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RURAL LANDSCAPES

AND

SOIL CONSERVATION

THIS DISSERTATION IS SUBMITTED IN PARTIAL
FULFILMENT OF THE REQUIREMENTS FOR THE
DIPLOMA OF LANDSCAPE ARCHITECTURE
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OBJECTIVES

This Dissertation relates to my concern for the future quality of New Zealand's rural landscape. It reflects an awareness of the importance of sustainable management of landscape resources, especially the thin mantle of soil which is the basis for agricultural systems. The objectives of this study are:

- to investigate soil erosion and how and why perceptions have influenced approaches to soil conservation, and, in turn, how and why this has affected the character and quality of our rural landscapes.

- to discuss a wider approach to agricultural landuse that considers a range of values, including those intangible, that landscape encompasses.

- to define design principles and propose guidelines for soil conservation planting that both protect and enhance the visual quality of rural landscapes.

A case study is used to substantiate the objectives and illustrate the issues relating to the visual implications of soil conservation plantings.
INTRODUCTION

New Zealand is indeed lucky to have a great diversity of landscapes on such a small landmass. The differences in climate and landform on this isolated southern archipelago have produced a wide range of original soils and contributed to the development of a diverse flora and fauna. These indigenous elements and the landscape of which they are part took many millions of years to evolve.

Over the last one hundred years European settlement has had a dramatic impact on the landscape and those elements within it. Pioneering fervour to replace native vegetation and impose pastoral farming techniques has had many unforeseen consequences. The loss of soils and pollution of waterways are two issues that have been addressed in the last forty years. Only recently have the changes in diversity and quality of our rural landscapes been perceived and acknowledged as issues worthy of public concern.

"New Zealand's reputation for beauty depends almost entirely on its natural, physical characteristics - the mountains, the rivers, the forests, and the coastline. The cultivated parts of the country are becoming less beautiful as civilisation imposes its ugly additions."


Rural landscapes are typified by sheep, pasture grasses and exotic conifers. The traditional range of products from this landscape has resulted in recipes for land use that exhibit a limited recognition of regional, local, and site specific characteristics. The present rural slump will inevitably result in an intensification of management systems in order to maximise profits and returns from investments. It follows that visual, wildlife, and historic values will increasingly suffer due to this cost-price squeeze. Constrained approaches to soil erosion control can contribute to the 'devaluation' of our countryside.
The general picture which emerges is one of a landscape of extreme complexity and diversity with sharply juxtaposed variations in landscape types."
Many farms are 'scarred' by both erosion and erosion control schemes. Erosion perceived in isolation results in policies and incentives, and advice that are reactive to the processes. Henceforth the 'solutions' appear in isolation and fragmented from the broader landscape context. Most soil conservation planting involves species and designs based on constraints and objectives that show little appreciation of the visual character and quality of that landscape.

Landscape is holistic; that is, it reflects the totality of the biophysical and cultural processes. Future planning should reflect this by considering not only the Economic value but also the Ethical and the Ecological values.

"For landscape planning to succeed it is necessary that there is a real commitment to the concepts of land having non-monetary values which may outweigh short-term economic returns."


Wise land use should support a healthy, stable, and beautiful environment for the future. An enlightened approach to land use could result in landscapes that would not require additional erosion control measures that conflict with the character and quality of that place.
SECTION ONE: LANDSCAPE AND SOIL CONSERVATION
CHAPTER ONE: THE LANDSCAPE

1.1 DEFINITION

Landslapes are expressions of the interrelationships of the natural and cultural world.

Biophysical Landscape

Vegetation

Climate

Soils

Fauna

Hydrology

Cultural - Social Landscape

Landuse, Attitudes, Perception

Land Tenure, Policies, Values...

One can view a landscape as a life form because a fundamental concept of landscape is that it is holistic. This means a landscape possesses qualities as a whole that cannot be described merely as the sum of its parts.
Landscape character is based on an inventory of the physical landscape and its overall visual appearance. The descriptive information can be organised to identify a range of homogeneous types or landscape character units. The scale of these units will vary according to the diversity and complexity of the landscape and in relation to the study undertaken.

"Every landscape has its own character and pattern, its scale and its range of tone and colour. This character is based on the factors of geology and climate developed through the history of land use. It is only when this individuality is appreciated that a land use can be developed into a good landscape attuned to that locality." Sylvia Crowe. (1966)

The concept of Palimpsest is that shadows of historical events are impressed through to today's images. As landscapes change they retain impressions of previous land uses. Natural processes, such as revegetation partially hides the evidence of Polynesian settlements such as pa sites in New Zealand. Today man has the ability to 'erase' these past impressions to create new landscapes involving major alterations to the landform. For example, the Clutha Power Scheme will hide parts of a rural landscape by flooding the river terraces previously used for horticulture.

Most rural land use practices have not made major alterations to the underlying landscape pattern; i.e. the landform. In rural land use the vegetative cover has been altered which has had unforeseen repercussions on other elements such as soils and hydrology.

Contemporary landscape character

[Horizontal (spatial) character]

[Vertical (temporal) character]

Historical landscapes (Palimpsest)
8.

**Dynamic (Temporal Character):**

1 year
Summer/Autumn/Winter/Spring

**Landscape Character Type**

[Landuse]

[Broad Landform]:

[Local Landform]

[Vegetation]

**Scale**

**Broad/Regional Scale**

High Country
Downlands

Nth Canterbury
Sth Canterbury
Nth Island downlands

North Otago Downlands

Kakanui Valley
Awamoko Gorge

Lower Awamoko Valley

Awamoko Downlands

Damaru Valley
Downlands
Tablelands
River Valley

Native Vegetation
Pasture Grasses
Aquatic Vegetation

**Specific/Local Scale**

**Spatial Character**
The vegetative cover of many rural landscapes exhibit a strong temporal character; as the seasons change, so, too, does the scene. The changes from hour to hour, day to day, and year to year are important aspects affecting perception and interpretation of these landscapes.

A primary component of landscape is its spatial character; many rural land uses have altered the natural spatial character. The Canterbury Plains are a vivid example of how land use practices have introduced a new spatial character through the introduction of enclosing elements such as wind breaks, woodlots, fences, etc.
1.2 LANDSCAPE PERCEPTION

Landscapes can tell us much about time, space and the significance of man. They are a reflection of our values and of fundamental importance to survival. Landscape perception is the outcome of an interaction between humans and the landscape. The human and landscape elements must be viewed in their interactional context and may be tangible (physical change in the field) or intangible (state of mind).

Zube, et al (1982) propose the following theoretical framework as a basis for studies in landscape perception:

- "Landscapes surround. They permit movement and exploration of the situation and force the observer to become a participant.

- Landscapes are multimodal. They provide information that is received through multiple senses and that is processed simultaneously.

- Landscapes provide peripheral as well as central information. Information is received from behind the participant as well as from in front, from outside the focus of attention as well as within.

- Landscapes provide more information than can be used. They can simultaneously provide redundant, inadequate, ambiguous, conflicting and contradictory information.

- Landscape perception always involves action. Landscapes cannot be passively observed; they provide opportunities for action, control and manipulation.

- Landscapes call forth actions. They provide symbolic meanings and motivational messages that can call forth purposeful actions.

- Landscapes always have an ambience. They are almost always encountered as part of a social activity, they have a definite aesthetic quality and they have a systematic quality."
Landscapes are indeed complex and humans undoubtedly complicated. So, can we come to a consensus of opinion about the interpretation and evaluation of landscape?

"Changes in perception, philosophy and politics have strongly influenced the ways in which landscapes have been evaluated over the centuries." Countryside Commission (1984) p.106

Perception involves a subconscious selective process of receiving, integrating and evaluating information received through the senses. A number of factors affect both the perception and interpretation processes. First and foremost is our philosophical values and how we view our position as humans in the cosmos and on the planet earth. Other factors in the human side of this equation are one's expectations, experiences, education, motivation and personality. The nature and outcome of the interaction will also be affected by the cultural context, the technological skills and the economic situation. It becomes evident that the nature of this interaction has a considerable variety of outcomes.

The work of D.W. Menning (Ten Versions of the Same Scene) indicates the range of interpretations possible from one landscape. These include the perception of landscape as the "home of man" where nature is domesticated and a symbiotic relationship between people and nature exists. The landscape can be perceived as an 'artifact'; that is, a platform for humans to use and adapt. This has connotations of man, the conqueror, and anthropocentric philosophies. Others perceive the landscape as a 'problem', and in their interpretation they see a condition needing correction. It is possible that most soil conservators perceive the landscape in these terms. Land as 'capital' is an abstraction of landscape into economic terms. A concern with aesthetic qualities can result in the perception of landscapes as 'aesthetics', pure forms being described in the terms of the basic language of art. Other perceptions of the landscape see it as a 'system' (scientifically evaluated), as 'nature' (romantic view), as 'an ideology' (philosophy), as 'history', and as 'place' (all-encompassing and elusive).

"One should not under-estimate the capacity of the human mind to extrapolate beyond the given stimulus." P. Clamp (1981).

We can, however, attain considerable agreement on the quality of our landscapes. We can reach a consensus on many of the eyesores in the landscape; for example, windbreaks that conflict with the colours, textures and landform. Perception studies (S. Kaplan, 1975) on scenic values and landscape aesthetics have identified four factors universally responded to. They include cohesiveness, unity, naturalness and mystery which, collectively, constitute a value for the visual quality of the landscape. Chapter 5 defines these factors as the basis for design principles.
Studies in the United Kingdom have shown that farmers are sceptical about visual values of landscape. It is probable their conventional views are also held by New Zealand farmers.

"Landscape is an aesthetic interest and is therefore largely subjective and ephemeral. Not only are there great variations in 'the eyes of the beholders' but changing cropping patterns, seasons and lights, all conspire to render the subject both elusive and of doubtful merit."


In New Zealand decisions on the use of rural land is primarily the domain of the farm manager. New Zealand farming philosophy tends to treat the land as an 'artefact' or as 'capital' with production and economics the overriding concerns. Farm advisors also reflect this bias towards economic values. The mechanisation in agriculture has tended to produce landscapes with less diversity and less regional variation. Governments have recognized the importance of aiding farmers in production and land protection; however, future policies should reflect a deeper awareness of the man-land interaction.

It has been assumed that the farmer is the best judge of how 'his' resources should be employed. Challenger, (1974) suggests that it is the New Zealand farmer who has the greatest influence in altering the New Zealand landscape. As the issues associated with rural landscapes have become more complicated farmers need more help and guidance to ensure the quality of the countryside is protected and enhanced.

Because landscape perception and evaluation is hard to objectively define and quantify it does not mean that it should be excluded from rural planning decisions.

"Landscapes mirror and landscapes matter. They tell us much about the values we hold and affect the quality of the lives we lead."

CHAPTER TWO: SOIL EROSION IN NEW ZEALAND

2.1 INTRODUCTION

'Normal' erosion processes are an integral part of evolving landscapes. The character of our mountains, hills, plains and coastlines can be directly attributed to erosive forces acting over a millenia.

The Lammermoor Range and downlands.
'Normal' or geological erosion is in a state of dynamic equilibrium with the soil forming processes. Erosion processes remove material from a particular location and deposit this material elsewhere. The transportation, resorting and deposition processes change the physical and chemical properties of that material. Sometimes the new material is lost, at other times it provides the basis for the evolution of highly fertile soils. In New Zealand the processes of erosion have sculptured the landscape and resulted in the creation of a wide variety of soils many of which are the foundation of our agricultural systems.

"Tukua mai he kapunga oneone ki au hai tangi."

"Send me a handful of soil that I may weep over it."
from The Concise Maori Handbook.

Human activities have utilized the land in many instances unbalancing the equilibrium between erosion and soil formation. Throughout the world 'accelerated' erosion has had, and is having, a serious and dramatic impact on the land and its people.

"Surface erosion (sheet, wind and scree) has been recorded on 74% of the South Island and 24% of the North Island. Soil scientists consider that 13.8 million hectares or 52% of New Zealand land is affected by surface erosion."

'Accelerated' soil erosion is a significant feature of our rural landscapes. It is a relatively recent component largely resulting from land use practices introduced with the European settlement. The desire to make the land suitable for pastoral farming techniques removed large tracts of forest and tussock-covered landscapes by felling and fires.

"Soil erosion was not created wantonly but was usually an unforeseen effect of human efforts to obtain a living from the soil. .... Awareness of the extensive effects of soil erosion spread very slowly, but it is now recognized that soil erosion and communities are incompatible and cannot flourish together."
2.2 EROSION PROCESSES

Soil erosion is one of the many processes involved in the complex interrelationships of events that culminate in the landscape we perceive. We can identify and categorize a range of erosion processes each having a unique spatial and temporal character. The significance of erosion as a landscape element will be directly related to the scale of the event and the time frame within which the process occurs.

There are three main types of erosion:

- those where the material is transported en masse.
- those where the material is transported by the wind.
- those where the action of water is the transporting agent.

They can be described separately, although they often occur together or in sequence.

Mass movement involves the downhill movement of entire blocks of soil and rock. It usually has a dramatic impact on the broader landscape due to the large volumes of material that have become disjointed from their surroundings. Earth flows involve movement of soil and underlying material which does not usually destroy the surface cover. Therefore, the significance of this process may not be apparent to the untrained eye.
Flows can have varying depths and occur as a fast event or as a slow process. Debris avalanches are rapid flows or slides on steep slopes which result in long, narrow slip scars; a common feature of the high country.

Mass movement, such as scree slopes, can occur as slow - almost imperceptible - downward movement. Movement en masse also results from a sliding action of surface or sub-surface material. Soil slip is the rapid flowing of soil and subsoil exposing a slip face. It is the most extensive and economically significant erosion process in the North Island where 30% of the land is affected. Earth slips are deeper versions of soil slips; both are a result of ground saturation causing a line of weakness.
Slumps are large movements of rock or unconsolidated material as a unit which rotates down the slope. They are visually dominant features that can rapidly alter the landform.

Wind erosion is a major concern in many parts of New Zealand:

"Some 3.4 million hectares of land in New Zealand is affected by wind erosion, or 13% of our total land area."

Dr. I. Shearer, (1983)
[from J. & B. Mortimer, p.66.]

Wind erosion involves the movement of particles along the surface (creep), bouncing above the surface (saltation), or within the wind stream (suspension).

Large volumes of soil can be removed either through a single event (storm) or over a long period of time. To those not closely associated with the land the significance of wind erosion may go unnoticed. What is often more visible is the measures that have been taken to control it; for example, the windbreaks dissecting the Canterbury Plains.

In 1985 three thousand kilometres of windbreaks were planted in New Zealand.

Aglink 16.

Movement of particles through the action of water accounts for the loss of huge volumes of soil and parent material throughout New Zealand.

Sheet erosion is the removal of a thin layer of topsoil due to the overland flow of a thin layer of water.
When these flows become concentrated into small channels, rills are formed. Vegetation cover may hide the presence of rill erosion; as a result the landscape may appear healthy, putting on a false face of fertility. Rills may lead to gully erosion which has a severe impact on the landscape and once initiated these gullies are hard to stop. Characteristically they are 'V' shaped with steep headwalls, secondary gullies, and fans at the mouth.

Tunnel gully is due to water flowing under the surface, through pipes or tunnels which remove the soil material. This erosion type is common throughout the pastoral hill country but is often underrated because it does not initially form an obvious landscape feature. Once the roofs collapse the gully is exposed and the scale of the 'problem' revealed.

River erosion is of particular concern to those involved with flood control. The banks of water courses are eroded through physical processes involving abrasion (sand, gravel and boulders), and hydraulic activity, and through chemical weakening (corrosion).

"Waterways are the cutting edge of the sculptural process. Every water course is unique in relation to its immediate surroundings, and a primary feature of the landscape character."

Soil erosion processes have varying impacts on the landscape. The clarification of what is 'normal' and what is 'accelerated' erosion is important in order that the health of our countryside can be objectively evaluated. D. J. Painter (1978) suggests that 'tolerable' and 'intolerable' erosion rates on New Zealand farms can be identified to enable management strategies to be developed in accordance with them. The criteria for these rates would undoubtedly have to consider values other than economic.

To an eroded landscape

THE NAKED LAND

by Robin Peace.

Once I was this land, was life,
was the shadow of the hills as the dream of the
clouds

Soft, intimate, woven-over;
a warm pattern of green.
a texture of leaf against branch against trunk
from the stone.

Aue! Listen to me!
I am naked: I am cold:
I have no cloak to cover me:
I cry from the bones of my earth in dismay!
The birds fly over me and mock my ugliness.
The owl and pigeon mark my uselessness.
I can no longer offer them a place to build their nests
nor web their silences
nor hold tired wings
nor be a place which gathers food together...
My cloak was all these things...

Aue!
I am naked: I am cold:
My veins are bruised. My skin punished.
The hooves of great beasts cut my heart.
My flesh crumbles ... falls away
I haemorrhage, bleed and scar.
Your demands are pitiless and I am broken by greed.
See that I die.
See that my shadow falls thinner in your dreams.
Impoverished:
Squandered:
Suilled by lies ...
Know that I die.
Cover me!
CHAPTER THREE: EROSION CONTROL IN NEW ZEALAND

3.1 INTRODUCTION

"While soil conservation itself cannot be considered a separate science, it has aims separate from those of straight-forward economic production of agriculture pastoral or tree production."

L. W. McCaskill (1973) p. 125.

Soil conservation is a pragmatic profession that has adopted measures in response to perceiving the landscape as a 'problem'. This interpretation that there is a condition that needs rectifying, tends to produce a reaction specifically directed at that condition. There is no doubt that the loss of soil is a major concern. However, the wider implications of soil conservation measures such as the visual impacts on the landscape should be investigated and clarified. In order to make wise land use decisions the range of interpretations of this man-land relationship must be incorporated into the decision-making process.

"Perhaps the strength of the soil and water conservation movement in the future will depend on how closely it adapts to the ecological approach, how successfully it aligns itself with the growing interest, in and concern for the environment."


In recent years the soil conservation movement has accepted and benefitted from a wider approach to land use. However, it appears that an overwhelming pragmatism responding to economic values prevails in all spheres from policy through to implementation.
3.2 APPROACHES TO EROSION CONTROL

Since the late 1930's when erosion was described as threatening to leave the country like an 'emaciated skeleton' public sector interests in erosion control have resulted in significant changes to our rural landscapes.

The general objectives of the Soil Conservation and Rivers Control Council (S.C.R.C.C.) [absorbed into the National Water and Soil Conservation Authority (N.W.A.S.C.A.) in 1983] have changed little over the years since its inception in the early 1940's. These objectives are "the promotion of soil conservation, the prevention and mitigation of soil erosion, the prevention of damage by floods, and the utilisation of lands in such a manner as will tend towards the attainment of the aforesaid objectives."

Regional Water Boards throughout the country are responsible for implementing policy laid down by the National Water and Soil Conservation Authority. The Acts they work under are: The Water and Soil Conservation and Rivers Control Act, 1940 plus the 1959 Amendments, and the Water and Soil Conservation Act, 1967, plus its subsequent Amendments. Some Catchment Authorities have extra powers conferred upon them by separate By-laws.

Over the years Catchment Authorities and Regional Water Boards have tended to adopt a 'passive' role by aiding the farmer through research, education, and direct assistance. The approach taken has been to convince the rural community of the advantages to them of soil conservation measures.

"Farmers throughout the world are known to be risk 'overters' which means they are just as concerned with minimising losses as with maximising profits." I. McLean, (1978).

Farmer self-interest has been a significant factor in the success of the soil conservation movement. Subsidies for fencing, earthworks, control structures, revegetation of pasture, establishment of windbreaks, and pole planting, have been the only way to obtain co-operation from many farmers. The N.W.A.S.C.A. and Catchment Boards give advice and specify constraints before approving these subsidies.

Soil conservation plans aim to minimize erosion with the least cost and disruption to the farming operation. In the past factors other than the cost of the scheme, the control of soil loss, and the increase in primary production received scant recognition. These are the main reasons why we have the soil conservation 'recipes' apparent throughout the country.
Erosion has been tackled at the site specific scale (gully control), at the farm scale (water and soil conservation plans), and on a regional basis (regional windbreak schemes). These approaches have had varying degrees of success and impact on the landscape.

Important changes to rural landscapes are due to remedial works such as contouring, pasture furrows, graded banks, broad-based terraces, diversion banks, and debris dams. Undoubtedly the most significant landscape impacts have been through the use of plant materials. Soil conservators are well aware of the importance of vegetation for protecting soil and water values.

"If we are to be serious about erosion then there is little doubt that the area of forests must be greatly expanded."

Planting designs involve species selection and layout and above all, it should reflect the natural landscape patterns. The resolution that certain species have been effective in controlling the 'problem' resulted in a limited range of plant materials for soil conservation. Poplars and willows are two notable species. In the 1984 season 13,200 poles, 734,000 wands, and 1,349,000 rooted trees were planted throughout New Zealand for catchment control. Since the 1960's the Aokautere Science Centre has been involved with research on the selection of trees, legumes, shrubs and grasses, for erosion control.

The recent publication 'Plant Materials Handbook for Soil Conservation, Vol. 3: Native Plants (1986)' indicates changing attitudes to planting design for soil conservation. However, many of these species have yet to be accepted as feasible or practicable alternatives, particularly by those involved with broad scale rural plantings. Conservative attitudes held by the farming community inhibits the species selection and layout so that differentiations in regional and local character are not developed.

"The advocacy and practice of all phases of vegetation control and improvement have proved the key to the amazing restoration..."
"... of vast areas of the New Zealand landscape."

It appears that many of the 'vegetation controls and improvements' have repaired the land (the thin mantle of soil) and reinstated primary production systems; however, the character and quality of the landscape has been altered. I do not advocate the restoration of rural lands to their pre-European condition but suggest that soil conservation works have greater potential to be integrated into the logical, natural patterns of the countryside.

"When we talk of plant materials for erosion control most people in the conservation field think of the treatment of eroded surfaces. This is a gross mistake because control, like the prevention of disease, is best achieved by maintaining a healthy landscape."
CHAPTER FOUR: SOIL CONSERVATION IS A LAND USE ISSUE

4.1 'LAND USE CAPABILITY'

The soil conservation movement is well aware that 'accelerated' erosion is the result of man's misunderstanding about the land and his inability to work within the physical parameters.

"Soil erosion must be considered as a symptom of a social malady of man's failure to adjust to his environment." L.W.McCaskill (1973) p. 145.

The S.C. & R.C.C. recognize that erosion was related to land utilization therefore supported the development of a method of classifying land that would indicate its most suitable uses. In 1952 Land Use Capability Mapping was adopted to provide information on the physical characteristics and conditions of each area of land so that its limitation for use could be identified. The New Zealand Land Resource Inventory (N.Z.L.R.I.) was undertaken in 1973 to provide a set of national standards as a basis for safe land use planning.

Extensive field surveys have produced data on geology, topography, pedology, flora and fauna, and erosion. The N.Z.L.R.I. and associated work sheets, have organized this physical data into units according to limitations and decreasing versatility of use. The Inventory of five physical factors for each map unit area includes information on rock type, soils, slope, vegetation, and erosion (type and severity).

An eight class system (stipulated by the S.C. & R.C.C.) is a land use capability system based on safe primary production. Sub-classes show the kinds of physical limitations; that is, erodibility, wetness, soil limitations, slope, and climate. Land use capability classes group areas with similar use potential; that is, combine areas that can produce similar crops.

"The S.C. & R.C.C. emphasis land use capability surveys are recognized as basic to planning erosion control practices and to the maintenance of production." W.A.S.C.O. 49 (1985)

Other sources are also of invaluable assistance to erosion control planners, e.g. remote sensing aerial photographs, detailed soil maps, and above all, personal experience.

The N.Z.L.R.I. has been criticized for its large-scale and limited soil interpretative data. Personal evaluations of land use capability can reduce the implied objectivity of the system. When referring to the work sheets it is important to consider changes in factors associated with land use. That is, changes in scientific knowledge, technology, and farming philosophies can affect the interpretation of physical data and hence the land use capability. An example of this is the technology that has allowed conservation tillage to safely cultivate soils previously perceived to be unsuitable due to their erosion susceptibility.
4.2 'ENLIGHTENED LAND USE ETHIC'

"The planned treatment and efficient use of each area of land so that its inherent qualities will sustain primary production or other uses in accordance with the multiple use concept are unimpaired and whereby uses of all the areas within the river catchment are balanced for the greatest overall benefit of the land and the people..."


The D.S.I.R. Discussion Paper - 'Land Alone Endures' (1980)(p.8) suggests the following 'land use ethic' to support a range of landscape values:

- to serve the whole person, not just his/her economic needs.
- to manage renewable resources as a sustainable basis and husband and recycle the non-renewable ones.
- to create satisfying and diverse town and country landscapes where beauty has been destroyed - take pains to recreate it.
- to complement production from the land with protection of the land so that degredation, causal damage and ugliness are not accepted as inevitable companions to economic development.
- to seek to prevent the development of urban and rural slums, the pollution of air and water, and the despoiling of soil landscapes.
- to ensure free access to natural landscapes with the myriad recreational and spiritual values which are essential components of our life.
- to leave a landscape which is better for

The Land Use Capability Mapping and subsequent N.Z.L.R.I. were developed to aid those involved in land use to make wise decisions. However, the issues pertaining to land use have become increasingly complex. Multiple values and multiple uses are concepts that need to be incorporated into today's land use decisions. What is meant by 'wise land use' has changed from and emphasis on the physical variables to a process that considers the complexities of different values, landscapes have to us.

"The need of urban man for countryside, for tended countryside, and for wild land, is complex and obscure but apparently very real... It has elements of the spiritual as well as the ecological."

our having been a part of it by enhancing that which is already pleasing, conserving the best of its natural and unique features, and preserving those buildings and places which reflect the heritage of human endeavour.

A. E. Jackman and B. Treeby (Landscape 21) (1982) proposed a 'Total Landscape Philosophy' that would involve "diversifying economic returns for both short and long term benefits whilst improving the ecological health and visual qualities of our present land use systems." They identified three value systems - Economic, Ecological, Ethical. Ethical values are the most difficult to define, therefore these have received scant recognition in land use planning. Ethical values are the expressions of a nation's culture; they embrace both morals and aesthetics. The consideration of these values are linked to philosophies of preservation. Ecological values recognize that all is finite, therefore conservation is their message. In contrast, economic values push for the development and utilization of resources for material gain.

These values are not isolated but have important relationships that the 'Total Landscape Philosophy' would endeavour to identify and incorporate into an enlightened land use planning system.

This dissertation suggests that many of our rural landscapes do not reflect 'an enlightened land use ethic'. There is opportunity for rural advisors and farm managers to adopt a wider approach to land use thereby making a holistic contribution to the character and quality of the countryside for future generations.
CHAPTER FIVE: DESIGNING QUALITY LANDSCAPES

5.1 DESIGN PRINCIPLES

The basis for a wise land use philosophy is to design in harmony with nature. The following design principles provide cues for the optimum use of land for our physical requirements, but, just as importantly, they are the basis for creating environments that will satisfy our less tangible needs.

"There is clearly no blueprint for success but rather a set of principles which, if applied sensitively to each situation will at least ensure that a coherent landscape layout or structure is achieved."


Studies on human perception by S.Kaplan suggest there are four factors universally responded to that provide the means for assessing landscape quality. These are 'empirically based while at the same time intuitively meaningful'.

Kaplan suggests we subconsciously respond to diversity, unity, naturalness and mystery, and when these factors are combined they constitute an evaluation of the visual quality of the landscape.

The key factor appears to be diversity or variety. We positively respond to variety in landscapes as our attention is drawn by interesting and stimulating changes. Diverse landscapes offer a range of options, they indicate the scope for adaptive potential of that landscape. Many perception studies evaluating visual dimensions of beauty have identified the value of contrast and variety in landscapes. [Litton (1968), Weddle (1969), Kiemstedt (1971), McDowell (1971), Newby (1973), Brown (1973) in Zube, et al (1974)]

The uniqueness ratio developed by Leopold (1979) supports the value of landscape diversity to man's satisfaction.

The establishment of trees in rural landscapes provides opportunities for further diversification. The variety of species that can be incorporated into that landscape increases thereby adding to and enriching that particular rural scene.
"The results of many tests involving people's evaluation of landscape scenes suggest that coherence is central to a person's ability to 'make sense' of the environment."


**Coherence** or **Unity** reflects the degree to which the landscape is linked; that is, how each part relates to each other and how the whole landscape 'hangs together' as a cohesive logical pattern. Windbreaks have the potential to be primary linking elements in many of our rural landscapes. They can be sympathetically established as an integral component of a coherent landscape pattern.

**Naturalness** is the degree to which land use and natural patterns are harmoniously integrated. The inherent characteristics of a site should be reflected through the land use systems. Naturalness engenders concepts such as integrity and legibility; that is, the rightness and appropriateness of elements in that scene. Natural elements do not necessarily result in natural landscapes. For example, some rural developments exhibit an insensitivity to specific site conditions. Plants imposed on inappropriate soils, slopes, and microclimates reflect any stress the site dictates through unnatural and unhealthy growth patterns.

**Mystery** is the factor that stimulates us to ask questions about that landscape. It provokes us to explore by challenging our sense of curiosity and it tests our powers of interpretation. Rural landscapes can all too easily be comprehended. The 'short back and sides' tradition based on the belief that if the farm looks neat and tidy it must be well managed, tends to produce uninspiring countrysides lacking in mystery.

The following quote from Zube, et al (1967) is applicable to the New Zealand situation:

"In the face of current increasing administrative and legislative concerns with cost-effectiveness, where is the proof that we (landscape architects) are providing a useful service in identifying landscape beauty? The proof lies in the understanding that the appreciation of beauty is not only desirable but is important in the development of thinking, caring human beings."
5.2 GUIDELINES FOR SOIL CONSERVATION PLANTING

The design of any soil conservation planting should not be considered separately from the development of the landscape scene as a whole. Windbreaks, woodlots and space plantings should be planned and designed in response to the design principles so that the quality of the countryside is enhanced.

Plantings that respond to the variations in topography, soils, and climate, are a primary step towards creating visually satisfying landscapes. The challenge, and what is often seen as a conflict, is to get away from rural landscapes dominated by formal arbitrary patterns. All planting is part of a pattern involving spaces, lines, and forms; these should relate to the underlying landform so that the landscape appears natural, legible and cohesive.
Trees are part of the working rural landscape, therefore their potential value should be recognized in multi-purpose designs. Soil conservation plantings can satisfy soil and water values as well as provide shelter, modify micro-climates, produce timber, fodder and fruits and nuts. They have undisputed potential to enhance the ecological diversity and wildlife of an area. They also form strong elements that can satisfy visual requirements such as the framing of views, screening, enclosing spaces, integrating structures, and enhancing the local character.

Shelter Belts

The basis for windbreaks (shelter belts) is to lift and disperse wind currents thereby reducing the erosive potential of the surface winds. Three factors are involved: the height, the permeability, and the angle of the belt to the prevailing winds.

Windbreak species should be chosen for their desired height as topping invariably produces unnatural and untidy lines of mutilated trees. Optimum permeability is best achieved through species selection and thinning. Side trimming is not recommended because this energy intensive programme results in sharp edges, straight lines, exemplifying man's manipulation and dominance over nature. The permeability is an important factor affecting turbulence, stock camps, and shading, therefore, careful choice of species to determine the density of the windbreak is required.

To avoid an artificial and contrived appearance species mixes should endeavour to contrast in only one aspect (either form, texture, colour, or habit).

Mixes should not be alternated but arranged informally as would occur in a natural system.

* Refer Appendix I
Native plants can add a soft, natural line to the base of otherwise straight formal windbreaks.

Windbreaks of rounded form and soft colour will disrupt the landscape less than dark, dense conifers because they are visually less obtrusive.

Windbreaks can be run with valleys, terraces, swales, waterways, and soil boundaries. This improves both the legibility and the naturalness perceived in the landscape.

The fundamental characteristic of rural landscapes is that they are a function of broad scale land use practices. Therefore, fussy small scale planting designs, using ornamental species are totally inappropriate.
The skyline, or horizon, is an area of visual prominence and often harsh conditions, especially in hilly country. Windbreaks should endeavour to protect the flowing lines of landform and maintain important views. Long straight rows should be avoided, especially in downlands where they contradict with the rounded landforms.

Windbreaks should not be run down terrace faces as this tends to fragment the line of the terrace. Planting should be kept back from the edge of terraces, except where the face has been established in trees. In this case it is possible to link the shelterbelt to the terrace plantings. It is important that windbreaks should not start or stop suddenly in order to maintain a unified cohesive landscape.
Windbreaks often form strong unnatural patterns; this is partly due to an attempt to locate the belt at right angles to the prevailing wind. Wind striking the belt at an oblique angle can accelerate along its length. By reducing the lineal nature of the windbreak through species variation and layout, this longitudinal acceleration can be reduced through deflection and diffusion. The visual consequences are to soften and naturalize the planting design.

Wind funnelling through gateways can be reduced through flexible design criteria.

Wind funnelling down valleys can be broken and deflected by the random groupings of trees (agroforestry) or short lateral windbreaks.
Winds at right angles to the shallow valleys (swales) are best broken by planting on the lee side slope.

Windbreaks should avoid crossing roads at oblique angles as this can produce confusing patterns for the road users as well as when viewed from a distance. It is also desirable to set back all windbreaks from the edge of roadways and for those running alongside the road to allow visual permeability thereby affording views to the surrounding countryside.
Agroforestry

An alternative, and increasingly viable approach to reducing wind erosion potential, is through space planting as part of an agroforestry system.

"Agroforestry, for example, at one hundred stems per hectare, results in a 40% reduction in wind run and creates a park-like landscape."


Cold air drains into valleys

Watercourse protection

Widely Spaced Deciduous

Closely Planted Conifers

Slips and slumps are traditionally approached through space planting usually involving poplars and willows.

Farm forestry has many tangible benefits; however, it also has the potential to create highly manipulated, contrived and ugly rural landscapes.
Space planting can create very strong visual patterns because each tree is apparent yet part of a broader system. The steeper the slope, the greater the visibility, and hence the stronger the effect. Never plant rows, especially wide spaced and at right angles to the contours, as this produces a layered or striped landscape.

Trees should be spaced across the pasture so as to appear a random distribution. The quincux pattern provides a system of layout that is both informal and naturalistic.

Trees grouped and linked in response to site specific variations add diversity and naturalness to the landscape. Clumps of trees can be grown in paddocks, gullies, etc. and protected by individual plastic sleeves or through suitable systems of electric or standard fencing.
Farm forestry systems provide an opportunity to tie the visual landscape together by reducing transitions between land uses. Space planting can bridge the gap between landscape components such as pastures, windbreaks, and woodlots. The transition zones can be a mixture of species of varying densities that reflect and integrate the component parts.

Alternatives

The two-tier system of fodder-shrub and pasture is becoming an increasingly viable option for land use in downlands and arid lands. The softer colours, smaller stature, and rounded forms, provide opportunity for increased visual integration and harmony. Visually prominent terraces and side slopes can absorb the muted colours, fine textures and small-scale of these vegetation types. Existing native vegetation, such as matagouri and manuka, is visually compatible with many of the fodder-shrub species. From a soil conservation and landscape perspective this two-tier approach to land use can only be viewed as making a positive contribution to our rural landscape.

Alternatives include multi-tiered management systems such as forestry, fodder-shrub, pasture approaches. The visual implications of this approach would be similar to the agroforestry (two-tier). However, the wider spacings of the tree species could be softened by inter-planting with visually and ecologically compatible shrub species.

The choice of species is vitally important because their form, habit, colour and texture are visually significant. In most situations, and particularly in downlands, trees of soft texture and colours with open habits, will integrate with the rural character. For example, acacias, ash, beech, chestnut, eucalypts, locust, oaks and walnuts.
Woodlots

Farmland with limitations due to erosion potential may be more appropriately planted as forestry blocks or woodlots. Foresters and soil conservators cooperate in planning and designing woodlots and forestry developments throughout the country. The design guidelines resulting from the principles already discussed in this section, apply to this approach to land use.

In summary, they should:

- be sympathetic and reflective of topography.
- relate to natural boundaries.
- respect sensitive skylines.
- avoid small, patchy woodlots in isolation.
- have species that reflect site characteristics.
- have species mixes that change logically and subtly.
- be part of a planting framework.
- if planted in rows, follow the contours and avoid being obvious.
- avoid cosmetics, colour foliage, and small, fussy designs.
- vary management, e.g. pruning, so that transition trees have a natural shape and are wind firm.
- respect any native remnants. (refer D.Lucas 1984)
SECTION TWO: CASE STUDY
6.1 INTRODUCTION

The Awamoko Downlands were chosen as an example case study because this area has:

- a strongly identifiable landscape character resulting from the landform.

- a range of land uses based on intensive and traditional rural management systems.

- susceptibility to soil erosion, therefore it receives attention from the Catchment Authority and its soil conservators.

It was felt that the character and quality of this rural countryside could be compromised by the establishment of traditional soil conservation plantings that dominate the Plains.

This case study discusses how the present landscape has evolved through physical and cultural processes, noting the role of 'normal' and 'accelerated' erosion. Land use planning and design related to soil conservation is discussed along with the visual implications of erosion control planting.

The visual character and quality is illustrated, described, and evaluated. Broad zones, sensitive areas, important views and positive and negative landscape features are identified. Approaches to land use based on the existing landscape character are proposed in accordance with the principles of visual quality and design outlined in Chapter Five. The conclusion summarizes the effectiveness of this study and its relevance to erosion prone rural landscapes of New Zealand.
LOCATION

South Island - N.Z.

Oamaru
6.2 THE LANDSCAPE - FORMATION AND PHYSICAL PROCESSES

'Normal' erosion processes have been responsible for creating a landform that persists as the dominant landscape characteristic. The North Otago downlands slowly emerged above sea level in the late Tertiary period. This sedimentary strata includes shelly mudstones and sandstones along with the distinctive yellowish brown of the exposed limestone deposits. Descending from the Kakanui Mountains the inclined slope has been dissected and sculptured into the mature hills of North Otago. The tablelands and associated downlands include varying combinations of loess overlying the soft sandstone, uncremented gravels, and conglomerates. The gently rolling, to undulating country, with slopes ranging between 5° - 15° are cut by short, narrow valleys.

The Awamoko Gorge is a major landscape feature with its exposed and sculptured limestone bluffs and outcrops. The river snakes its way through the tablelands and emerges via a series of terraces that have been successively planed from the valley sides by the Waitaki River.

The region has volcanic remnants such as the Tokaraki tableland that are significant landscape features. In the north-eastern sector the Waikoura catchment forms an arid, underlating to sleepy rolling, landscape.

Climate is a fundamental component of the landscape with particular relevance to the processes of erosion. The climate of the Downlands is governed by the prevailing wind systems. These arrive from the north-west, but as one moves towards the coast the north-east predominates. Most of the rain arrives from the south-west quarter, falls often being erratic and localized. Flood-producing storms are associated with south-east, or stationary fronts. The north-west (föhn) has low humidities and a persistence during the spring and autumn that can have desiccating effects. Major seasonal and daily temperature fluctuations are common, and during the winter cold air draining off the mountains (Kakanuis) can depress temperatures in the valleys.

River flows of the Awamoko, and other tributaries, are considerably variable. They can drop to one-tenth of the average annual flow during the frequent droughts.

Most of the Downland soils are derived from loessal, alluvial and glacial deposits. Therefore they are a product of 'normal' erosion processes. The wind and water borne parent material forms the basis for Downland soils. Most of the soils are moderately to highly fertile yellow-grey earth which are susceptible to moisture deficiencies which is their major limitation for use. Some of the wetter sites in the river valleys have low fertility soils whereas highly fertile (rendzina) soils occur in locations on the limestone outcrops.
Many archeological sites occur amongst the limestone formations of the Downlands. The Maoris did not settle in the area but left some vivid reminders of their passing through by rock drawings and artifacts.

The first European settlers arriving in the 1850's saw the Downlands clothed in native grasses and tussocks. Thickets of fern, tutu, matagouri, flax and cabbage trees, clung to the gullies, and occasional kowhai trees added a splash of colour during springtime. Fire proved an effective tool in clearing most of this unwanted vegetation thereby increasing the amount of land available for pastoral farming. It also led to the initiation and acceleration of soil erosion processes.

By the turn of the century the phenomenal demand for land was partially satisfied when many of the large estates, within and adjacent to the Downlands were forced, or encouraged, to subdivide. Apart from English grasses and sheep, the land was found to be suitable for cereal crops, especially wheats. Since the 1920's the most noticeable change has been the growth of trees, predominantly conifers. More recently shelterbelts and small woodlots are asserting themselves upon the landscape.

Today the Downlands support medium-sized farms under freehold titles that run either sheep and/or cereal crop operations. Aerial top-dressing, over-sowing, subdivision fencing, are some of the management practices that have intensified land use and stabilized erosion-prone soils. Lucerne as a drought crop has increased stocking rates, as has knowledge about animal health relating to parasites and mineral deficiencies.

The local Catchment Authority (Waitaki Catchment Commission) considers many farms in the Lower Waitaki to be too small to physically and economically sustain the farming methods practiced. As a result, over-grazing and, over indulgence in cereal cropping has led to severe losses of productive soil. Gale force winds, predominantly from the north-west, but also from the south-west, can cause significant soil losses on the land that has been cultivated and exposed to the elements. These soils are also susceptible to water erosion processes resulting from high intensity rainfalls. Bare soils on slopes less than 8° are very susceptible to sheet and rill erosion, which can lead to minor gullying in spite of stable grass covers. Loess soils on steeper sites are prone to slips, gullying, and tunnel gullying. Severe streambank erosion can occur due to flooding. The use of protective vegetation can stabilize the banks; however, this must not encroach on the water channel and hinder flow.
The Waitaki Catchment Commission has undertaken land use capability mapping of the Aramoko Downlands which has helped to identify the following points.

The whole of the Downlands is considered to have potential for forestry operations. Much of the Tablelands and Downlands are capable of sustaining rotational crops and/or intensive grazing. Intensification of land use through fodder and cereal crops is a feature of the gently rolling to undulating lands.

As in the United Kingdom, New Zealand farmers: "operate in a policy context that encourages them to expand output whilst placing a premium on technological sophistication." R. Munton, (1983) p.307.

The side slopes and the Tokarahei Tableland are suitable for grazing and are presently clothed in silver fescue, tussocks, and grasses. The Waikoura Catchment has medium to low producing pastures, with patches of short tussock associations persisting along with patches of gorse, broom, and matagouri. Within the Awamoko Valley small areas are considered to be capable of sustaining semi-intensive horticultural development.

Slipping side slopes of tableland.
N.B. Landuse ≠ natural patterns.
Regional planning is undertaken by United Councils and the Awamoko Downland may lie within the Aorangi Region when this issue is resolved. District planning is the responsibility of the Waitaki County Council, which can directly influence land use by defining and guiding resource allocation and management. District Planning Schemes are the most suitable mechanism for the protection of landscape values. The Waitaki Catchment Commission is the Regional Water Board responsible for carrying out N.W.A.S.C.A. policy, managing and making decisions on land use related to water and soil values.

"The Waitaki Catchment Commission provides for a series of works to be undertaken on farms that will have soil and water conservation benefits and where costs will be shared by the State. It prefers to deal with the whole property rather than the single jobs and catchment control schemes to property development." The Commission aims to cooperate with other agencies to maximise benefits of its soil and water conservation works.

"The Waitaki Catchment Commission operates the Soil Conservation Council's policy for the establishment of windbreaks to 'combat wind erosion.' In the past these plantings have generally taken the form of rows of Radiata pine or Corsican and Pondorosa pine." Waitaki Catchment Commission II (1984) p.164.

The Commission operates two nurseries that provide plant material suitable for soil and water conservation purposes. They list seven species suitable for shelter in the downlands: Corsican pine, eucalyptus (white Ash), Leyland Cypress, Himalayan Cedar, Ponderosa Pine, Radiata Pine, and Spanish Fir. They also have a list of ninety 'amenity' species and thirty trees suitable for honey production.

Shelter-belts established by the W.C.C. are designed to maximize protection from the north-west wind. If shelter-belts are designed to provide protection from other sources, the rate of subsidies is reduced and sometimes removed altogether.*

A change in shelter-belt design to satisfy multiple objectives is acknowledged. These uses include - cropping (timber, fruit, nuts), visual enhancement, stock shelter, reduction in wind erosion, stabilisation of river banks, recreation, ecological, wildlife, and honey production.


The W.C.C. sees small-scale forestry enabling farmers to diversify and notes that this will bring changes to the landscape. It also sees potential soil and water conservation and economic benefits in space plantings allowing agricultural and pastoral land uses as a second tier.

*Refer Appendix II.
The Commission encourages farmers to use cultivation techniques that assist with erosion protection; these include conservation tillage. This has relevance to the Downlands where the variable topography reduces the efficiency of windbreaks. The W.C.C. makes grants available for the stabilisation or protection of gully erosion, mass movement, and localized erosion; small slips or tunnel gullies are mostly planted with poplar poles while large-scale gully erosion would be stabilized by block-planting of pines, eucalypts, and Douglas fir.
6.5 'TRADITIONAL' APPROACH TO SOIL CONSERVATION PLANTING

I have reviewed a number of Soil and Water Conservation plans (S.W.C.P.) for properties throughout the Downlands. The design and conditions set out in these plans have a similar format as outlined below:

- where possible any programme of soil cultivation must incorporate techniques known to minimize the risk of wind erosion.
- windbreak fencing must be maintained to exclude stock.
- all trees which die must be replaced in the following planting season at the cost of the landowner.
- must be managed by pruning the sides, trimming to maintain permeability.
- trees harvested on maturity must be replaced.
- trees must not be topped.

Windbreak designs have similar layouts producing straight, narrow lines with sharp ends. It is one of the objectives of total farm plans to provide a connected system of shelter; however, the points of linkage invariably form sharp, angular junctions.

The designs allowed some degree of flexibility in species selection. Most proposed one tall growing shelter species and up to four rows in total or one row each of a fast and a slow growing species, e.g. P.Radiata and C. Arizonica. (Refer Appendix III.)

A recent design proposed one row each of Eucalyptus Nitens (shining gum), C.Arizonica (Arizona Cypress) plus one row of Cortaderia Selloiana (pampas) and Phormium Tenax (flax).

In an attempt to provide protection from the north-west and south-west a proposal included a series of shelterbelts running along the cliff tops in a complimentary and perpendicular direction to the ridge-line plantings.
Works to control erosion from slips and slumps involved protection forestry eligible for subsidies under the Forest Encouragement Grants Scheme. Examples of this type of design include plots of Douglas Fir and Pinus species. These plots have sharp edges due to the single species being pruned and a limited response to the natural patterns. Gully control is approached by space planting (poplars, Eucalypts and willows) randomly laid out with little flow-on effect. The visual impacts of many of these plantings are significant mainly due to the lack of cohesion and unity with the natural patterns. Often each conservation work appears as an isolated component with its 'neat' sharp straight lines and edges. The limited range of species does not reflect a multiple use, multiple value approach to land use. It appears that many of the plantings are viewed as a relatively short-term economic venture. Avoiding topping is seen as a positive contribution towards a natural landscape, however, side trimming must be considered a strong detracting factor. Species mixes, e.g. Conifers, Eucalypts and flaxes, are both visually confusing and ecologically unsound. S.W.C.P are at an effective and practicable scale, however for landscapes of visual quality to evolve fencelines and farm boundaries, must not be seen as the end point for planting developments.
1 Awamoko Tablelands
1a Tokarahi Tableland
2 Kokoamu Basin
3 Awamoko Valley
3a Tokarahi Sub-unit
3b Central Gorge
3c Lower Valley
4 Waikoura Downlands
The study area has been divided into units that have a recognizable landscape character and quality. The overriding factor in determining these units is topography; land use and vegetative cover are considered as major but secondary factors in determining these units.

Unit 1: The Awamoko Tablelands

The 'Tablelands' unit refers to areas that tend towards a horizontal profile. The land may be gently rolling but the overall character is one of a flat and uplifted landform. Towards the Kokoama Basin the side slopes drop gently; elsewhere the edge of the Tableland is more clearly defined by a noticeable changing gradient that can develop into short, steep terrace faces and bluffs. Viewed from outside the unit it is the horizontal skyline that is particularly vulnerable to visual disruption.

The more recent conifer shelterbelts forming sharp, unnatural lines, are detracting elements whereas the older groups and lines of trees appear somewhat absorbed into the landform. Time has rounded and reduced the formality of these plantings so that today some offer a positive contribution to the diversity of this landscape.

From within the unit views are expansive and panoramic. Towards the north-west the distant horizon is formed by the profile of the mountain ranges. In places shelterbelts adjacent to the roads have screened the views. Future planting should be developed with an awareness of these views, especially those towards the Awamoko Gorge. This Gorge takes a definite slice from the centre of the Tableland and its importance to the character of the district demands that it be evaluated as a separate unit.

View south-west into Awamoko Gorge
Land uses include extensive areas of cereal cropping which provide strong seasonal contrast that make a positive contribution to the landscape by increasing the degree of diversity. Views across the field misrepresent the topography by hiding the gullies and even the Awamoko Gorge. There is potential to clarify the landform by planting appropriate species in these valleys and depressions.

View south across the central Tablelands - N.B. Hidden Awamoko Gorge.

Sub-unit 1 (a)

The Tokarahi Tablelands

This sub-unit has been defined because it forms a distinctive 'tongue' that drops sharply on the west, south, and eastern sides. It is the most elevated and therefore exposed unit within the Downlands. Land uses tend towards an emphasis on pastoralism; however an increase in cropping is a future possibility. This would require an increase in protection, possibly through the linking of the existing fragmented shelterbelts.

Looking west to profile of Tokaraki Tableland and beyond towards Dansey Pass.
Unit 2: Kokoamu Basin

This very soft and gently rolling landform is rarely broken, or disrupted, by man's additions. Therefore it has both a strong natural and cohesive quality. The land uses are on a scale 'in keeping' with the undulating landform. The odd trimmed and lineal windbreak stops the flow and arrests the eye. Nevertheless it is a very open landscape with the horizontal tablelands forming a low and unbroken horizon on the south-eastern quarter. In the remaining quarters the views extend to the distant ranges and the river flats of the Waitaki River.

Cropping and pastoral systems flow with the land adding subtle contrasts in colour and texture to the surfaces. The temporal changes provide a diversity that is exemplified by the changes in lighting (nor'west season).

Unpainted farm buildings are detracting elements, especially those sited in the open as their colours, lines and form contradict with the soft, rounded setting.

The quality of this gentle landform and open spatial character is vulnerable to change through intensified land use practices. (Conservation planting).
Unit 3: The Awamoko River Valley

The Awamoko River descends from the Kakanuis and takes a meandering course through the Tableland before cutting out to the terraces of the Waitaki River. The river valley has been divided into three sub-units: the Tokaraki Valley, the Gorge, and the Lower Valley.

Sub-unit 3 (a)

The Tokaraki Valley relates to the flat-bottomed valley, with steep to moderate slide slopes, that extends south of the small cluster of buildings located at the crossroads of Tokaraki.

Strong contrast is provided by forestry operations on the valley sides, yet this diversification has not detracted from the unit because its scale and layout illustrates an attempt to integrate with the valley and its side slopes. Planting of windbreaks on the horizon (the Tablelands) detracts from the visual quality as does the sharp, straight, unnatural lines of poplars. Below the crossroads sympathetic contour cultivation is undeniably a positive feature, demonstrating man's ability to work in harmony with nature. These soft-flowing lines clearly respond to and reflect the underlying landform as well as protect the impressive limestone formations. Small clumps of willows give us some indication as to where the water course is; however, an increase in this and similar vegetation could unify the river as a feature thereby improving the legibility of this landscape.
Unit 3 (b)

The Awamoko Gorge itself does not start or finish clearly but includes several identifiable features that can be linked with the character and quality of the district as a whole. Its unique character is due to the limestone walls that rise vertically from the flat-bottomed valley thereby defining this relatively lineal enclosure. These walls form sedimentary bands that reflect the geological processes involved in the creation of the Tablelands. Wind and water has sculptured and eroded these faces and the light plays upon the multi-coloured, multi-textured surfaces.

The water-course has not been tamed (straightened and stop-banked); it seems to meander through the pastureland with the aid of the mature willows. In places native shrubs cling to the base of the cliffs and soften the edges without reducing the scale of the wall.

The road to Dansey Pass from Oamaru passes within the top section of the Gorge; however, the lower section is physically inaccessible as it lies on private land. As an enclosed space the Gorge has a powerful quality that should not be undermined by planting from within and especially by planting along the highly sensitive skyline ridge. Soil conservation plantings should endeavour to respect the character of this vulnerable unit.
Unit 3 (c)

The Lower Basin is similar in character to the Kokoamu Unit; however, its steeper slopes increases the degree of visibility and spatial enclosure. Like the Tablelands, land uses include cropping and pastoralism that provide a patchwork quilt effect not so apparent on the flatter land. This is a productive landscape that seems to lack an identifiable cohesive framework. The new plantings (windbreaks) do not, at present, improve the natural-ness or unity of the unit.

The thin, straight lines of the conifers seem to dissect the rolling landform, whereas the mature trees have become rounded and subdued. River protection works include straightening of the water-course and willow planting to protect the stream banks. At present the immaturity of the willows exemplifies these manipulations. An increase in unity and cohesion could be achieved by increased planting delineating the conservation works through fingers of vegetation that extend laterally into adjacent swales or connect to the existing plantings.

Unit 4: The Waikoura Downlands

This is a distinctive unit due to its steeply dissected topography but also because the land uses have had only a subtle effect on the surface texture due to changes in vegetation cover. The Unit is roughly defined by the Waikoura Catchment which drains through the intricate and irregular system of steep-sided gullies and valleys. The horizon forms a slightly undulating to horizontal profile. This belies the rolling ridges with their steep slide slopes dropping into the water-courses.
Man has not introduced any visually disruptive elements into this simple, uniform and relatively naked landscape. These Downlands have a very low visibility rating. This means that most of the Unit cannot be seen from the surrounding areas as well as from within. The Unit is susceptible to visual disruption if future planting does not respond to the natural patterns (topography) and uniformity in character (vegetation).

Vulnerable Area (Terrace Faces)

A highly visible and vulnerable aspect of the Downlands is the skyline ridge apparent from State Highway 83. This study does not consider this area as a separate unit but recommends that land use on and adjacent to these side slopes should be developed in recognition of the dominant aspect and sensitive profile.
6.7 LANDSCAPE RECOMMENDATIONS

The following recommendations are intended to enhance the visual quality of the Downlands as well as fulfill soil conservation requirements by developing a diverse and cohesive landscape. (Refer Sections 5.1 and 5.2)

It should be noted that the effectiveness of windbreaks in Downlands is debateable because the wind currents can be unpredictable and variable.

A naturalized shelter system would maintain areas of open space suitable for intensive cropping and grazing. Techniques known as 'conservation tillage'; that leave the soil structure more intact, therefore less erosion-prone, are advocated for those 'spaces' created. The coordinated framework of shelter could improve the legibility and reinforce the cohesion of the landscape.

These approaches suggest the utilization of a wide range of species to reflect and respond to the variations and site conditions thereby enhancing the degree of naturalism in the Downlands. Individual tree protection and electric fencing allows corners to be rounded thereby softening inappropriately sharp edges.

Short term tree crops could be a component of the comprehensive shelterbelts; however, the slower growing species are considered important in providing a stable long term framework. The opportunity to utilize the long and short term benefits of coppice systems should be appreciated. Due to the visual character of many coppice species (deciduous, muted colours, and rounded form) they are considered appropriate to harmonize with the character of the Downlands. From a soil conservation perspective the rooting zone of coppice species that is maintained has ongoing land stabilizing benefits compared with post-harvest root decay of single stand crops.

A comprehensive shelter system is advocated for the Kakoamu Basin, the Lower Awamoko Valley, and the cultivated areas of the Tablelands. The density of the shelter system would vary in accordance with the range of scale and unity. This means that the Kokoamu system would be more extensive offering wider vistas, larger fields and broader patterns. The Lower Awamoko would exhibit a smaller scale of patterns reflecting the drainage systems leading into the Awamoko. The Tablelands system should make the most use of the small gullies and swales to enhance the underlying character. The network of shelterbelts should be kept back from the edge of the Gorge as well as allowing spaces to provide selected views from the roads.
Farm Forestry is advocated for the areas incapable of sustaining intensive cultivation. This includes significant parts of the Downlands such as the Tokarahi Unit and particularly the Waikoura Unit. The canopy of space planting would lift and hold the wind above the surface while the rooting zone would bind and protect the surface from slipping and slumping. The layout of these systems require careful consideration (Section 5.2); random planting, or the quincux pattern is considered an essential design criteria. Varying the spacings and species to reflect natural patterns avoids creating a monotonous vegetation cover associated with extensive forestry operations.

As discussed and illustrated in the Design Guidelines alternative multiple land uses include three-tier forestry, fodder-shrub and pasture systems. These are considered appropriate for most of the areas suggested for farm forestry systems, but have particular relevance to the Waikoura Unit and the side slopes.

The two-tier fodder-shrub and pasture has visual qualities that suggest it is appropriate for the side slopes and arid terrace faces.

Woodlots can enhance and develop the landscape character by responding to landform through species changes, reflected in height, colour, texture, form and habit, extending the degree of naturalism. Woodlots are most appropriate on the side slopes and adjacent gullies within the Tokarahi Unit and throughout the Waikoura Unit.

Linkages between these systems within the Units and beyond, is an integral and vitally important design consideration. The naturalized shelter can flow into farm forestry systems and link directly or through subtle species changes with the woodlots.
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</thead>
<tbody>
<tr>
<td>1. Awamoko Tablelands</td>
<td>Cropping and Grazing</td>
<td>'Comprehensive' Shelter</td>
<td>Cohesion and 'Legibility'</td>
<td>Maintain temporal character (seasonal changes) - protect 'Tableland' effect (horizontality - provide open spaces and maintain selected views - protect vulnerable skyline ridges. (edge of Gorge.)</td>
</tr>
<tr>
<td>1(a) Tokarahi Tablelands</td>
<td>Cropping and Grazing</td>
<td>As above</td>
<td>As above</td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two-tier agroforestry</td>
<td>Variety and Cohesion</td>
<td>Diversify through species and design layout. (Naturalism).</td>
</tr>
<tr>
<td>2. Kokoamu Basin</td>
<td>Cropping and Grazing</td>
<td>Comprehensive Shelter (wide-spaced, rounded, planting.)</td>
<td>Unity</td>
<td>Maintain openness (large fields); Protect views and rolling landform. Maintain temporal character (seasonal changes).</td>
</tr>
<tr>
<td>3(a) Tokarahi Valley</td>
<td>Predominantly Grazing</td>
<td>Woodlots and farm forestry on side slopes.</td>
<td>Diversity and Naturalness</td>
<td>Variety in species reflecting natural changes yet tied into a cohesive framework.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fingers of shelter in valley floor.</td>
<td>Legibility</td>
<td>Connections to side valleys and central watercourse.</td>
</tr>
<tr>
<td>Landscape Unit</td>
<td>Existing land use</td>
<td>Landscape Recommendations</td>
<td>Dominant Design Concerns</td>
<td>Implications for Character and Quality</td>
</tr>
<tr>
<td>----------------------</td>
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<td>----------------------------------------------------------------</td>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3(b) The Awamoko Gorge</td>
<td>Grazing</td>
<td>Increase planting adjacent to water course.</td>
<td>Legibility (naturalism)</td>
<td>Protect the views from the road. Maintain lineal, spatial enclosure. Clarify path of river. Maintain visual dominance of limestone formations.</td>
</tr>
<tr>
<td>3(c) Lower Awamoko Valley.</td>
<td>Grazing and Cropping</td>
<td>Comprehensive shelter linked to farm forestry. and occasional woodlots.</td>
<td>Diversity</td>
<td>A variety of species and layout reflecting natural variations. A range of spatial enclosures integrated with the drainage patterns.</td>
</tr>
<tr>
<td>4. Waikoura Unit</td>
<td>Extensive Grazing</td>
<td>Farm forestry - two- and three-tier systems.</td>
<td>Unity</td>
<td>A cohesive vegetative cover linking the complex drainage patterns. Subtle species variations reflecting site conditions. Unified cover maintaining broad scale spatial character.</td>
</tr>
<tr>
<td>Vulnerable Area</td>
<td>Grazing</td>
<td>Three-tier farm/shrub forestry; Two-tier fodder/shrub grazing.</td>
<td>Naturalism</td>
<td>Rounded forms and soft colours protecting horizontal landform.</td>
</tr>
<tr>
<td>(Terrace Faces)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.8 CONCLUSIONS

The Waitaki Catchment Commission is aware of the multiple use potential of the plantings for which it is involved. It is also aware of the values other than economic such as protecting the landscape character and scenic quality. To date the erosion control plantings on the Downlands have not illustrated a flexibility and design enhancing the diversity and visual quality of the rural landscape. At the present stage the Awamoko appears as a relatively 'young' and 'manicured' rural landscape. With an increase and diversification in planting a chance exists for the Downlands to evolve into a more stable and visually satisfying environment. This will partly depend on the advice the farmers receive and therefore I consider soil conservators to be an avenue for influencing rural attitudes about the visual values of landscape.

These recommendations are made in a broad scale context; that is, district landscape planning. It is acknowledged that the most effective way to influence the 'nature' of our landscapes is to become involved in design at a smaller scale. Single farm developments that can evaluate the site variations and physical characteristics (including visual) are considered to be the most effective way to resolve design issues.

The Awamoko Downlands is a rural landscape susceptible to erosion predominantly resulting from the forces of the wind. Nevertheless, it is felt that the design principles and guidelines illustrated in this case study have national significance. Farm development and erosion control schemes throughout the country, and especially downlands susceptible to wind erosion, can benefit from the ideas discussed and recommendations proposed.
SECTION THREE - SUMMARY
SECTION THREE - SUMMARY

Soil conservation plantings have had significant visual implications for the character and quality of our rural landscapes. The perception of erosion as a critical 'problem' led to legislation, policies, and plans that show a sensitivity to the capability of the land for primary production. It also drew reactions to land use that were problem-solving developments. Catchment Authorities are faced with increasingly complicated decisions as our knowledge and awareness of landscape expands. Values other than soil and water must be considered in land use decisions. The legislation does have a broadly stated goal "to enhance aesthetics through control of water quality, erosion, ...." However, to directly support and control multi-purpose plans that have objectives other than the protection of soil and water values is at present beyond the jurisdiction of the Soil Conservation Movement. Therefore, it is important that land use decisions are directed by multi-disciplinary teams in which soil conservators would play a vital role.

This Dissertation has endeavoured to provide information relating to landscape values (visual aesthetics) that appear to have received little recognition in rural development decisions in the past.

The farmer makes the final decisions; however, this dissertation recognizes that the advisor has an important role in influencing their attitudes to the land.

In order to improve the quality of our rural landscapes, changes to agricultural policies may be required. The landscape architect has a valuable contribution to make towards the planning process and through public education, and their involvement in land use decisions.

Financial and resource oriented incentives may be required before rural land use practices reflect a holistic approach to the landscape. (Refer Q.E.II Covenants). As in the United Kingdom "Demonstration Farms" may be the only way to illustrate the viability and benefits of an 'extended' approach to rural land use decisions.

Our rural landscapes are not merely financial assets - they can provide the stimulation and inspiration so necessary to imagination and creativity from which flows the ideas which sustain existence." (C. Anstey 1979).

"Haha te whenua, haha te tangata."
"In a desolate land, man is deserted."
(The Concise Maori Handbook.)
APPENDIX 1

(FROM MORTIMER 1984)

Diagrammatic representation of wind flow through a permeable barrier (top) and an impermeable barrier (below).

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Distribution of zones of shelter at ground level, expressed as a percentage reduction of the wind velocity in the open. h - sheltered height. A — zones of shelter for belts of maximum density throughout their height. B — zones of shelter for belts of medium density throughout their height.
Isolated Work.

40% Windbreaks on defined wind erosion prone soils for properties unlikely to be covered by an acceptable regional windbreak scheme.

60% Works implemented through a comprehensive soil and water conservation plan for a property.

60% Windbreaks within district-regional windbreak schemes approved by NWASCA and established as part of a plan for the whole of a defined area and the properties within that area.

70% Destocking of Class VIII and associated severely eroded Class VII land by fencing and/or the provision of alternative grazing for stock numbers displaced.

70% Works implemented as a part of a catchment control scheme. Scheme works shall not include on-farm works of more immediate benefit to the individual property owner.

50% For C.A.'s setting up an initial main nursery or replacement due to silver leaf, poplar rust, disease etc.

50% Establishment of large extensions of C.A. nurseries. Excludes capital costs of land and plant but includes plant hire rate, rent of land, interest etc for two years.

Note: Charge-out price for poles etc must be high enough to cover costs as if no assistance had been granted. Proceeds to be funded for further nursery extensions. In time, nursery extensions will thus be financed without assistance.

Notes:

(1) Development is defined as: Use of urban or rural land primarily for residential, commercial or industrial purposes.

(2) Utility is defined as: road, railway, airport, areas administered by a ports authority, bridge, culvert, communication system, electricity transmission system, pipeline, reservoir, water supply reserve and structure, hydro generation structure etc.

(3) Rural is defined as: land used for primary production, zoned rural within the district scheme, including land alienated for reserves.
Points to note in subsidy rates are:

(i) The Rates quoted are current at the time of writing however they can be subject to change and advice should be sought from the Commission when you are considering works.

(ii) Currently the Commission charges a service fee of 25% on the total cost of works to cover overheads associated with the approval process and including the preparation of works, plans, supervision and inspection of works.

This charge is payable by the applicant, it is however subject to the appropriate rate of subsidy applicable to the approved works. Payment of this amount to the Commission is usually effected by deduction prior to payment of subsidy by the Commission.

This has an effect on maximum Rates of Grant per $100.00 of cost and property owners can budget to receive the following percentages for actual "on farm" cost of works.

Note: This is calculated on a 25% service fee which can be subject to change and advice should be sought from the Commission when you are considering works.

<table>
<thead>
<tr>
<th>Maximum Rate of Grant</th>
<th>Net Grant After Deduction of Fees per $100</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>$12.50</td>
</tr>
<tr>
<td>40%</td>
<td>25.00</td>
</tr>
<tr>
<td>50%</td>
<td>37.50</td>
</tr>
<tr>
<td>60%</td>
<td>50.00</td>
</tr>
<tr>
<td>70%</td>
<td>62.50</td>
</tr>
</tbody>
</table>

11/84
RECOMMENDED DESIGN FOR:

SINGLE ROW SHELTERBELT

ERODING WIND

Permanent Stockproof fences either side

Fan pruned or side trimmed to maintain permeability & stability

WIND

Permanent Stockproof fences either side
Four major soil types occur over this property:

(i) Avamoko soils. These are young floodplain soils and vary in texture from silt loams through to stony variants. The majority of the soils in this area are shallow fine sandy loams to silt loams.

(ii) Harapa and Harapa Hill soils. These are yellow grey earths with a developed frasipan. The main soil over the property is the fine sandy loam, rolling phase. Hill soils are fine sandy loams with a southerly aspect where slope processes have not, as yet, eroded the loess mantle.

(iii) Oamaru Hill soils. They are southern rendzina soils derived from hard massive limestone. Limestone is found at shallow depths i.e. < 45 cm. They are either stony clay loams of shallow silt loams. The former may have rock outcrops and the latter an admixture with loess.

(iv) Karu Hill soils. They are clay alluvial yellow grey earths derived from shallow loess overlying sandstone. The upper horizon(s) i.e. < 45 cm, are derived from loess. Both fine sandy loams and silt loams occur.

6. MANAGEMENT

It is planned to run this block in conjunction with the adjacent home block. This will lift the carrying capacity by 800 to 900 stock units. There are no plans for cereal cropping but some greenfeed crops will be grown. Pasture renewal by direct drilling is planned.

7. PREVIOUS WORKS

No previous soil conservation works are recorded.

8. EROSION PROBLEM

This property is exposed to gale force winds capable of causing wind erosion when cultivated. The Karu Hill soils are prone to earthslips and slumps. The slumps may be landform features or more active erosional forms.

9. CONSERVATION PROPOSAL

It is proposed to establish 3.6 km of windbreaks. If earthslips and slumps become active in the Karu Hill soils then space planting will become needed to stabilise these slopes.


TANE, H., Forest Farming. From the Planning Services, Twizel.


WASCO, L.38 Native Plants for Lowland Soil Conservation.


