 1994; Whitmore *et al*, 1995)

In the Rockies, Jones *et al* (1976) found that water bodies were the third most important landscape component in defining preferences after the high mountains and forests. Mosley [1989] found water ranked the fifth factor in New Zealand after forests, view angle, relative relief and alpine components (e.g. snow and ice). Significantly he found the river environment to be more important than the river itself in determining preferences. In the less spectacular landscape of the Connecticut River valley, Palmer & Zube (1976) found that after landform, water was the second most important dimension.

Herzog (1985) assessed the preferences for different kinds of water bodies and found in order: mountain waterscapes; large water bodies; rivers, lakes & ponds; with swampy areas last (See Figure 2.4).

Factors which were found to decrease the scenic value of water included pollution and waterlogging (Choker & Mene, 1992), water colour (Gregory & Davis, 1993), and litter, erosion, water quality and structures (Nieman, 1978). Interestingly Hodgson & Thayer (1980) found that water bodies labelled as artificial rather than natural (e.g. reservoir instead of lake) scored lower than natural labels.

Serenity and tranquillity contrasting with awe and arousal were found to be psychological factors associated with water bodies (Gobster & Chenoweth, 1989; Herzog & Bosley, 1992; Schroeder, 1991). Water holds one's attention and has a stabilising effect on emotions (Urlich, 1981).

Overall, water was found to be a major and positive factor by Calvin *et al* (1972); Choker & Mene (1992); Dearinger (1979); Dunn (1976); Herzog & Bosley (1992); Hull & Stewart (1995); Orland (1988); Shafer *et al* (1969); Urlich, (1981); Vining *et al* (1984); and Zube (1973).

2.6   USE OF PHOTOGRAPHS IN SURVEYS

Photographs of scenes are generally used in ascertaining the preferences of participants. These have obvious advantages over transporting large numbers of people into the field to visit widely dispersed locations. It would be clearly impractical to take 300+ people around the South Australian coast for the purposes of rating scenic quality. However the issue is whether photographs can be relied upon as substitutes for field assessments.

There have been many studies of this issue and their overall finding is that providing the photographs meet certain criteria then the ratings gained from them will not differ significantly from ratings gained in a field situation. Some of these studies are summarized below.

Zube, *et al* (1975) reported on a series of studies including the responses from field vs surrogate assessments. Using a range of techniques (semantic scales, rank order and Q-sort) and groups of field and non-field populations, they found high correlations between field and non-field assessments. Comparing the field and non-field evaluations for eight views, the average R^2 was 0.92.

Daniel and Boster (1976) used their Scenic Beauty Estimation (SBE) method to compare results produced by on-site vs slide judgements of forest landscapes. The SBEs derived from on-site judgements were generally slightly lower (i.e. based on the scale used, the scenes were judged to be of higher quality) than those derived from slide judgements. The correlation coefficients were highly significant statistically.

Table 2.5 Comparison of Field and Laboratory Assessments

Group	Mean value	Mean deviation	Range of variation
Basic group - field	56.9	6.8	44 - 63
- laboratory	56.1	7.8	42 - 65
Comparison group - lab	55.1	8.2	43 - 63
City dwellers - lab	55.9	10.2	40 - 66
City dwellers - lab	54.0	9.4	40 - 65

Source: Kellomaki and Savolainen, 1984

Kellomaki and Savolainen [1984] used a variation of the semantic differential method to assess the scenic values of selected tree stands in Finland. Three groups of participants evaluated the scenic values:

- a Basic Group of forestry students assessed the scenic values in the field and laboratory
- a Comparison Group, also students, assessed the values only in the laboratory
- 2 groups of City Dwellers only assessed the values in the laboratory

The results indicated very close assessments between the three groups (p<.01) (Table 2.5). While only one group rated the scenes in the field,

the mean value of their assessment was only marginally higher than the laboratory assessments but their range of variation was slightly less.

A definitive study on the use of photographs as a surrogate of field observations was undertaken by Shuttleworth (1980). Being concerned that many of the studies that had examined this issue used different populations to assess the sites and the photographs, Shuttleworth used the same group in both situations.

His study used landscapes in rural areas and on the urban fringe (East Anglia, England). Colour and black and white prints were used as surrogates. Semantic differential (SD) and bipolar scaling techniques were used. The sample population of students (n = 93) was divided into two groups all of whom visited all the field sites and half viewed the colour and half the b/w photographs. Various techniques were used to ensure randomness (e.g. changing the sequence of field vs photograph assessments) and to enable within-group and between-group analysis.

Shuttleworth found no differences between groups in responses to landscapes in the field and found little difference in responses to the photographs. However he did detect distinctly more differences between responses to b/w photographs and field views than between colour photographs and field

views. He found that with b/w photographs, participants tended to "make much more definite and differential responses by reinforcing likes and dislikes; responses to them thus tended far more to extremes of opinion than did responses to colour photographs".

Shuttleworth concluded that the results "indicated that there were very few differences of significance between the reactions to and perceptions of the landscapes either when viewed in the field or as photographs" with any differences being explainable by content. He proposed that photographs can be used providing they are in colour and that they are wide-angled to provide a lateral and foreground context.

In conclusion, with few exceptions, surveys have established that photographs can provide a viable surrogate of landscape, however there are slight differences in responses and certain rules should guide their use. Photographs tend to provide more objective, more dispassionate responses, while site assessments can yield a more subjective response influenced by a range of site factors unrelated to landscape quality. Black and white photographs can reinforce likes and dislikes and produce more extreme responses than colour photographs. Generally, photographs should be in colour and provide a wide view to provide sufficient context.