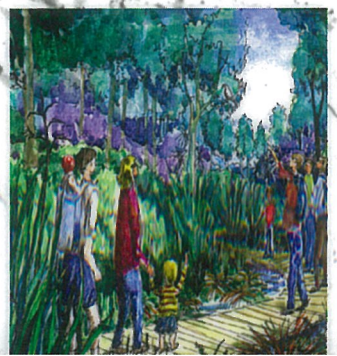
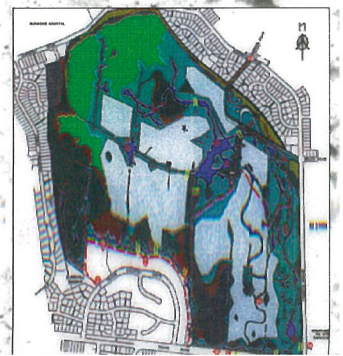
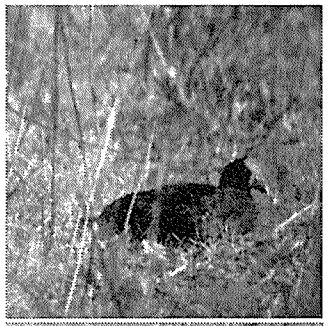
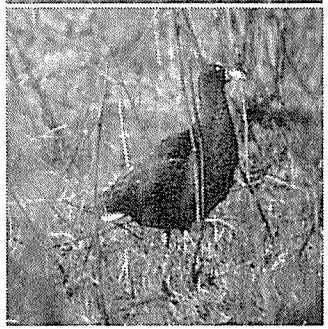
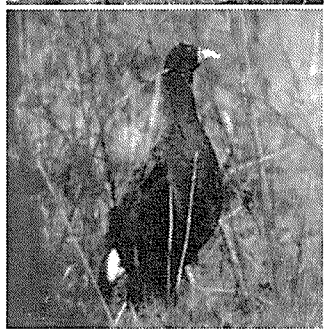
$8.00
incl. gst

Travis Wetland Nature Heritage Park

Landscape Development Plan





Summary

Travis Wetland is an urban park with significant natural and cultural heritage values. It was purchased by the Christchurch City Council in two stages, the latter in July 1996. The purchase was made largely at the instigation of the Travis Wetland Trust who espoused the values of the wetland, both present and potential.

At present volunteer and Council funded wetland management activities are taking place both in terms of planning and on site. At the same time there is some pressure to permit public access in order to justify public expenditure. In order to assure the integrity of sensitive features of the wetland and to efficiently manage the site, an immediate coordination of activities is required.

It may be a number of years before legal and financial questions of the expressway designation, funding and the date of vesting the southern half of the wetland as reserve are finalised. The preparation of a management plan is dependant on the resolution of some of these unknowns and will incorporate any later changes in management deemed necessary by the Travis Wetland Technical Liaison Group and Parks Planning. These two teams consist of Council officers and two representatives of the Travis Wetland Trust. The Landscape Development Plan will constitute the bulk of the future management plan.

The Landscape Development Plan was written to provide direction for the coordinated restoration and enhancement of the wetland over at least the next 10 years. The Park's objectives are centred on preserving and enhancing the wetland for the benefit of future generations. Priorities have been formulated to best achieve the mix of human use and ecosystem preservation objectives.

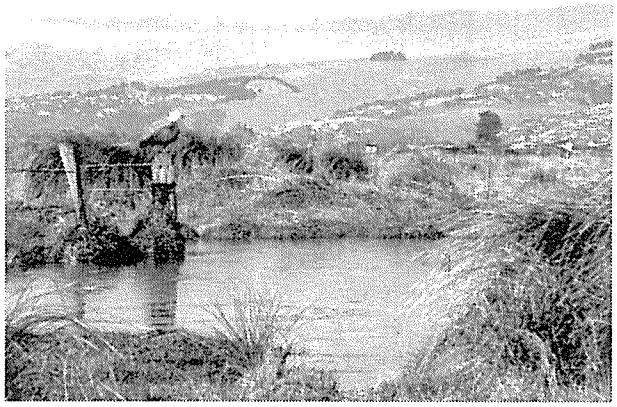
Although this document is designed to be a comprehensive guide it does not necessarily purport to be the ultimate solution to the question of management of Travis Wetland. Because of the uniqueness of the site many technical and ecological unknowns exist; experimentation will therefore play a role in the Park's management.

The preparation of the current draft has involved consultation with the Travis Wetland Trust and has incorporated comment from numerous Council and independant specialists including; Colin Meurk: ecology, John Walter: hydrology, Alan Cutler: landscape design, Kelvin McMillan: parks planner (all Christchurch City Council), Andrew Crossland: ornithology, and Rod Mcfarlane: entymologist. Comment and advice has also been received from Landcare Research, NIWA, DoC and interested parties such as the Canterbury Geographical Society, Christchurch-Otautahi Agenda 21 Forum and local residents. Ngai Tahu have clearly indicated they support the wetlands protection.

A marketing document is currently being developed by the Travis Wetland Trust in association with the Council and will be used to complement the Landscape Development Plan as an aid to gaining sponsorship and for general publicity.

Travis Wetland Nature Heritage Park is an exciting project which will provide interest and enjoyment for generations to come.

Paradise Shelduck.



Paradise Shelduck near proposed Kahikatea swamp forest.

Document Structure

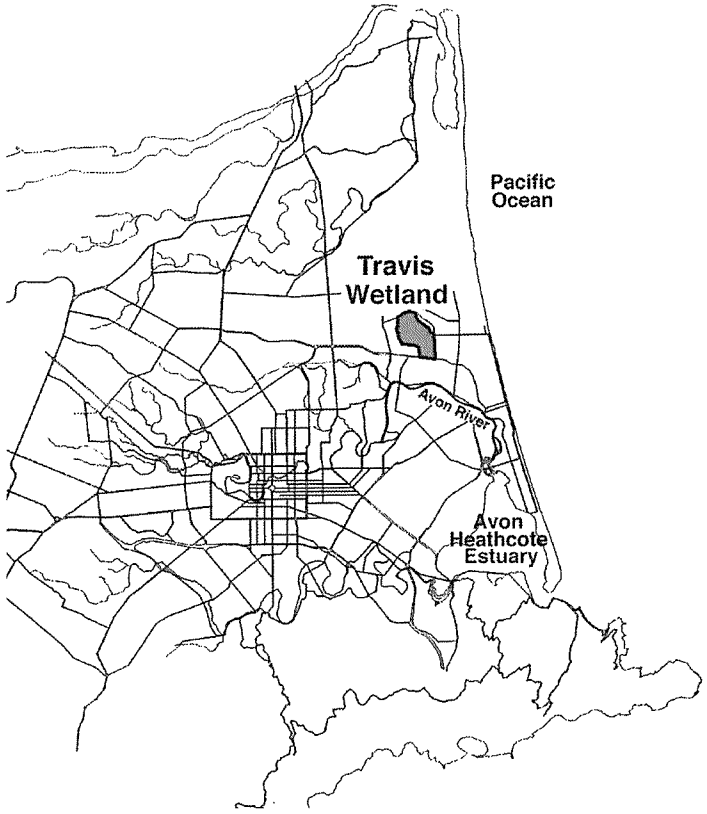
Section I: The Wetland - Background and Overview, provides a background to the Development Plan, the wetland's history and why it is important.
Section II: Park Concept - Objectives and Priorities, lists the objectives for the Heritage Park, provides an impression of the appearance of the Park towards which management will be directing efforts, sets out development priorities for achieving the objectives and includes a budget summary listing costs and revenue associated with the proposals.

Appendices follow which provide further detail for development and management. Because the document is designed to be read by a wide variety of people the more technical details have been allotted to the Appendices. They should be consulted by those concerned with the park's management and operations before undertaking any activities.

An example of negotiating the document structure: If one wished to gain an impression of the future appearance of the Central Ponding Area, or how management intends to achieve the relevant objectives, the following sections could be consulted:

- Section II - Ponds & Waterways and Central Ponding Area,
- Appendices - Ponds & Waterways and Landscape Development map, and
- Photographs and sketches within the above sections.

Looking north across Travis Wetland to Bottle Lake Forest.



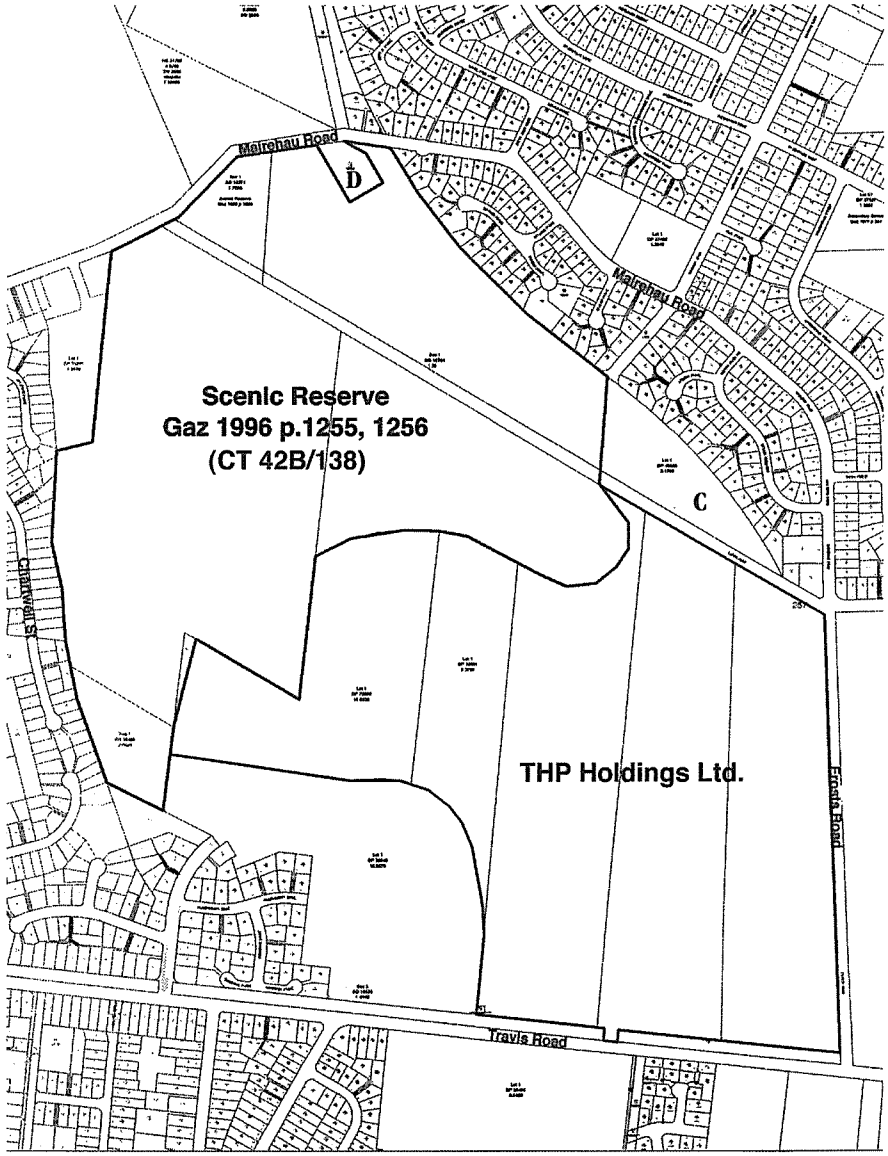
Section I: The Wetland - Background & Overview

1.0 Introduction

The Canterbury region contains an extensive network of lakes, rivers, water races and estuaries stretching from the high-country, across the Plains, to the coast. Travis Wetland is located in northeastern Christchurch close to sea-level and is part of the eastern green corridor linking sites of ecological and recreational importance. The wetland represents an ecosystem that is becoming increasingly scarce in Canterbury and is the only viable refuge for the stabilisation of Christchurch's declining pukeko population. It is therefore the **key** element of this habitat type in the City's evolving network of nature areas.

The primary purpose of Travis Wetland Nature Heritage Park is to enable the restoration and maintenance of wetland habitat and to help sustain a living city that integrates cultural activity and natural heritage. Effective restoration and careful management of the wetland will protect and enhance the remnants of a historical wetland system with its soils, plants, insects, reptiles, fish and birds. As an urban wetland park, the enhanced remnant will provide the clearest representation of how prehistoric Christchurch may have appeared. In this respect Travis will provide the missing link in the Garden City's network of parks. At the same time opportunities for education and passive recreation will be created.

Travis Wetland is a site of National Importance for its soil and vegetation system and of regional significance for its pukeko (*Porphyrio porphyrio*) population. It also provides habitat for a large number of other bird species including, seasonally, the white heron (*Egretta alba*) and visiting Australian cattle egrets (*Bulbulcus ibis*). Of the remaining lowland freshwater wetlands in the Christchurch area Travis Wetland offers the greatest potential for restoration of modified wetland, the creation of margin forest habitats, the provision of ponding areas to encourage greater numbers of waterfowl and the reintroduction of locally extinct birds.



1.1 Legal Status

The northern part of the wetland has been gazetted as Scenic Reserve under the Reserves Act 1977. Currently the southern wetland is being held for the Council via the Travis Group of companies (THP Holdings) which were set up in order to facilitate the purchase of this portion of the wetland. This southern portion will be vested as reserve once the Travis Group of companies has been consolidated. This is not likely to occur until the year 2007. Travis Wetland consists of;

(A) *Scenic Reserve*
Area: 56.5408 ha,
Title: 42B/138 comprised of sections 1,2,3 SO 19465, section 1 SO 19363, section 1 SO 18724, section 1, SO 18371 and lots 1 and 2 DP 73239,
Gazette notice: GAZ 1996, P.1255, 1256,
Owner: Christchurch City Council,

(B) *Travis Group of companies land,*
Area: 59.6830 ha,
Legal description: Lot 1 DP 75093, Lot 1 DP 75091, Lot 1 DP 75092, Pt Lot2 DP 9176, Pt Lot 1 DP 9176,
Owner: THP Holdings Ltd.

(C) *Lea's Property (3.1ha).* To become part of the Park. Aquired 30 June 1998 as fee simple land. Likely to be vested as Recreation reserve.

(D) *Southpower Property (0.57ha).* Mairehau Road. The intention is to acquire this land for inclusion into the wetland.

Under the Proposed City Plan the wetland is zoned as *Conservation 1.* The preservation of natural values this zoning implies is reflected in the park's objectives (Section II).

There is currently an expressway designation along Frosts Road and from the intersection of Frosts and Beach Roads extending north-west through the wetland to Mairehau Road. Whether this designation stands or not is dependant upon the results of a hearing at which it was recommended it be removed. It is likely that Frosts Road will be upgraded to take up all its current road reserve and 5-10m of the expressway designation on the wetland side. It is also likely the bends in Mairehau Road (northern wetland boundary) will be smoothed and the existing road widened to take up a greater proportion of the existing road reserve. This is likely to be limited to 2-3 metres on the southern side.

1.2 History

The wetland is situated in a low-lying depression bordered on the north and west by recent gravels, and on the east by sand dunes. Periodic flooding by the Waimakariri and Styx rivers until recent times created alluvial deposits over a sandy substratum. As underground water seeps through acquifiers in the plains it intercepts the surface between the dunes producing wetland conditions.

The study of pollen extracted in core samples from dated layers of peat soils provide a picture of the swamp through time. Approximately 1600 years ago the area was an estuary dominated by *Leptocarpus* species, oioi (a saltmarsh restiad) and would have had a similar appearance to the present day Avon-Heathcote Estuary and Brooklands Lagoon.

As the estuary sand bar gradually closed off the sea, the decreasing salinity made it possible for flax, raupo, tussock, baumea sedges and manuka to replace the saltmarsh species. Other trees and shrubs such as totara and coprosma would have occupied the swamp margins and at the same time, sparsely vegetated dunes adjacent to the site were colonised by open totara forest and scrub.

By the time of the first Maori (around 1000 a.d.), the brackish waters had largely given way to fresh water. The swamp would have been dominated by tall sedgeland, manuka and other scrub, as well as open pools and slow moving streams. The swamp margins supported shrublands of manuka, coprosmas, weeping mapou and possibly bog pine. Around the swamp in pockets of damp soils were woodlands of matai, totara, kahikatea, houhere, five finger and other broad-leaved small trees. Shrubby thickets of matagouri, coprosmas, kowhai, bracken and grassland existed on dry sand dunes.

The early Maori to pass through this landscape would have experienced flocks of tui feeding on flax nectar, wood pigeon gorging on wine berries, hawk, moa, possibly Haast's eagle and other birdlife indicative of a more complete ecosystem than exists today.

During this period (800-500 years ago), the wetland provided the nearby settlement of Oruapaeroa Pa with eel and fish, kereru, other wildlife and native plants such as raupo seeds for food. Harakeke was used for weaving baskets, roofing and clothing; raupo for thatch. Fires were lit by Maori to maintain tracks and flush moa from the bush. Much of the forest surrounding the swamp was destroyed and replaced with bracken, grasses and scrub. Raupo and tussock sedge increased their spread over the swamp itself replacing the burnt out scrub. With the advent of European settlement in the 1850's, grazing, further fires, the introduction of feral animals, drainage and exotic weed invasion greatly reduced the proportion of native swamp species and associated wildlife. There remained nevertheless a substantial area of open water in the north.

The situation we find today is a wetland much modified and still partially grazed; significant values and benefits remain however. With coordinated management and appropriate funding, experts from various professional backgrounds believe it will be relatively easy to restore large areas of the site to a state representative of a Christchurch freshwater wetland in the pre-Maori period. Given time, native birds currently rare or locally extinct could be attracted back to the area, and current populations increase.

Although the wetland probably formed from an old estuary and progressed through a lagoonal stage influenced by salt water, it was essentially a fresh-water swamp at the time of Maori settlement (from McGlone, 1995).

The preservation of the natural character of wetlands is listed as a matter of National Importance *under the Resource Management Act, 1991.*

Pukeko (Porphyrio porphyrio)

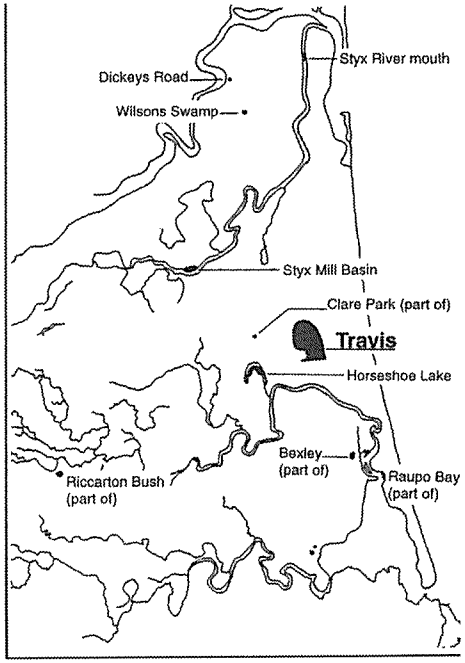
2.0 An Overview of the Wetland's Values

Restoration and enhancement of Travis Wetland Nature Heritage Park has four major benefits for Christchurch and the surrounding region: 2.1 Biodiversity of soils, plants and animals, 2.2 Habitat development, 2.3 Cultural uses and 2.4 Landscape Enhancement. These benefits are interrelated and combine to enhance the individual values of conservation and human use perspectives.

2.1 Biodiversity - Soils, Plants, Birds and Insects

Biodiversity is the variability among all types of living organisms and the ecological complexes of which they are a part. The term biodiversity can be applied to variations within and between species and ecosystems. It therefore includes not only species and habitats but interactions, connections and processes (adapted from Given, 1994).

Approximate extent of wetlands in Christchurch in 1850s



Approximate extent of wetlands in Christchurch in 1990s

Protection of ecosystems offering biodiversity to the extent existing at Travis Wetland is stressed by the Convention on Biological Diversity ratified by New Zealand in 1993 (adapted from Given, 1994). The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna is a matter of *National Importance* under the Resource Management Act, 1991.

Broadly speaking, Travis Wetland can be defined as swamp fen and marsh with some exotic dicot tree swamp (Meurk, 1995). See further wetland definitions in Appendix A. Even though highly modified by over 500 years of human occupation, Travis Wetland as a whole still retains an important representation of Christchurch's former range of indigenous species. Nearly 80% of pre-European wetland plant species and 77% of the native freshwater wetland birds of lowland Canterbury have been recorded. Eighty three percent of the invertebrates sampled were endemic to New Zealand.

Ornithologist Andrew Crossland states that one of the most conspicuous species, the pukeko, is an indicator of diversified wetland habitat (presence of both wet and drier sites spatially and seasonally). Such wetland habitats are now very scarce in Canterbury and declining elsewhere in New Zealand (Meurk, 1995).

Native Sundew (Drosera binata)

2.1.1 Soil & Landform

The site as a whole contains the full topographical and soil range of the permanent and seasonal wetlands of the Aranui complex. This complex includes a wide diversity of the younger Taitapu soils and Waimairi peats, and an excellent example of a transition to Kaiapoi soils. Because of the rarity of these native soil-vegetation associations the site has been listed on the New Zealand Geopreservation Inventory as a soil site of *national importance*. See soil map at Appendix G.

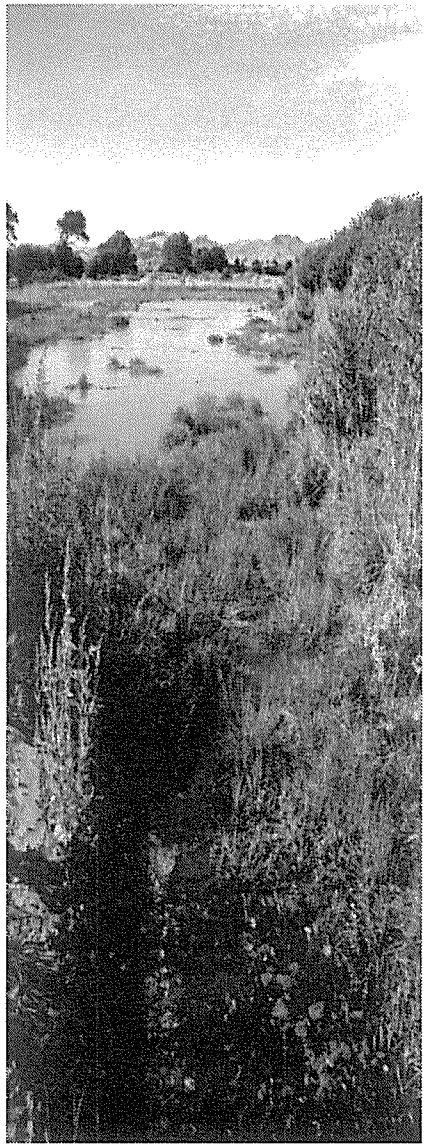
2.1.2 Plants

Travis Wetland is an important site for local and regional conservation of wetland plants. The Park contains a number of species now rare on the Canterbury Plains including the only substantial stand of manuka (Meurk 1997). Other plants such as *Carex flaviformis* and *Baumea rubiginosa* (swamp sedges), *Luzula* sp. (wood rush), *Corybas macranthus* (spider orchid), *Drosera binata* (native sundew) and *Ranunculus glabrifolius* (buttercup) are regionally vulnerable.

2.1.3 Birds and Insects

Fifty five species of birds including 31 native have been recorded at the wetland. Travis is the most important freshwater wetland for birds in Christchurch and supports around half of the total Christchurch pukeko population. The swamp contains Canterbury's largest winter concentration of Pukeko peaking at over 700 birds. Due largely to destruction of other local habitat, Travis Wetland is the only location in the region where pukeko numbers are not declining and are in fact increasing. Conservation of this habitat is a matter of local and regional importance for this species. The park also provides occasional habitat for rare species such as white heron (*Egretta alba*) Two globally endangered species have been recorded in the last five years; the Australian bittern (*Botarus poiciloptilus*) and black stilt (*Himantopus novaezelandiae*).

The open grass and shrub lands of Travis Wetland abound with insect life.



The estimated diversity of 700-900 insect species is a moderately high number compared with other lowland, largely non-wooded sites. It has been estimated that 70 - 90 of these are undescribed. This has important implications for biodiversity protection and future research possibilities. There are likely to be over 100 other invertebrate species in the park area.

2.1.4 Reptiles and Fish

An indigenous skink (Oligosoma nigriplantare polychroma), the native short finned eel (Anguilla australis) and possibly the Canterbury mudfish (Neochanna burrowsius) have been observed at the wetland.

2.2 Habitat Development

Habitat development in the Nature Park has high potential to increase numbers and diversity of plants, birds, invertebrate, and fish life. The southern part of the park, which is primarily a grazing marsh of introduced plants, offers the greatest opportunity for creation of new and enhanced habitat features.

Crossland (1996) estimates that habitat enhancement will make the Nature Park a local breeding stronghold for at least 17 wetland species within 10 years. He estimates that within 5 years of planned waterway enhancements winter peak numbers of wetland birds should exceed 5000. Numbers may exceed this figure if sufficient open water habitat can be created.

In addition, seventeen non-wetland species can be expected to use the Nature Park as a breeding ground (Crossland 1996). Within 10 years the bird checklist should increase to 55-60 species due to the appearance of vagrant and transient species as well as influx from the Avon-Heathcote Estuary. The result of development of a Nature Park will be a significant indigenous enrichment to what has long been a Christchurch urban avifauna dominated by introduced (exotic) bird species (Crossland 1996). In the future it may be possible to reintroduce native bird species that have been lost from the Christchurch area. Crossland's estimates on likely bird numbers using Travis Nature Park are based on an area of at least 100ha and take into account the magnitude of influxes when surface flooding occurs and the numbers and species of birds which typically occur on other Canterbury wetlands.

These influxes are aided by the existence of linkages to other suitable habitat sites across the city and province. The Nature Park will provide a suitable link in the Christchurch urban green corridor which in turn has links with other urban waterways and to Canterbury lakes and rivers.

New habitats in Travis Wetland such as kahikatea and matai-totara forest will provide further habitat opportunities for native forest birds. It is hoped that waterway enhancement will provide the rare Canterbury Mudfish (*Neochanna burrowsius*), with a suitable habitat into which it can be reintroduced. Such restored habitats are likely to considerably increase the human recreational, educational and ecological interest of the site (Crossland, 1996).

2.3 Cultural Uses

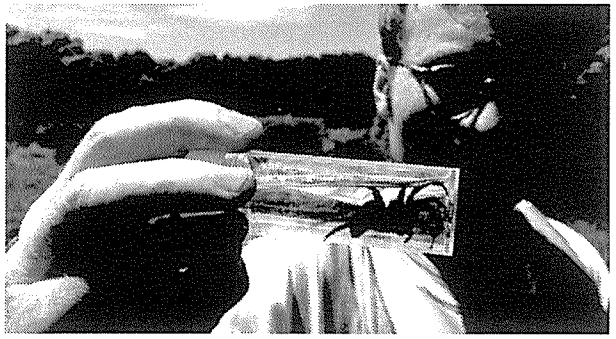
2.3.1 Education and Research Potential

The Nature Park has scientific benefit for the City's universities and research institutions as a research site. The park will provide a large enough area for scientific studies with intensive or random sampling to be undertaken. The large area of the Park will also allow undisturbed areas to be available for scientific research, hence avoiding conflicts between the different users and minimising disturbance to the natural values.

Educationally the site will become a valuable resource, providing a natural environment within easy reach of schools, universities and other educational establishments.

Travis already provides students and professionals with material for research projects and is the subject of regular visits by onservation clubs.

The wetland will provide great potential for educational and research uses.



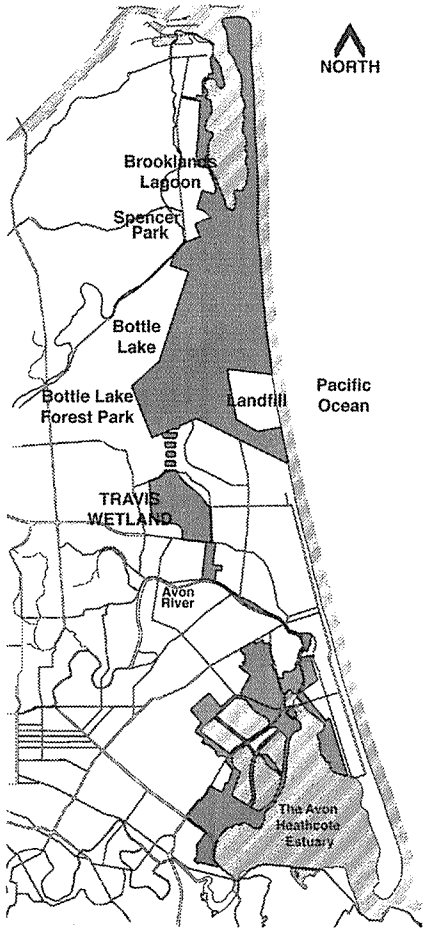
2.3.2 Recreation/ Open Space Corridors

Travis will become a cornerstone of the City's open space network by providing a different type of recreation experience for locals as well as tourists. Walking, jogging, bird watching, photography and nature study in a more natural environment are activities enjoyed by many. Just across the road from Burwood Hospital the Park's walkways will open up new possibilities for the recuperation and relaxation of patients. The wetland is also strategically placed on the eastern 'green' corridor, part of the circum-city greenway concept, which will provide an important link to other wildlife habitats.

2.3.3 Ecotourism/ Tourism Potential

Tourism is of important economic value to the City. The Canterbury Tourism Council indicates that the main overseas tourism marketing thrust is New Zealand's 'Clean, Green and Outdoor Image'. However the reality falls short of the image in lowland New Zealand and especially for wetlands. The demands of international visitors to New Zealand are changing and over the past ten years or so there has been a shift towards increased demand for outdoor activities. The shift in tourism has lead to a more nature orientated, active and educational holiday with emphasis on education and environmental protection.

Many attractions are available for visitors, but considering many of the visitors are environmentally conscious, there are very few attractions showing native flora and fauna in their natural surroundings within an urban context. Travis Wetland would provide a missing link in the attractions available to visitors within easy travelling distance of the city centre. One of the regular requests from overseas tourists visiting the Information Centre is the location of bird sanctuaries in the City. Travis Wetland has been identified as one of the key features in the redevelopment of the New Brighton area.



Location of Travis Wetland as part of the city's green corridor.

Tourist sources suggest that the current 'Clean, Green' marketing will need to backed up with further local facilities and opportunities close to the City. Christchurch is a gateway city where visitors want readily available short nature walks and the like at the start or end of their trip that they can fit into the limited time they have here. Readily accessible local environmental areas are needed to complement the traditional city attractions for the many tourists who are interested in environmental matters.

2.3.4 Maori significance

Travis Wetland was one of the mahinga kai sites used by Waitaha from about 900 a.d., Kati Mamoe from about 1600 and by Kai Tahu from about 1650. Adjacent to this site, the land now occupied by QEII Park was the residential area for the families of Ngai Tahu who harvested these wetlands. Ngai Tahu consider protection and enhancement of the whole wetland as a Heritage Park will enhance the image of Christchurch, and complement the tangata whenua values of this area.

"The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga", is a matter of National Importance under the Resource Management Act 1991.

Section 15 of the Te Runanga O Ngai Tahu Act 1996 requires that any iwi consultation required by an act of parliament be with Ngai Tahu. Ngai Tahu have submitted interests in a number of cultural issues. A tangata whenua working party has been set up with which the Council will liaise regarding an agreed range of developments at the wetland. Liaison will relate to: further written material relating to historical background, progress in terms of biodiversity of the area, habitat development and enhancement of the area, and ecotourism planning. As with other interested parties the opinions of Waitaha will be sought on similar matters.

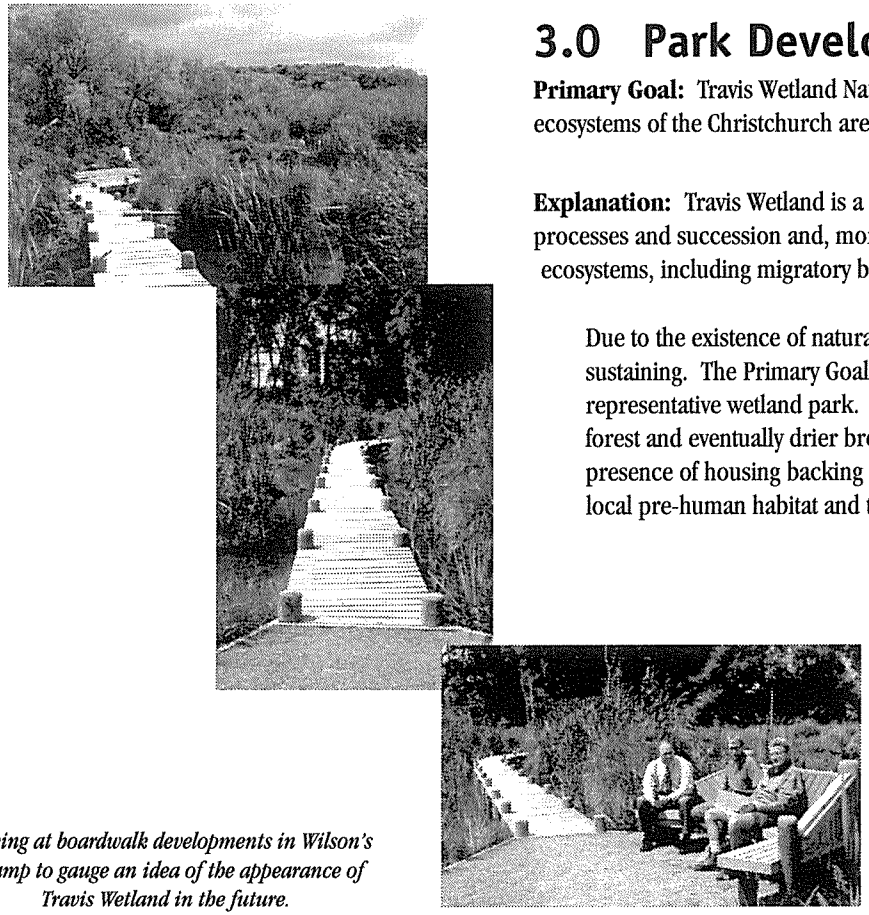
A report on the matter has been prepared by Optimax Research Associates entitled, 'Pointing to Matters of Resource Management Significance to Takata Whenua in regard to the Concept Plan for Travis Wetland'. It includes the following two extracts: (A) "The Travis Wetland Park Concept goes in some way to rectify the following six key issues that have faced kaitiaki of taoka in order of priority: 1. Diminishment of the local varieties of flora and fauna resources, 2. Uncertainty of localised supply of these varieties and species, 3. Poor management of existing resources, 4. Lack of recognition of cultural value in the past, 5. Conflicts of ecological, recreation and landscape values, 6. Absence of community knowledge about these resources and uses." It also points to the following proverbs with regard to the importance of restoration education, "1. Hoatu he ika ki te takata kua whiwhi ia te kai. Akona te takata ki te hi ika, kua whiwhi ai i te oraka tonutaka. (Give a man a fish and you give him a meal, teach him how to fish and he will live forever.)" and "2. Ta ke koanga, Whakapiri ngahuru. (Those that are otherwise occupied at planting time and always very close at harvesting time - referring to collecting the reward unjustly without contributing to the foundation."

2.4 Landscape Enhancement

Landscapes are part of the overall experience of nature. The views within and out of the wetland away from intrusive elements such as roads and buildings contribute an important part to the park's character. Landscape character vastly adds to the visitor's experience of a natural area. The view across the expanse of Travis Wetland to the Port Hills or the Southern Alps is an aspect valued by many in this area of the city. The large size of the wetland provides the scope and space to screen boundaries to retain a 'wilderness' aspect in the midst of the urban area and provide relief from the built environment.

The Southern Alps add another dimension to the Travis landscape.

Section II: Park Concept - Objectives & Policies



Looking at boardwalk developments in Wilson's Swamp to gauge an idea of the appearance of Travis Wetland in the future.

3.0 Park Development Objectives

Primary Goal: Travis Wetland Nature Heritage Park is to be an indigenous self-sustaining wetland system which will represent ecosystems of the Christchurch area from pre-Polynesian times through until the present.

Explanation: Travis Wetland is a relatively recent phenomenon. The area has been modified through natural geomorphological processes and succession and, more recently, extensive modification has resulted from the activities of human occupation. Associated ecosystems, including migratory birds both local and distant, also exist today in modified states.

Due to the existence of natural successional processes as well as urban constraints it is likely that the wetland will never be fully self-sustaining. The Primary Goal is therefore an ideal goal but one in which even partial achievement will result in a more diverse and representative wetland park. The natural successional processes associated with this type of wetland would transform it to swamp forest and eventually drier broadleaved forest. Constraints include the prevalence of exotic weeds in neighbouring areas, the presence of housing backing onto more than 50% of the wetlands perimeter, drainage of neighbouring areas, severe reduction in local pre-human habitat and the planned presence of visitors and public facilities on site.

Coastal wetlands are not permanent states. If left to natural progression, the areas of mineral soils to the southeast would have formed swamp forest similar to Riccarton Bush; the peatlands would have been similar to the remnant sedgeland, manuka, coprosma and broadleafed swamp forest in the current Manuka Area (see Current Vegetation Map p.31). The surrounding dunelands would be covered in coastal bush such as at Nape Nape.

It is therefore not possible or desirable to re-create the wetland as a 'snapshot' from a particular period and locality.

To gain an impression of how the wetland may look once enhanced, reference should be made to: (a) the artist's impressions throughout the document, (b) the boardwalk development at Wilson's Swamp (north of Belfast) which runs through mostly carex and raupo, and (c) the Landscape Development Map at the end of the document.

Objectives

1. **To conserve and enhance the representative peatlands and alluvial wetland and associated soil sequences of the Aranui soil complex and the processes that maintain them.**

2. **To conserve and enhance the wetland habitat, biodiversity and populations of native plant and animal species, particularly the pukeko.**

3. **To use Travis Wetland as a means of promoting ecological values and as a resource for educational purposes and scientific research without detriment to the Park's ecology.**

4. **To provide Travis Wetland as a resource for passive recreation and tourism without detriment to the Park's ecology.**

5. **To provide an essential conservation link in the City's planned eastern Green Corridor.**

6. **To protect and enhance the landscape values of the Park as a relief to the built environment.**

4.0 Landscape Development Units

*Throughout this section reference should be made to the **Landscape Development map** which is located at the end of this document.*

This section describes each landscape area of the Plan and provides an outline of the associated issues, goals and management solutions that apply.

The Landscape Development map illustrates the following landscape units:

(1) Ponds and Waterways,
(2) Vegetation Type, and
(3) The Built Environment - Visitor Facilities.

The Central Ponding Area will be located in the area of highest ground water level. Winter ephemeral flooding is shown.

4.1 Ponds and Waterways

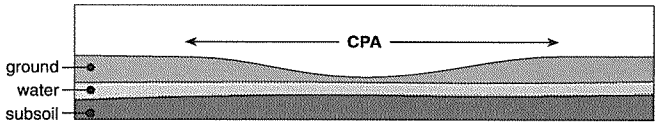
Ponds and waterways will form the framework around which many of the plant communities will develop. Water flows will be concentrated along Travis Stream and along the waterway adjoining the Travis Country Estates' subdivision and Travis Road. All ponds and water-ways will be sited so as to retain natural soil values as far as possible and minimise disturbance to native plants.

4.1.1 Water Level Maintenance

Current inflows comprise surface water from the catchment, rainfall recharge, lateral (ground water) inflow and upwards leakage from Aquifer One (Riccarton gravel layer). Outflows are via evapotranspiration and lateral outflow which includes surface flow through Corsers and Barkers Streams.

In order to maintain pond levels and sufficient ephemeral flooding two main methods will be employed; tidal flooding and a system of weirs and bunds. It is planned to direct tidal Avon River water into the south-eastern corner of the wetland via the Woolston-Burwood expressway canal. This may be necessary to ensure seasonal water levels are maintained at 0.1 to 0.2 metres above present levels. Ponding levels are listed on the Landscape Development map. Flooding will be possible at high tide and be regulated as needed by weirs at either end of the waterway. A further series of weirs and bunds within the Park will contain swale and ponding levels.

The extent to which tidal flooding will penetrate into the swamp is yet to be determined and will involve some degree of on-going experimentation. Park management will ensure water channels and bunding are placed to ensure ephemeral ponding is contained wholly within the boundaries of the park and that existing drainage from adjoining private land is maintained. This is designed to limit the *maximum* extent of ephemeral ponding. Although largely undetermined in a practical sense, the maintenance of an acceptable *minimum* level of ephemeral ponding is more likely to be a management problem. A degree of experimentation will be required to determine appropriate weir levels and flooding periods.



4.1.2 The Central Ponding Area (CPA)

The Central Ponding Area (approximately 2ha) will be a principal landscape and ecological feature of the Park design. It is situated in a central position close to the natural drainage channel of Travis Stream. The central location is important to provide maximum distances between the aquatic habitat and residential areas thereby reducing disturbance to wildlife. Other reasons for the choice of location are that the site coincides with a shallow water table depth which means the ponding area can be readily empounded with a very low bund (200mm).

The Central Ponding Area will contain several islands and peninsulas. This is to provide nesting sites for birds and to help reduce eutrophication. Eutrophication is the result of a build up of nutrients in slow moving water bodies and is often characterised by a scummy layer and unpleasant smell. Fewer birds and aquatic species can be supported in such conditions. Planting raupo, flax and *Carex secta* will attract bittern and crake to the site and help prevent eutrophication by absorbing nutrients.

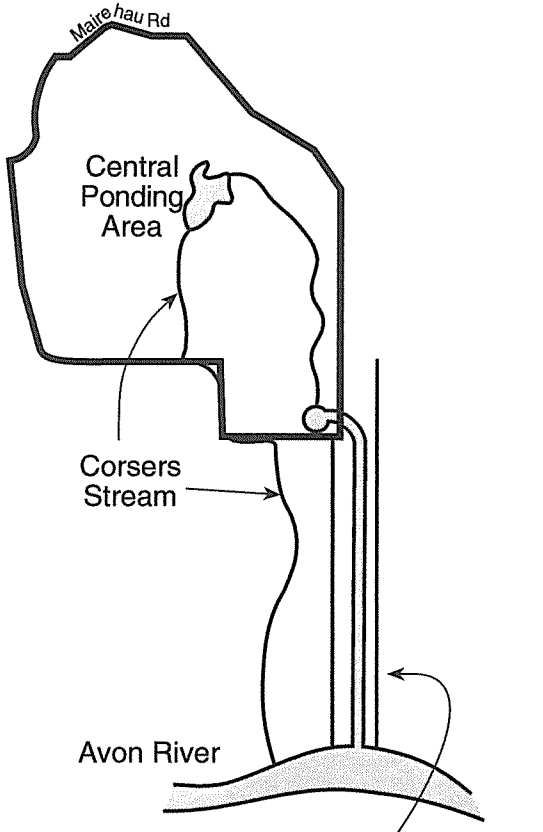
Larger open water areas will be predominantly shallow with extensive areas no deeper than 200mm. This is to provide habitat for wading birds. Water levels will drop in the summer to provide habitat for a range of birds that use the muddy shores to feed. Some central areas of water will be deeper (>1m) to provide habitat for diving water fowl.

4.1.3 Waterways and Swales

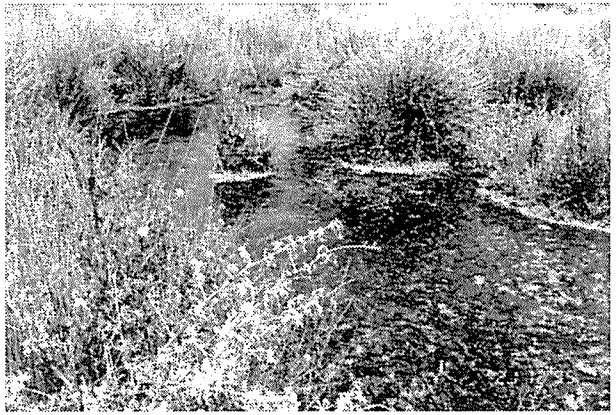
The plan aims to naturalise the Travis Stream by changing its course to a position nearer to Beach Road and removing a long artificial straight section. A large central island (over 9 ha) will be created in the wetland by connecting Travis Stream with the new lake via western and southern waterways. This will provide a greater disturbance-free area for wildlife.

The majority of the north-south drains will be modified to form shallow swales and small ponds. One or two deeper ponds will be created to provide some permanent water bodies for visual variety and habitat for diving birds. These swales will provide ephemeral winter water bodies for wading birds such as pied stilts. Some waterbodies will be planted with native plants such as tussock sedges, toetoe, NZ flax, cabbage trees and the occasional stand of kahikatea along the margins. This will provide greater cover for birdlife in the adjacent paddocks and increase the visible profile of native plants.

A permanent ponding area will be constructed in the extreme southeast adjacent to the Travis-Frosts Roads corner. Its purpose will be to provide an obvious wetland vista into the swamp for passing traffic, as well as a habitat for wildlife. A partial screen of Tussock/Reed Swamp vegetation and possibly some broadleaved trees will be planted between the pond and the planned Travis Road expressway to direct water birds safely up over the road when landing or taking off from the pond.



Proposed Woolston/ Burwood Expressway corridor showing planned canal connection



Top: *An example of a water body suffering from mild eutrophication.*

Below: *Raupo will form a major component of the wetland's waterway margins.*

4.1.4 The Wetland Buffer and Moat

The south-western waterway between Travis Country Estates' residential development and the Nature Park will provide drainage for some of the subdivision and overflow from the wetland and act as a semi-aquatic introduction to the park. Planting was carried out in two stages; the first was undertaken late 1997, the second in the winter of 1998. The moat will reduce wetland access by cats, provide additional wildlife habitat and mitigate the intrusion of housing. Funding for this project has been provided by the Water Services Unit of the City Council.

Angela Stream - a dedication

Robert Watts of the Water Services Unit has proposed that this moat be named after the daughter of Murray Binnie of the Waste Management Unit. Murray was instrumental in ensuring that the important link from Travis to the Avon River via Corsers Stream was brought beyond the concept stage. Bob Watts made the parrallel between the wetland which was once pristine but later made less so, and Murray's daughter, Angela, who was left intellectually handicapped as the result of a postnatal viral infecton. Both, however, have now had the opportunity for a better life through care and attention.

There is a possibility of further moats or swales being constructed in the future. They would be located on the periphery to act as predator barriers. Construction will be dependant on future necessity and funding availability.

4.1.5 Potential Water Weed Problems

Algae species with a propensity to bloom are present within the wetland. Generally, blooming does not occur to any degree however due to the irregular shape of the waterways, the high sediment load (causing a dark coloured water), and the presence of *Azolla* (floating fern), *Lemna* (duckweed) and some tree shading. The Central Ponding Area will be subject to initial algae blooms soon after construction due to the release of nutrients. However, this is a manageable situation over the medium to long term. Techniques available to reduce the possibility of blooms and other water weeds occurring are listed in Appendix B under Ponds and Waterways.

One possible benefit of using Avon River water is the suppression of watercress as a result of a marginal increase in salinity. Watercress is currently partially responsible for clogging city waterways.

Because of the large number of variables involved in maintaining water levels and in weed control, experimentation will play a part in the Wetland's management.

4.2 Vegetation Type

The proposed vegetation pattern is 'designed' to reflect the natural attributes of the park; namely the soils, hydrology, wildlife and existing plant cover. See appendix G (soil map). Elements which no longer exist in the area, such as native forest in its various forms, will be reintroduced to represent communities that were formerly much more common in prehistoric Christchurch. The plant communities developed will become an important education aid to the interpretation of natural history, ecological systems and wetland management and restoration. Large areas of vegetation will be allowed to regenerate by themselves with minimal enrichment planting in order to increase plant diversity. Biodiversity will also be enhanced by planting using seed gathered from existing natives on-site or from within the local region.

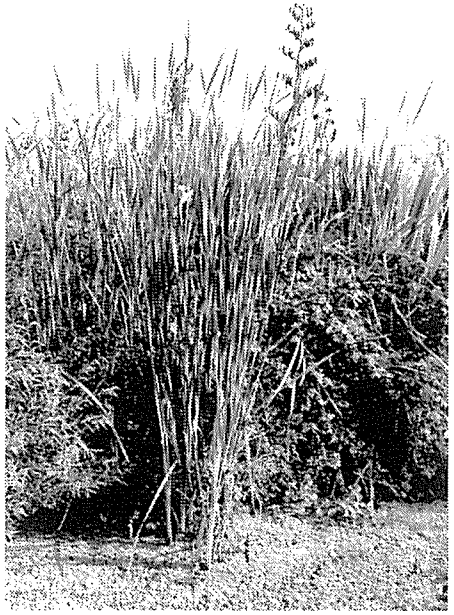
Tall growing trees such as kahikatea, manatu and houhere will be planted in strategic places in order to lessen the visual intrusions of roads and houses and break-up the expanse of open grazing marsh areas. Screening of adjacent houses is vital if the re-creation of a visually natural setting is to have any integrity. Screens will be planted adjacent to open walkways to minimise disturbance to wildlife.

4.2.1 Grazing Marsh

Grazing Marsh is an extensive area of cattle grazed short grassland (around 0.15 m), with scattered tussock and rushes. It will provide habitat for pukeko, waterfowl, waders, harrier hawk and gulls particularly the endemic black-billed gull (*Larus bulleri*). Ephemeral flooding will extend feeding habitat and maximise the breeding potential of local populations.

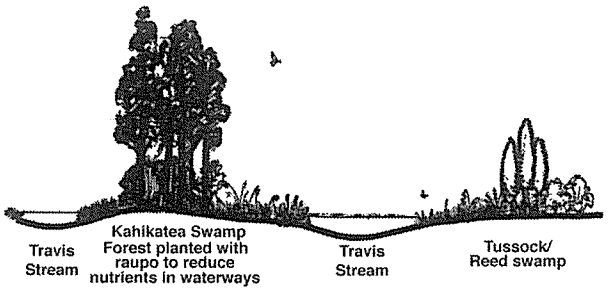
Left: *Creeping buttercup.*

Below: *Grazing marsh panorama.*



Above: *Flax and raupo will predominate in waterway margins.*

Below: *Cross section of the central kahikatea area.*



A major objective of the Park Concept is to retain as large a population as possible of the regionally important winter pukeko concentration. Because of a significant reduction in pukeko habitat in the Christchurch area, larger areas of grazing marsh are now required to maintain populations than would have been necessary in the past. Paddock fencing is designed to keep grazing cattle away from waterways and riparian areas in order to reduce water contamination, and to provide ample taller cover along paddock margins for wildlife.

Grazing has three major benefits: Firstly, it is important for the maintenance of a structural mosaic of short grazed areas and longer tussock growth which is ideal for the nesting and feeding of pukeko, waders and waterfowl; Secondly, it provides an environmentally friendly option to control of willow, blackberry and other weeds; Thirdly, some wetland birds for example, cattle egret and white faced heron, often feed in association with cattle finding their food in sodden ground where hooves have upturned worms and insects.

Continued grazing in the existing Grazing Marsh area will help maintain control of grey willow, blackberry and other weeds and encourage pukeko habitat. The Sedge-Rush Marsh area is too soft, waterlogged and botanically sensitive to cope with cattle grazing.

Future grazing will take place at a lower intensity than at present in order to take pressure off rushes, sedges and native herbs growing in the grass sward. This will be possible by planting natives unpalatable to cattle in these areas. The actual grazing intensity will be the subject of experimentation to determine the effectiveness in maintaining weed control and the extent of pugging and addition to nutrient levels. Sheep grazing in drier areas and the use of scythes by volunteers will be investigated for small areas as possible alternatives in order to reduce pugging and eutrophication.

4.2.2 Tussock/Reed Swamp

Waterways, stream margins and pond edges will feature various combinations of raupo, flax, toetoe, tussock sedge and cabbage trees. These areas will provide nesting sites and shelter for pukeko, crake, bittern and other water-birds.

4.2.3 Sedge-Rush Marsh

Large areas of ungrazed wetland will be dominated by a mixture of tussocky plants such as pukio and rushes and various other native sedges and herbs. Exotic sedges and herbs such as buttercup will continue to co-exist with the native plants. Due to the softness of the peaty ground in these areas grazing is not seen as an option.

4.2.4 Kahikatea Swamp Forest

Theoretically most of the Taitapu soils in the southeast could be planted with kahikatea (white pine) forest. However the concept plan restricts kahikatea to the central area currently occupied by willow forest and a wide strip to the south of the Central Ponding Area , scattered riparian strips and the transition between sand dunes and peatlands in the north. This is to retain as great an area as possible in grazing marsh to maintain the large pukeko population, and to enhance wetland bird numbers in winter when surface ponding occurs. A block will also be planted on the northern side of the Beach Road

entrance drive to act as a wildlife buffer and to provide another habitat type immediately adjacent to the Visitors Centre.

The Lincoln Univeristy group Christchurch Native Habitats are in the process of conducting an experimental planting programme of mostly kahikatea, immediately north of Clarevale Reserve and to the south of the proposed broadleaved forest.

Because of their potential size kahikatea will be one of the major species used to screen visual intrusions where height is required and soil types permit. It will also eventually be a major source of fruit for bush birds.

4.2.5 Totara-Matai Hardwood Forest

Totara-Matai forest will be planted on the drier parts of Kaiapoi soil and some sandy peat in the dune-peat transition, north of the kahikatea zone. This forest type will grade into broadleaved and kahikatea forest. Strips will be planted along the northern, northeastern and southern boundaries on suitable soil types to provide a greater habitat range.

4.2.6 Coastal Bush

Coastal bush will be planted on the dunes on the northern and eastern boundaries of the Nature Park. Species include cabbage trees, bracken, kanuka, ngaio and kowhai.

4.2.7 Broadleaved Swamp Forest

In addition to planting, Broadleaved Swamp Forest will develop from self-seeded individuals in the western willow woodland which currently occupies the main Broadleaved Forest zone. This is already occurring with large numbers of coprosma, cabbage trees, ferns and other native species regenerating under the willows. A partial screen of broadleaved trees will be planted on the park boundary to reduce the visual impact of housing on the park.

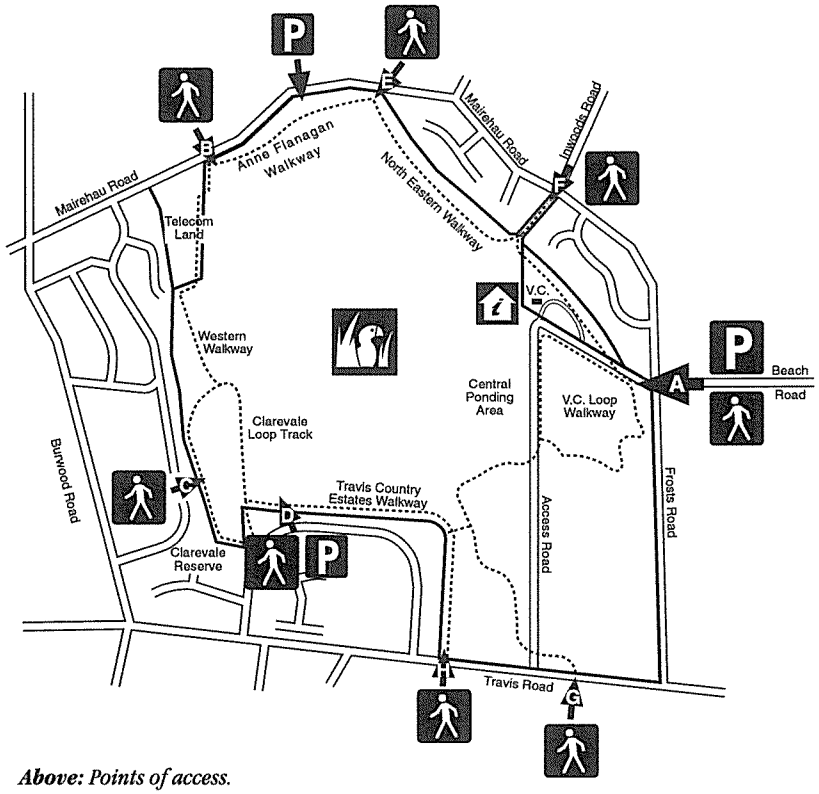
The Manuka Area is a relatively small area on the northern boundary of the western willow woodland currently subject to intensive volunteer enhancement activity and is denoted by ⑩ on the Landscape Development map. Refer also to the Current Vegetation map on p.31.

4.2.8 Manuka Tall Shrub Swamp

Manuka/Coprosma shrubland was a much more abundant vegetation type in pre-European times than at present. The plan aims to extend the area of wetland shrubland in the park as a border between swamp forest and open tussock swampland. This will have major benefits in respect of enhancing invertebrate life and may allow the reintroduction of some gecko species into the park. The above habitat type will be boosted by enrichment planting in order to restore lost seed source and accelerate the recovery and regeneration process.

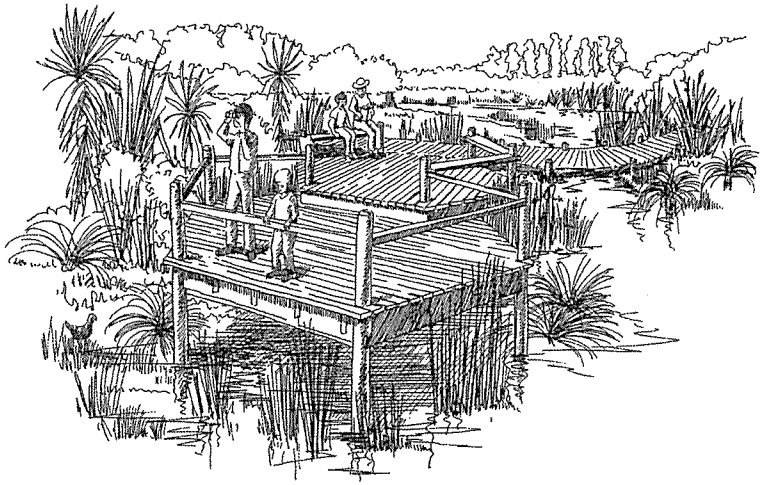
Associated with remnant manuka is the botanically precious baumea reedland. This represents a lower fertility peatland typically occupied by sundew, small spike sedge and orchids.

Manuka in flower.



Above: *Points of access.*

Below: *Typical walkway/viewing platform.*



4.3 The Built Environment - Visitor Facilities

4.3.1 Walkways

The park design allows for a perimeter walkway on the northeastern, northern, western and southwest sides of the Park.

- A central walkway beginning at the Visitors' Centre will pass to the eastern side of the Central Ponding Area and continue south to meet the Travis Country Estates moat walkway and the southern extension of the central walkway to Travis Road.
- A western walkway will connect Clarevale Reserve in the south to the Anne Flanagan Walkway on Mairehau Road via the Broadleaved Forest and the eastern edge of the filled Telecom land. The northern latter section is dependant on forming an agreement with Telecom.
- Loop tracks will be constructed in the southwestern section of the Park adjacent to Clarevale Reserve and near the proposed Visitors' Centre at Beach road. These will provide visitors who have less time or mobility a chance to complete a route rather than merely back-track the same way after an allotted time.

The Park's entranceways will provide starting and termination points for walkways. There will be one major entrance at Beach Road (A), three secondary entrances at Mairehau Road (B), Clarevale Street (C), and Travis Country Drive (D), and four minor points of access (E-H). See adjacent Points of Access map

Tracks through the wettest areas will require boardwalks, where compacted grit is not suitable, in order to prevent damage to the fragile peaty soils. Exact routes will be selected to avoid damage to vulnerable and significant native species localities. Both raised grit tracks and boardwalks will incorporate wider sections at strategic intervals to provide seating with a view over the wetland and include laybys and wider areas of track at regular intervals for wheelchairs to pass or for educational groups to congregate.

Screens will be planted along walkways adjacent to waterways, ponding areas and some open marshes to prevent disturbance of wildlife. Plantings are likely to take several seasons to reach head height and fill out to cover. If wildlife disturbance becomes a problem temporary screening in the form of a stick fence or shade cloth may be necessary as an interim measure. In order to minimise these kinds of problems the public will be discouraged from entering these areas until screening is fully developed. Bird hides and discretely located screen gaps will ensure views of wildlife.

Screen planting will be located at strategic points in relation to walkways to insulate walkers from one another, road traffic noise and the visual intrusion of traffic and housing.

Cycling / mountain biking is incompatible with the objectives of the plan and will therefore be prohibited within the wetland. Provision for a cycling route on the shoulder of Frosts Road is a possibility which should be investigated however. It would be appropriate to incorporate this cycleway into the City's planned circular walkway.

Anne Flanagan Walkway - a memorial

The northern section of the peripheral walkway is referred to in this plan as the Anne Flanagan Walkway. The walkway the length of the Mairehau Road frontage.

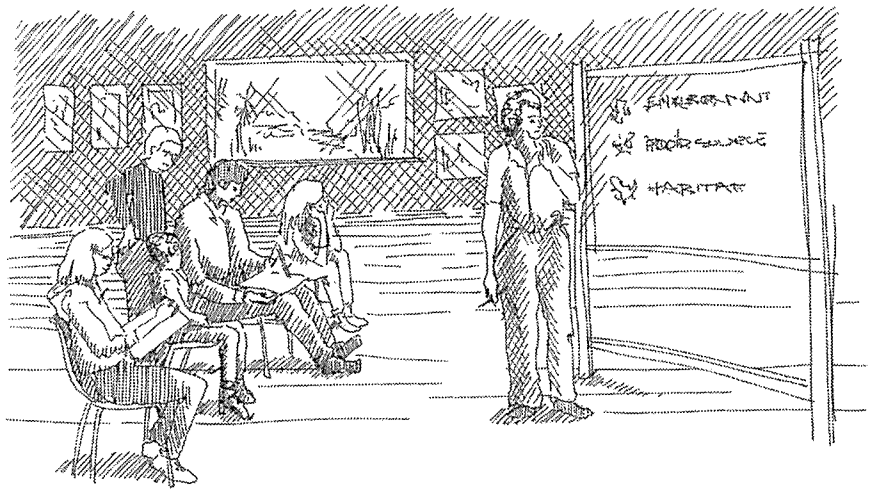
Anne Flanagan was the founder of a group of people intent on preserving the wetland remnant. This group was later to become the Travis Wetland Trust of which she was the inaugural chair. Anne Flanagan died (August 1994) before the remaining southern half of the wetland was purchased by the Council (July 1996). The Trust thought that this section of the walkway would be a fitting memorial to the person without whose efforts the setting aside of Travis Wetland as a Nature Heritage Park may not have eventuated.

4.3.2 Visitors Centre & Interpretation

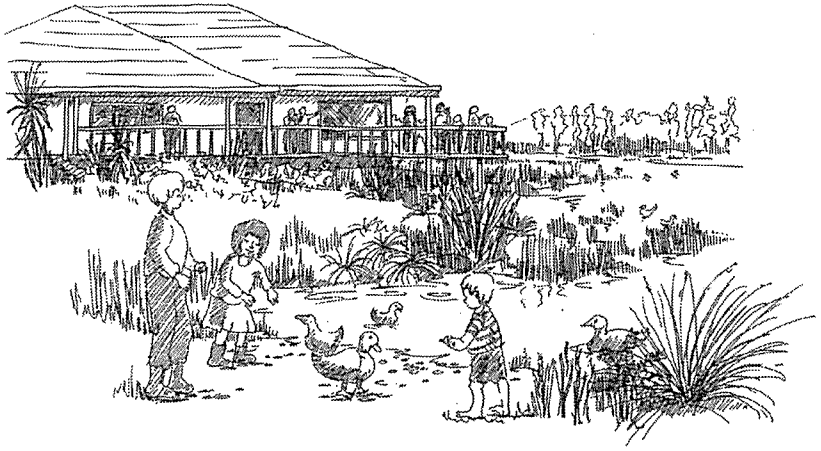
A Visitors Centre is planned for the Beach Road entrance to the park. Initial funding has been provided by the Community Trust. Current draft plans make use of the existing house at marked on the Landscape Development map (end of document) which is intended to provide lecture rooms and other facilities to complement an interpretation centre to be constructed at (1) on the map. This centre will provide extensive views over the adjacent Central Ponding Area (the core wildlife area) and further afield. Access throughout the visitors centre complex will be wheelchair accessible.

A boardwalk will connect the Visitors Centre to the adjacent short loop walkway and a ponding area for visitors to feed wildlife. This pond will be the only area in the Park where feeding and pond dipping by the public will be encouraged. Potted wetland plants could be made available for sale to the public at the centre. An adjacent carpark and coach park will be established with space for 50 cars and 2 or 3 coaches.

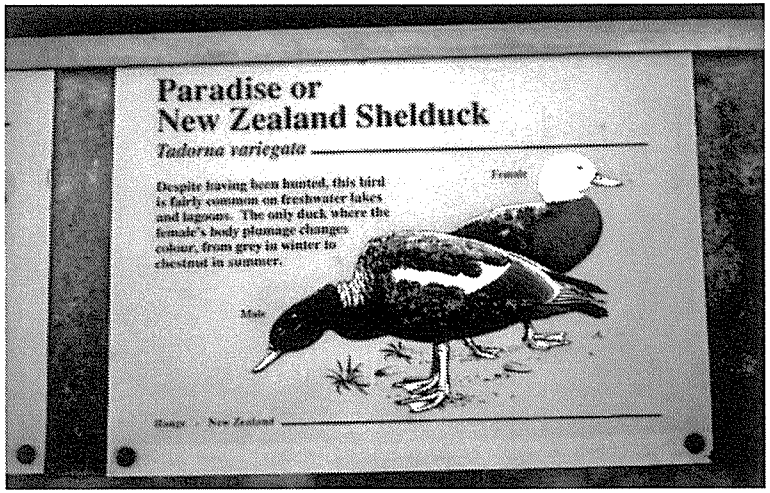
An interpretation plan is currently being put together which will provide a basis for the design and content of the visitors centre, signage and other facilities. The interpretation plan includes a consultant's report which provides a Maori perspective for interpretative use. Detailed interpretation will be made available, such as, a planned display by the Canterbury Regional Council in the Visitors Centre on their role in water resource management. It is expected that presentations concerning the wetland will be made as required in the seminar room which could also be let out to interested parties. The Visitors Centre is expected to be extensively used by schools as well as tourists.



The Visitors' Centre seminar room will form an important part of education of wetland values.



Visitors' Centre concept (see Landscape Development map and Interpretation Plan)

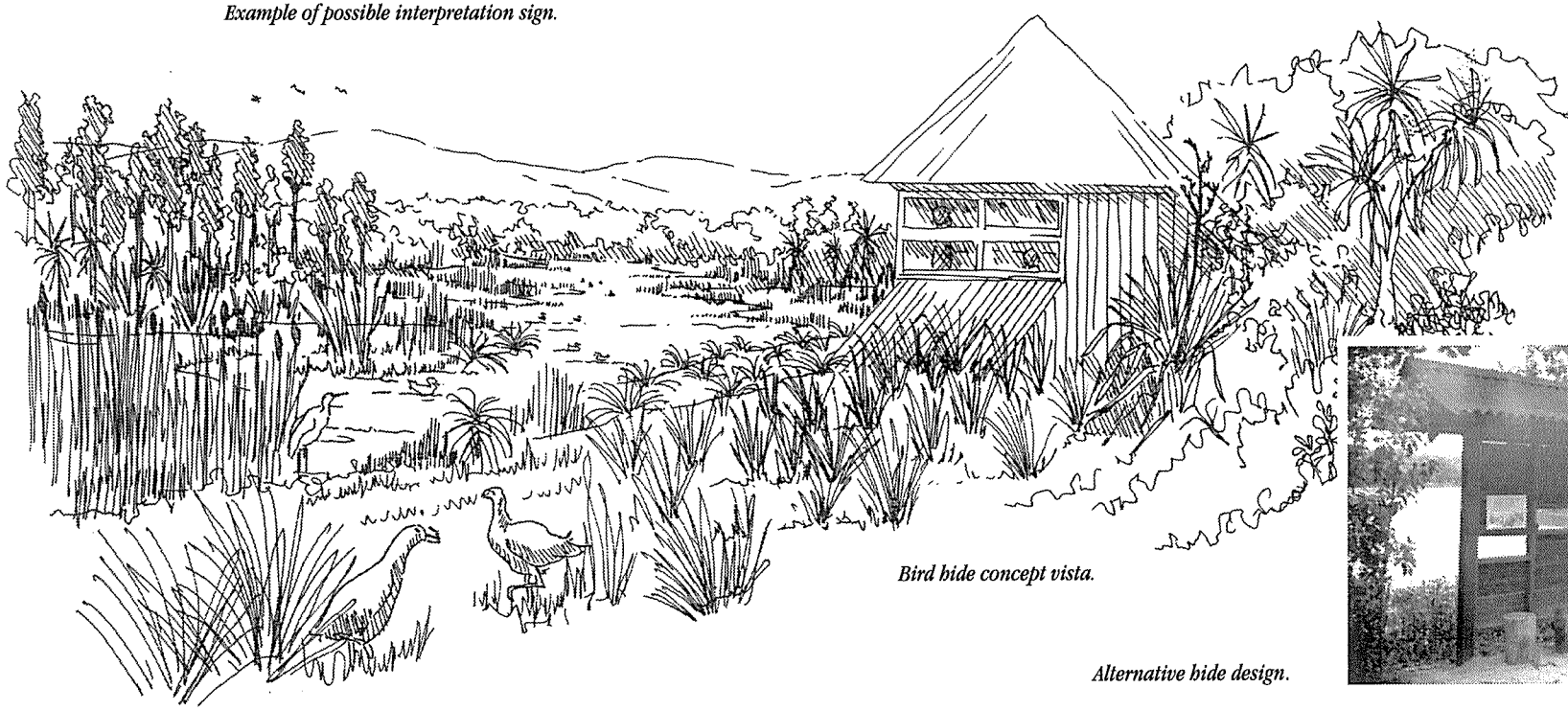


Example of possible interpretation sign.

Fire control procedures will be posted in the visitors centre. Interpretation signs will be placed along walkways and at viewing sites. These signs will serve to educate visitors about wetland values and advise on appropriate forms of behaviour.

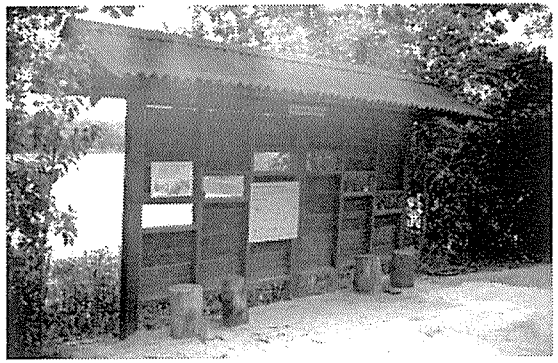
4.3.3 Viewing Platforms and Hides

One enclosed hide, one open hide and three open viewing platforms are to be constructed at strategic points from where it will be possible to observe wildlife. Two hides will be constructed at the Central Ponding Area; the more elaborate of the two will look out over the ponding area, the second will provide views of one of the pukeko strongholds in the grazing marsh to the east. Viewing platforms will be located on the Anne Flanagan Walkway, at the southern point of the Visitors Centre Loop Walkway and a raised viewing platform will be constructed on the eastern edge of Western Broadleaved Forest to provide views of the semi-encompassing regenerating bush and out across the wetland. See the Landscape Development map at the end of the document; viewing platforms and hides are denoted by red squares.



Bird hide concept vista.

Every effort will be made to ensure all facilities are wheelchair accessible. The one possible exception will be the upper levels of the proposed western viewing platform. Parafed (Canty) will be consulted as to future design requirements.



Alternative hide design.

4.4 Park-Wide Management

4.4.1 Weed Control

Initially much of the park's weeds will be controlled by grazing, at least until full control of the willows and blackberry has been achieved. Long term grazing will probably be required however for the maintenance of open space and habitat for pukeko and other wildlife (Meurk, 1995).

A programme of principally grey and some crack willow elimination is being undertaken in the eastern parts of the proposed Park and of female grey willow in the western willows. Remaining male grey willow forest patches will be fenced from stock, surviving weeds controlled and planted in broadleaved native trees in the west and kahikatea in the central willow patch. These areas will then be allowed to regenerate towards a dominant native association. Tussock/Reed Swamp vegetation will naturally colonise waterway margins. Planted native forest and Tussock/Reed Swamp areas will gradually become self sustaining.

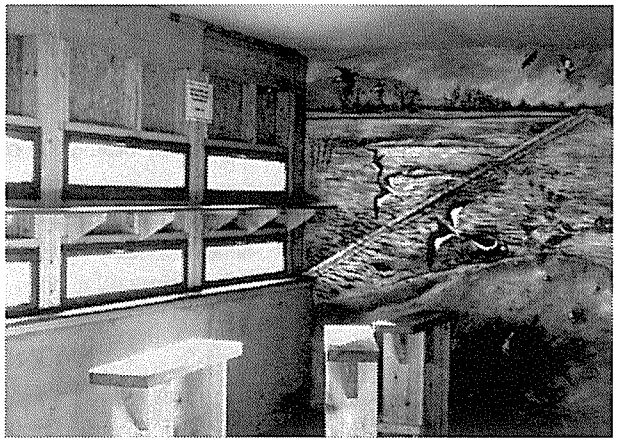
4.4.2 Predator Control

Fences: The effects of predators on wildlife will be monitored annually. The effectiveness of other predator control programmes such as the peripheral fencing of Karori Reserve in Wellington will also be assessed. The decision of whether to construct fencing specifically for the purposes of predator control in the future will be based on the above outcomes. Such fencing could also be useful for security measures. A chain mesh fence along Travis Road may be necessary to encourage pukeko to fly over the road.

Peripheral swales will be constructed to encircle the park as far as possible within physical and monetary constraints. The existing peripheral drain in the current western willow area will be retained in its present state. If deemed necessary for predator control once wetland infrastructure is in operation, and if water levels permit, this drain could be converted into a wide, deeper channel.

Trapping and poisoning: Initially trapping and poisoning will take place on a limited experimental basis.

Other mitigation: Agreement will be sought in the near future with neighbours to allow the fitting of bells to pet cats. The idea is that birds will be warned of a cats presence before it strikes. Another possibility would be to try luminous collars. It may be that in the future some residents may chose not to have predatory pets in adjacent residences. Such a decision by wetland neighbours could be encouraged by the Council.



Above: *Double viewing slits will provide views from bird hides for visitors of different heights and abilities.*

Below: *Weed clearing.*

4.4.3 Fire Precautions

Travis Wetland is within an urban gazetted fire district and as such the primary emergency contact is via the 111 emergency services.

Precautions that can be taken include maintaining short grass along Mairehau Rd verge to counter thrown cigarette butts, minimise stacks of dry vegetation, locating fire control signs at viewing points and hides.

If fires occur emphasis should be on containment and protection of buildings and boardwalks. Vegetation will generally recover although there is a small possibility of peat fires occurring which can be difficult to extinguish. It should be remembered that weak fliers such as crakes and fernbirds will be more vulnerable.

4.4.4 Involvement of Unpaid Labour

The Travis Wetland Trust have been an active force at the wetland for several years. They have been involved in the promotion of the wetland as a reserve and in weed control and planting. Trust cooperation with the Council in the form of an Adopt-a-Park programme is set to continue and develop with the wetland.

Volunteer planting kahikatea.

With the development of the park opportunities for further volunteer activity will increase. The possibility of using subsidised labour in the form of unemployed persons and periodic detention workers exists. Networking with other voluntary groups in order to increase labour availability for particular projects will be considered. A database of volunteer workers which has been developed recently will come in useful in this respect.

The benefits of using ongoing voluntary labour include;

- An increase in (semi) experienced labour availability,
- The existence of a labour pool to draw on when required for short-term projects and emergencies,
- Fostering community understanding and respect for wetland values,
- A reduction in maintenance and development costs.

Costs of using voluntary labour include;

- Training may be necessary depending on knowledge and experience of labour,
- Supervision will be required, particularly if using unemployed, or periodic detention workers.
- Reliability may be less assured than if using staff or paid workers.
- Health and safety will need to be regulated to OSH standards. This is a legal responsibility for work scheme, periodic detention workers and for volunteers. The Travis Wetland Trust have prepared health and safety guidelines for voluntary workers.

Costs and benefits should be weighed up when considering using volunteer labour for a particular project. Some projects or areas may be unsuitable for voluntary labour because of their complexity or sensitivity. The Council will formulate a voluntary work programme in association with the Travis Wetland Trust prior to commencing any additional voluntary or subsidised work schemes.

Other types of neighbourhood and community involvement should be encouraged for the following reasons;

- Possibility of gaining volunteers,
- Neighbours with a wetland boundary could be used as watchdogs to report on any problems,
- Involvement by either of the above is likely to promote an understanding of wetland values and consequently contribute to a sense of community pride. Neighbourhood contacts outside the immediate community could then foster a greater wetland environmental ethic. Rubbish dumping and other vandalism would be less likely to occur.

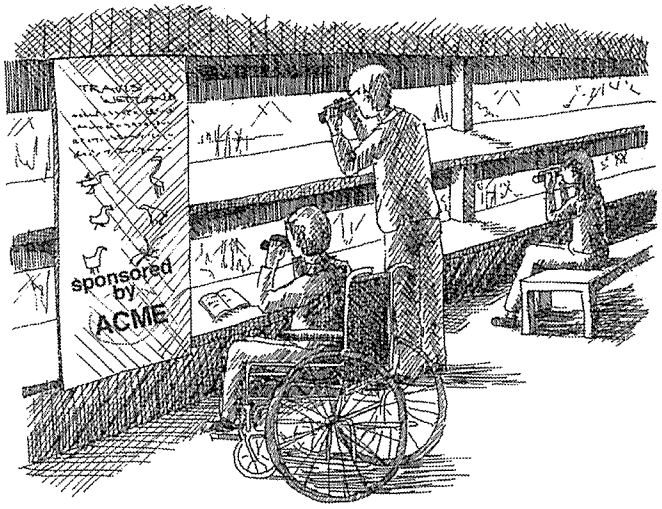
4.4.5 Funding

Because of the wide variety of development activities planned for the wetland, many opportunities exist for corporate sponsorship. It is hoped that private funding will aid the early completion of projects and thus enable the Nature Park to operate as a cohesive unit sooner rather than later. The seeking of grants and sponsorship will be staged to correspond with the priorities set out in the following section. The right to name some wetland features will be retained for corporate sponsorship possibilities. Names will in all cases be encouraged to be in keeping with the wetland context.

The following development grants have been obtained to-date; the first four by the Travis Wetland Trust:

1. Canterbury Regional Council - $35,000 towards Visitors Centre information and display area,
2. Stout Trust - $26,000 for a viewing platform,
3. Forest and Bird Society - $10,000 toward walkways and bird hides.
4. Pacific Development and Conservation Trust - $17,500 towards the western viewing platform walkway.
5. Community Trust - $150,000 towards a visitors' centre.
6. Lotteries Board - $200,000 towards development of the Central Ponding Area.
7. New Brighton Horticultural Society - $2,000 towards seating.

Donations in the form of trees have been made via the Trust. Donors include Trees for Canterbury and the DoC's Motukarara nursery. The Burwood Pegasus Community Board has set aside $40,000 toward the construction of the Anne Flanagan Walkway. The above figures have been incorporated into the revenue section of the budget.



Possible example of corporate sponsorship.

4.5 Budget Summary

The following budget is a ***summary*** of costs and revenue required to sustain the wetland's proposed developments for the next 10 years. The ***full*** budget extrapolates on development costs and provides other costing details. This is held at the Parks Unit, Civic Offices and should be consulted by management when considering development activities. Costs and revenue figures represent the ideal development situation as outlined in this document with some allowance for likely funding uncertainties. All figures are estimated at 1997 price levels and as such are not inflation-proof. Some figures have been updated as at February 1999. A 15% planting failure rate has been incorporated. Actual expenditure will be subject to the annual plan process.

Potential revenue has been estimated using figures which are moderately conservative (neither optimistic or pessimistic) and as such produce reasonably realistic net costs.

Ten Year Budget Summary

	Development Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Activity Total
1	Anne Flanagan Walkway	**20,000**	20,000	20,000	2,000	0	0	0	0	0	0	62,000
2	Predator Control	0	800	540	0	0	0	0	0	0	0	1,340
3	Broadleaved Forest - Clarevale entrance	0	1,000	15,000	10,000	1,000	2,000	0	0	0	0	29,000
4	Broadleaved Forest - Loop Walkway + V/Platform	0	17,500	26,000	7,500	5,000	0	0	0	0	0	56,000
5	Broadleaved Forest planting	0	5,000	5,000	5,000	5,000	5,000	5,000	5,000	10,000	5,000	50,000
6	Western Walkway -	0	0	9,500	7,000	6,000	25,000	20,000	1,000	0	0	68,500
7	Northeast Walkway	0	11,000	0	0	0	0	0	0	0	0	11,000
8	VC Loop Walkway	0	0	5,500	5,000	5,000	18,000	23,500	21,000	38,900	0	116,900
9	Visitors Centre Site	0	0	45,000	9,100	0	15,000	22,700	0	0	0	91,800
10	VC - TCE Walkway	0	0	0	0	0	0	0	14,000	0	0	14,000
11	VC - TCE Cycleway	0	0	0	0	0	0	0	16,000	0	0	16,000
12	Central Kahikatea Area	0	0	500	500	1,000	2,000	1,000	2,000	2,000	1,000	10,000
13	Travis Stream -Travis Rd to CPA	0	0	0	500	35,500	30,000	1,000	1,000	1,000	1,000	70,000
14	North-south drains Naturalisation	0	0	0	0	0	0	0	3,000	4,500	0	7,500
15	Central Ponding Area	0	**200,000**	5,000	1,200	5,000	5,000	0	0	0	0	216,200
16	CPA Access Roads	0	0	4,000	10,000	0	15,000	26,000	10,000	0	0	65,000
17	Weirs - other areas	0	0	0	0	0	0	0	15,000	0	0	15,000
18	Matai/totara Forest	0	0	0	0	5,000	9,000	5,500	17,000	5,000	5,000	46,500
19	Grazing	0	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	24,300
20	Other Planting	2,000	3,000	3,000	2,000	2,000	2,000	2,500	2,500	2,500	2,000	23,500
21	Assist reintroduction of native birds	0	0	0	0	0	0	0	2,000	0	0	2,000
22	Site Clearance	**5,000**	0	0	0	0	0	5,000	10,000	0	0	20,000
21	Signage	3,000	1,500	0	5,000	0	0	0	5,000	5,000	5,000	24,500
22	Management	0	8,000	10,000	10,000	14,000	14,000	16,000	16,000	16,000	20,000	124,000

cont...

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Activity Total
	TOTAL DEV COSTS	30,000	270,500	151,740	77,500	87,200	144,700	130,900	143,200	87,600	41,700	
	Plus Design & Supervision	33,000	297,550	166,914	85,250	95,920	159,170	143,990	157,520	96,360	45,870	
	Totals incl. Contingencies	39,930	327,305	183,605	93,775	105,512	175,087	158,389	208,967	105,996	50,457	
	Less allowance for voluntary labour and plant donations	38,115	312,428	175,260	89,512	100,716	167,128	151,189	183,243	101,178	48,163	1,366,932
Capital Acquisitions Items												
1	**V.C. Site (3.17ha)**											
	House + Land		**379,000**									379,000
2	**Southpower Land (0.57ha)**					150,000	100,000					250,000
	TOTAL CAP. ACQUISITIONS		**379,000**			150,000	100,000					629,000
	TOTAL CAPITAL COSTS	38,115	691,428	175,260	89,512	250,716	267,128	151,189	183,243	101,178	48,163	1,995,932
Maintenance Costs												
1	**Weed Control**	**30,000**	**42,000**	21,000	18,500	16,000	15,250	13,750	12,250	10,750	8,750	178,250
2	**Fencing**	0	5,750	41,900	0	25,760	15,535	0	0	0	0	88,945
2	**Waterway dredging**	0	0	0	0	15,000	0	0	0	0	15,000	30,000
3	**Walkway maintenance**	0	500	1,000	1,000	1,250	1,250	2,000	2,250	2,500	2,500	14,250
4	**Building maintenance**	0	0	1,000	1,500	2,000	2,500	3,000	3,000	3,000	3,000	19,000
5	**Signage**	0	250	250	250	500	500	500	500	500	500	3,750
6	**Rangers time**	1,000	1,000	2,500	3,500	4,500	4,500	6,000	7,500	7,500	8,000	46,000
7	**Management**	500	500	1,000	1,500	2,000	2,000	3,000	3,500	3,500	4,000	21,500
	TOTAL MAINTENANCE	26,500	50,000	68,650	26,250	67,010	41,535	28,250	29,000	27,750	41,750	401,695
	Total Costs	64,615	741,428	243,910	115,762	317,726	308,663	179,439	212,243	128,928	89,913	2,402,627
Estimated Revenue												
1	**Sales**	0	9,000	5,000	17,500	18,000	20,500	20,500	21,500	26,500	26,000	
2	**Other External Funding**	0	**369,500**	55,000	82,000	86,000	52,000	5,000	15,000	20,000	5,000	
	TOTAL REVENUE	0	378,500	60,000	99,500	104,000	72,500	25,500	36,500	46,500	31,000	854,000
	NET COST PER YEAR	64,615	362,928	183,910	16,262	213,726	236,163	153,939	175,743	82,428	58,913	1,548,627

* **Actual figures in bold**

5.0 Park Development Priorities

Development of the park is expected to be a medium to long term operation taking at least 20-30 years. Large areas of the wetland will be largely self maintaining. The major costs of development will be: waterway enhancement and pond creation, fencing, provision of public access facilities, construction of a visitors centre and planting. It is expected that voluntary assistance and donations will significantly reduce the cost of items such as planting and maintenance as indicated in the budget.

This section provides an overview of priorities for the wetland's development and management. Each management topic or area is divided into tasks which are prioritised according to: their perceived urgency, ecological constraints, budget allocations or logistical limitations.

Public Access Rationale

Because of the existence of social benefits and the investment on behalf of ratepayers, it is important to encourage visitors to the wetland. Priorities lie however in ensuring park infrastructure is operational before large numbers visit the site. This means prior to general public admission pathways must be screened from bird nesting, loafing and feeding sites, board-walks and tracks must have been constructed, major ponding and waterway earthworks must have been completed and weeding and planting programmes are underway.

The above protocol exists to ensure (a) minimal disturbance to wildlife, plants and soils and, (b) first impressions of the wetland are consistent with those of a "wetland nature heritage park".

Visitors will be encouraged to attend open days at specific sites. These sites will initially be limited to the Anne Flanagan Walkway and extension to Inwoods Road and the Manuka Area. Visitors are also encouraged to take part in planting and weeding days once a month with the Travis Wetland Trust at Mairehau Road and the Manuka Area. The Travis Country Estates' walkway is now accessible to the public. Development of the Anne Flanagan Walkway and visitor access to the walkway and to the Manuka Area has been selected as a priority in order that public interest be maintained in the wetland while development is in progress at restricted sites elsewhere.

The following section (5.1) sets out priorities *within* planned activities or areas. Following these priorities, section 5.2 lists priorities *between* activities and provides a greater degree of detail for the initial developments.

5.1 Priorities within activities

5.1.1 Weed Control

(a) First priorities

- **Willow eradication** along Travis Stream / Frosts Rd boundary. Remove all female grey willow from the Frosts Road boundary and all willow adjacent to Travis Stream.

- **Mairehau Rd frontage.** Remove blackberry. Maintain weed free and replant cleared areas as per Landscape Development map (end of document). Reference should be made to the species list in Appendix C under each appropriate vegetation type.

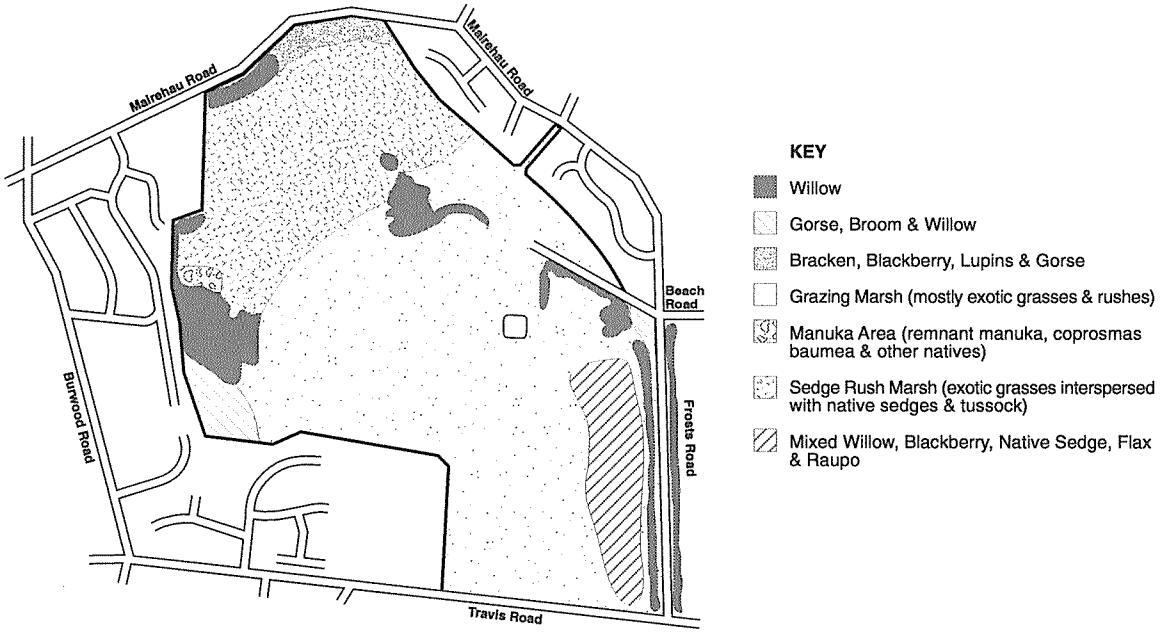
- **Open northern wetland** - Maintain free of willow colonisation and regrowth.

- **Western Willow area** - Eliminate female grey willow and otherwise maintain weed free and replant as per Landscape Development Plan. Cleared sites should be replanted as soon as possible in order to prevent weed regrowth and to facilitate the enhancement of the area in accordance with the Landscape Development map (end of document). This may not apply to cleared sites which have been left for experimental purposes.

  A specialist weed control contract will continue in the Manuka Area. Remaining gorse and blackberry stands will be removed; those adjacent to intended walkway and those which threaten botanical values will be tackled first.

  In the short term the willow woodland will remain largely intact to inhibit the spread of blackberry, gorse and other invasive weeds and to act as a nursery for native seedlings/ saplings. Larger female grey willows in the centre will be ringbarked or drilled and poisoned but left in place. More rapid clearing will take place in the future when resources sufficiently large and reliable enough to maintain weed control are made available.

Current Vegetation



(b) Second-level priorities

- **Beach Road entrance.**
- **Southeast flax area.**
- **Western walkway** - (The walkway connection between Clarevale Reserve Extension and the Anne Flanagan Walkway via the Manuka area). Maintain weed free and replant as per Landscape Development Map.
- **Clarevale Loop Track** - southern end. A peripheral and central strip will be cleared and planted with broadleaved trees, shrubs and kahikatea. Planting to fill in the remainder will take place as a part of an experimental planting programme currently being undertaken by Christchurch Native Habitats.

(c) Third-level priority

- **Other areas** where weeding has begun will be maintained weed free and replanted as per Landscape Development Map.
- **Central Kahikatea Area** - Any female grey willow and other willow will be replaced as required. Gaps created by willow or other weed removal will be planted immediately to prevent other weed spread. As with the Western Willow Woodland, removal of willow will be staged so that a canopy of willow remains to act as a nursery until plantings have matured to a point where they no longer benefit from the willow canopy.
- **Inwoods Road Willow** - Female grey willow will be removed. The remainder will be retained until native screen planting has matured. See Current Vegetation map on p.31.

Paradise shelduck over northern wetland.

5.1.2 Anne Flanagan Walkway

As at January 1999 the compacted grit section had been constructed with the boardwalk section due for completion by June 1999.

(a) First Priority

- Weeding maintenance.

(b) Second-level Priorities

- Planting programme as per Appendix C.
- Completion of boardwalk .

(c) Third-level Priorities

- Construction of viewing area.

5.1.3 Western Willow Woodland

(a) First Priorities
- Weeding maintenance. Grazing is not appropriate in this area.
- Propagation of rare/sensitive plants. Refer to Appendix C for details.

(b) Second Priorities
- Construction of eastern section of loop walkway from Clarevale entrance.
- Construction of viewing platform at location specified on Landscape Development Plan.

(c) Third Priority
- Completion of Clarevale loop walkway.
- Complete conversion to broadleaved forest, manuka shrubland and Tussock/Reed Swamp as per species list in Appendix C.

5.1.4 Ponds and Waterways

Pre-requisite for public admittance to the Central Ponding Area:
Screen plantings must have reached a stage where they will be effective in preventing disturbance to wildlife. This prerequisite exists to ensure there can be no disturbance to wildlife under normal operating circumstances.

A botanical check of each particular area will be carried out prior to construction of ponds and waterways and significant native plants will be transplanted.

As at February 1999 excavation of the CPA is about to commence and is due to be completed by June 1999. Travis Stream has been realigned.

Travis Stream.

(a) First Priorities
- Construction of the Central Ponding Area, weirs and associated water-ways.
- Modification of Travis Stream as per Landscape Development Map.
- Termination of drains and naturalisation of drain shapes as per Landscape Development Map.
- Construction necessary to limit extent of ephemeral ponding caused by influx of Avon River water.
- Southeast pond construction.

(b) Second-level Priorities
- Construction necessary to direct water from Central Ponds to Travis Country Estates' moat and Corsers Stream.
- Small pond adjacent to Frosts Road near Beach Road entrance.

5.1.5 Stock Fencing

New fence lines will be required to prevent cattle from polluting water-ways, eating native plants and pugging the soil. Alterations to fence lines must be coordinated with the enhancement of other areas and may necessitate the use of temporary electric fencing.

(a) First Priorities
- Fencing and gate construction in the Central Ponding Area in accordance with the Landscape Development Map. Temporary electric fencing should be used where permanent lines are undecided. Coordination of planting and waterway construction may necessitate this.
- Fence an area off for cattle drinking water.

(b) Second-level Priorities
- Fencing and gate construction in the other areas in accordance with the Landscape Development Plan.

Other Fencing
In the medium term (10-12 years) fencing designed for security will be considered as an option and initially limited to a 2.5m high wire fence and gate of limited length at the entrance to the Central Ponding Area.

5.1.6 Signs

All signage will be produced within the parameters of the Interpretation Plan.

(a) First priorities
- By-law statements, required to inform public of rights and responsibilities, will be located at entrance points; initially Mairehau Rd and Clarevale Reserve.
- Interpretation signs. To be installed along the Anne Flanagan Walkway.

(b) Second-level priorities
- Install interpretation signs at strategic points along other public walkways and at bird hides, viewing platforms and the Visitors Centre.

5.1.7 Predator Control

(a) First Priorities
- Trapping and poisoning experiments.
- Cat collars.

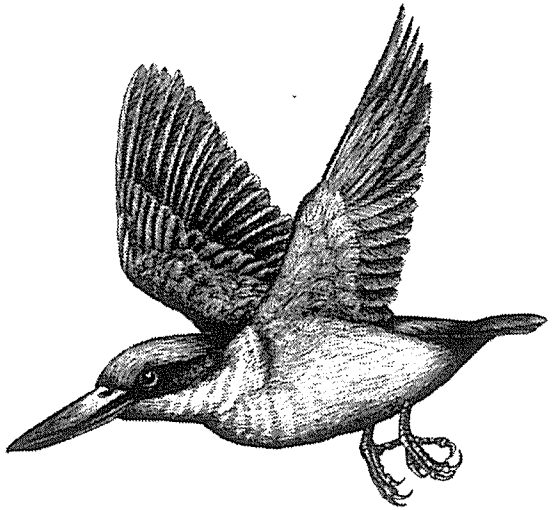
(b) Second-level Priorities
- Peripheral swales.
- Fencing.

5.2 Priorities between activities

Weed control takes overall priority and will continue to do so throughout development activities. Planting areas not listed below indicate a low priority and can be tackled at any stage as long as they not postpone any of the listed developments. The following priorities are listed in order of importance from highest (1) to lowest (20).

The following priorities represent the most logical order given current knowledge of funding and logistical requirements. As development proceeds, ongoing experimental management and changes in funding availability and to logistical requirements may necessitate minor alterations to the following priority order. For example, a grant may be tagged to a particular development and only be available during a limited time period. The active seeking of corporate sponsorship, grants and donations will, however, be encouraged to follow the logical order listed here and in section 5.1.

1. Completion of Interpretation Plan.
2. Completion of Anne Flanagan Walkway.
3. Construct Central Ponding Area (CPA) and reconstruct access road.
4. Screen planting along CPA walkway. Re-fence CPA.
5. Transfer sensitive plants from Manuka Area and CPA. Begin nursery propagation.
6. North-eastern walkway completion.
7. Screen planting Beach Road.
8. Screen planting North-eastern walkway between Inwoods and Mairehau Rds.
9. Screen planting along Telecom land boundary.
10. Screen planting along Visitors Centre Loop walkway south of Beach Rd.
11. Visitor Centre area developments.
12. Construction of eastern portion of Broadleaved Forest Loop Walkway and viewing platform.
13. Fern Dell and Mairehau Rd frontage planting (in addition to regular volunteer planting).
14. Planting along route of Western Walkway.
15. CPA bird hide facing east.
16 Second CPA bird hide (facing CPA).
17. Western Walkway construction (to link Mairehau Rd to Clarevale Park).
18. Visitors Centre loop walkway incl. viewing platform
19. Extension of CPA walkway to Travis Country Estates and off-shoot to Travis Rd.
20. Naturalise shape of North-south drains.



Monitoring

Monitoring is necessary to ensure that Development Plan objectives for the wetland are being achieved. Because of the experimental nature of some of the development ongoing monitoring will be necessary. On-site development will be monitored to ensure that it complies with the Landscape Development Plan and that it remains the most effective means for achieving Park objectives.

A review of Plan Priorities and Design Guidelines will be made on an annual basis. The annual review will be carried out by the management committee which consists of the Planning Technical Support Team and Parks Unit planning. Planning Team members are: Kelvin McMillan - Parks Planner (team leader), John Walter - Hydrologist (CCC), Colin Meurk - Plant Ecologist, Andrew Crossland - Ornithologist, Alan Cutler - Landscape Design (CCC) and one member of the Travis Wetland Trust. Liaison is also maintained on a regular basis between the Travis Wetland Trust and the Parks Unit via Garry Harrow (Area Parks Officer) and Coastcare. Other members of the City Council are consulted in their area of technical expertise when required.

The annual review will take public opinion into account. This will be achieved by monitoring public opinion in terms of on-site visitor surveys and correspondence received during the year.

Acknowledgements

I would like to thank the following people for their assistance in producing this document:
Dean Aldridge - planning technician: CCC, Andrew Crossland - ornithologist, Alan Cutler - landscape architect (CCC), Kate McCombs - botanist (CCC), Rod McFarlane - entomologist, Kelvin McMillan -parks planner (CCC), Colin Meurk - ecologist (CCC/Landcare Research), John Walter - hydrologist (CCC), and the Travis Wetland Trust for their input. The Landscape Development map was drawn by Malcom Kitt, CAD draughts-person (CCC). Wetland perspective sketches are by Louisa Davies. Photographs were taken by Kelvin McMillan, Eric Banks, DoC, Daphne Banks, Liz Briggs and Eleanor Bissel.

Eric Banks, Parks Planner

December 1997 (Draft date),
March 1999 (Final version).

Bibliography

Arand J., Basher L., McIntosh P., Heads M., (1992). *Inventory of New Zealand Soil Sites of International, National and Regional Importance - Part one -South Island and Southern Offshore Islands (1st edition,)* - Prepared for the Joint Earth Sciences Societies Working Group on Geopreservation (Unpublished).

Burrows C.J., (1995). *Report To The Christchurch City Council On The Flora, Vegetation, Wetland Character And Ecology Of The Travis Country Estates' Portion Of Northern Travis Swamp*- Prepared for the Christchurch City Council (Unpublished).

Buxton R., 1991. *New Zealand Wetlands A Management Guide*, Department of Conservation and former Environmental Council,

Collier A., 1994. *Principles of Tourism A New Zealand Perspective* - Third edition, Longman Paul.

Crossland A., February-August 1997. Personal Communication.

Crossland A., 1996. *Travis Wetland Birdlife Inventory, Analysis And Restoration Potential* - Prepared for the Christchurch City Council, (Unpublished).

Department of Conservation, 1989. *Whangamarino Wetland Management Plan*, Department of Conservation, Hamilton.

Given D.R., 1994. *Travis Swamp: Global Perspectives* - Prepared for the Christchurch City Council (Unpublished).

Harris C.S., Fox J.P., and Vucetich C.G., 1946. *Soil report on Travis Block with special reference to subsidence,* DSIR.

Johnson and Brooke (1989). *Wetland Plants in New Zealand*, DSIR.

Macfarlane R.P., et al, 1996. Travis Marsh - invertebrate inventory and analysis, (Unpublished).

McGlone M.S., 1995. *Vegetation History of Travis Swamp*, Landcare Research NZ Ltd, Lincoln.

McMillan K.R., Reynolds A.C., 1996. *Travis Wetland Nature Heritage Park - An assessment of the Development Concept & Summary of Technical Evidence: Attachment C,* Parks Unit, Christchurch City Council (Unpublished).

Meurk C.D., Ward J.C., O'Connor K.F. 1993. *Natural areas of Christchurch: Evaluation and Recommendations for Management as Heritage* - Prepared for the Christchurch City Council (Unpublished).

Meurk C.D., February-August 1997. Personal Communication.

Meurk C.D., 1995. *South Travis Wetland: Botanical Inventory, Ecological and Conservation Assessment*, Landcare Research NZ Ltd, Lincoln.

Meurk C.D., 1988. *Travis Swamp Revisited* - (in Canterbury Botanical Society Journal No.22, pp. 47-63), Canterbury Botanical Society.

Partridge T.R., 1984. *The Vegetation of Travis Swamp*, Prepared for Botany Division, DSIR, Lincoln, (Unpublished).

Pattle Delamore Partners Ltd, 1995. *Report on: Hydrological Investigation of the Travis Road Property* - Prepared for Travis Country Estates Ltd, (Unpublished)

Pattle Delamore Partners Ltd, 1996. *Report on: A second Phase Hydrological Investigation of the Travis Road Property* - Prepared for Travis Country Estates Ltd, (Unpublished).

Resource Management Act, 1991.

Sagar P.M., Hawes I., Taylor M.J., Smith R., 1996. *Inventory of aquatic life in North Travis Wetland and an assessment of its ecology* - Prepared for the Christchurch City Council (Unpublished).

Thompson K., 1995. *Report on the wetland status of Travis Swamp,* Christchurch - Prepared for Travis Country Estates, University of Waikato, (Unpublished).

Travis Wetland Trust, May, June 1997. Personal Communication.

Webb T.H., 1995. *South Travis Wetland Soil Description And Conservation Assessment*, Landcare Research, Lincoln.

Wheeler B.D., et al, 1995. *Restoration of Temperate Wetlands,* John Wiley and Sons England.

Appendices

Appendix A - Wetland Definitions

1. *Resource Management Act, 1991.*
"include permanently or intermittently wet areas, shallow water, and land water margins that support natural ecosystems of plants and animals that are adapted to wet conditions."

2. *Environmental Council(1986). New Zealand Wetlands Management Policy, p3.*
"A collective term for permanently or intermittently wet land, shallow water and land-water margins. Wetlands may be fresh, brackish or saline, and are characterised in their natural state by plants and animals that are adapted to living in wet conditions."

3. *Johnson and Brooke (1989). Wetland Plants in New Zealand, DSIR, p1.*
"places where the ground is permanently or periodically wet...bogs, swamps, marshes, mires, fens, flushes, seepages, puddles, ponds, margins of lakes, streams and rivers."

4. *Wheeler et al(1995). Restoration of Temperate Wetlands. Wiley & Sons, p12.*
"...the concept of wetlands essentially accommodates sites that have (or once had) a water table close to the ground surface for much of the year, but which may experience some periodic inundation or drying."

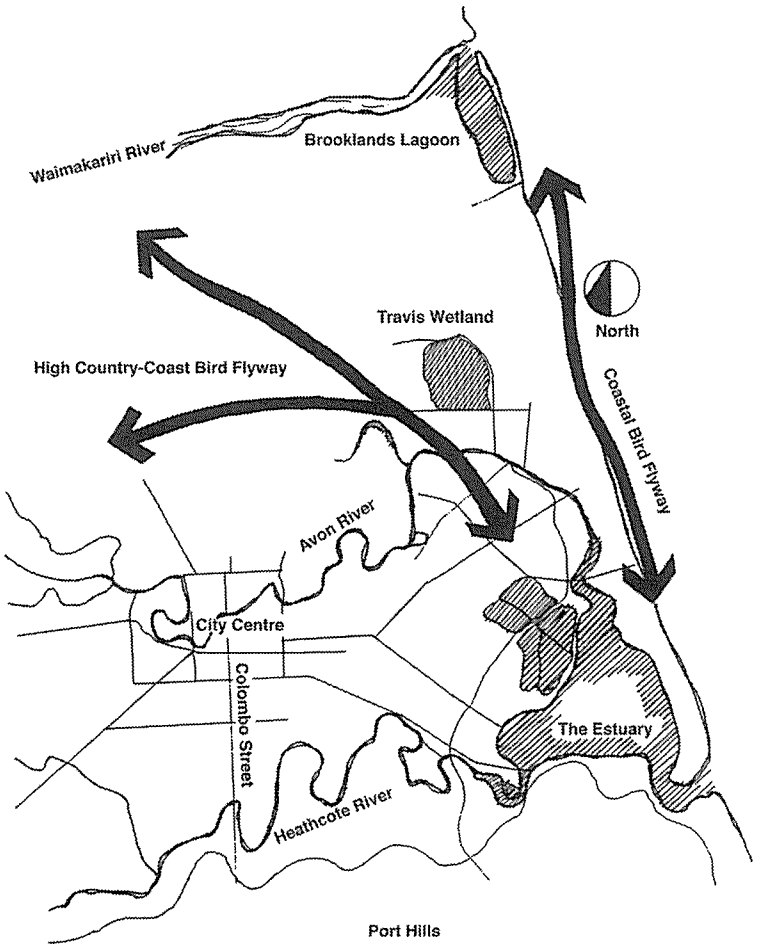
5. *Burrows (1995).*
"a vegetated area where the water table lies at, or below the ground surface for much of the time." Report to the CCC on the flora, vegetation, wetland characteristics and ecology of Travis Country estates' portion of northern Travis Wetland. (Used during several Planning Tribunal hearings and decisions).

6. *Webb (1995). South travis Wetland soil description and conservation assessment.*
"land in which water tables are within 50cm of the soil surface for greater than 50 percent of the time."

Appendix B - Ponds and Waterways

Purpose:
- Preferred feeding and loafing habitat for cormorants, herons, waterfowl and waders.
- Waterways act as a buffer to mammalian predators.
- Waterway edges offer important nesting opportunities for wetland birds.

Planting:
- Dense fringing vegetation - NZ flax (*Phormium tenax*), raupo (*Typha orientalis*), pukio (*Carex secta*), other sedges, for example, *Bolboschoenus caldwellii* and *Schoenoplectus validus* and rushes (*Juncus spp.*). These will become islands during times of high water level and provide nest sites, shelter and food (insects and plant material). They will also help provide shade over the water which is one means of reducing eutrophication.
- The following plants will be used in riparian zones to help reduce the chances of algae forming by intercepting nutrients and promoting zooplankton; *Juncus gregiflorus*,



The ponds and waterways of Travis Wetland form an integral part of the local and regional bird flyways.

Juncus sarophorus, Juncus pallidus, Carex virgata, Carex secta, Carex coriacea, Carex maorica, Cortaderia richardii, Blechnum minus, Polystichum vestitum, Typhas orientalis, Schoenoplectus validus.

- *Carex secta* interplanted with raupo will provide shelter for waterfowl and effectively isolate nesting pairs so that a greater number can be accommodated for a given area.
- Raupo will need to be kept within manageable levels to prevent it from clogging waterways. Harvesting riparian raupo would serve two purposes; removal of nutrients from the site (and therefore lessening eutropication), and providing material for cultural purposes.
- Native pond margin species such as myriophyllum (milfoil) will accommmodate bird and possibly sheep grazing and reduce the need for the more destructive cattle grazing.
- There should be a succession through aquatics and emergents through marsh-land to dry land.
- Tall trees, mostly kahikatea, will be planted adjacent to the Central Ponding Area. These will eventually provide roosting and nesting opportunities for birdlife. Existing crack willow and male grey willow will be retained in the short term to provide nursery conditions for kahikatea forest seedlings and interim roosts.

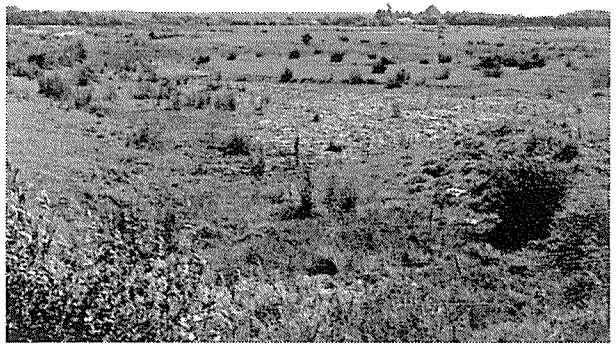
Design and Management Guidelines - Central Ponding Area:

- Long sinuous ponds, peninsulas and islands will provide a quality and diverse environment.
- Shorelines will be indented and islands and peninsulas will be constructed within ponds. This will maximise the ratio of margin to water area thus (a) providing greater breeding suitability, and (b) reduce eutrophication and the chances of algae bloom forming.
- Ponding margins will be constructed to form gently sloping banks' of varying width. A critical depth of 25 cm must be available for the feeding of bittern.
- Water coverage of the Central Ponding Area will be maintained at a minimum of 2ha.
- Higher water levels will be maintained over the breeding season (Aug-Nov). Water should be allowed to flow over bunding onto the adjacent wet meadows in order to help attract birds during this period.
- Lower water levels will be maintained in the Central Ponds from Dec-Feb to provide insects for feeding chicks and to attract waders and herons.
- The area of open deeper water is designed to provide habitat for diving birds. Water turbulence is also likely to reduce eutrophication and algae blooming. This expanse of water will have a maximum depth of 1.7m at high water level and a maximum depth of 1.45m at low water level.
- Each island will incorporate a raised grassy headland to provide roosting habitat for cormorants, herons and waterfowl. The remaining area of each island should be planted in flax and raupo.
- Islands will be domed in shape to provide shelter and to segregate species. Each island will be oriented so that the largest bay of each island is leeward of the easterly wind.

- Access points will be limited to reduce disturbance to wildlife and minimise construction and maintenance costs.
- All areas of public access will be screened using kahikatea and pokaka (*Elaeocarpus hookerianus*), and smaller but faster growing trees such as, *Coprosma robusta, C. propinqua*, manuka, *Pittosporum tenuifolium*, NZ flax, toetoe, *Plagianthus regius*, or other trees and shrubs appropriate to the soil type. If premature public access becomes a problem interim screens of canvas or shade cloth may have to be used until trees planted as screens have reached sufficient height and lateral coverage.
- Interpretive material will be focused in this area.

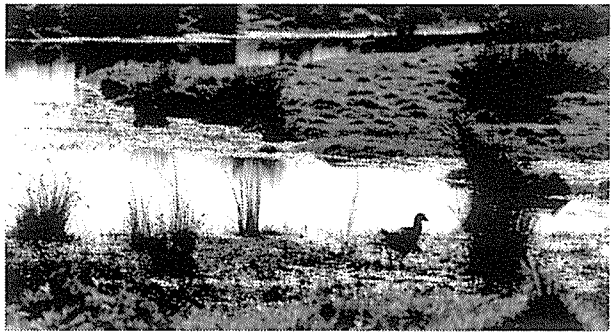
Design guidelines - other waterways:

- Naturalise the flow of deeper north-south drains; the more shallow will eventually fill in themselves. Care should be taken to ensure that native fish (eel) are transferred when filling in any complete sections of drain.
- Methods of allowing access for native fish from the Avon and through / over weirs within the wetland will be investigated.
- Water levels should be manipulated to ensure ephemeral ponding is available over the breeding season (Aug-Nov). The resulting water movement in the riparian margins will assist seed dispersal of *Carex secta* and other species.
- In order to maintain a visible summer bird population the Travis Stream area should be flooded up to the Central Ponding area weir during drier periods. This will be possible by invoking the two southeastern weirs, thus allowing the Central Ponds to drop to summer levels whilst retaining adjacent ephemeral water.
- Pond and waterway inflow, particularly at the waterway entrance to the park, should be filtered using native plantings or a grate system to help prevent algae and other water weeds from gaining entry. Other weeds to watch out for include Avon River weed *(Potamogeton crispus)*, oxygen weed (*Lagarosiphon major)* and water cress (*Rorippa microphylla*).
- Waterway dredging will take place on a 5 yearly basis. A modified rotary suction dredge fitted with swamp tracks could be trialled. Weeding waterways will take place on an annual basis and will be carried out by hand. It is hoped be able to confine the above two activities to Travis Stream.
- Sheep may be trialled to graze under electric wire down to pond margins. If grazing birds manage to keep pond margin weeds down or if *myriophyllum* and other native lake margin species are able to dominate then sheep may not be necessary in these areas.



Above: *An ephemeral pond during summer in the southern wetland.*

Below: *The same ephemeral pond during winter.*



Monitoring Water levels:

- Water levels and water quality including stormwater inflow within the Central Ponding Area and other waterways must be monitored at regular intervals. Monitoring will need to be more frequent when river water is being directed in and allowed out to ensure appropriate levels are obtained.
- Water levels of land adjacent to the Barkers Canal and Travis Stream will be monitored during construction trials to ensure there is no possibility of neighbouring properties being flooded.
- The permanent ponding area in the extreme southeast will be constructed so that it will aid flooding of the Central Ponding Area via Barkers Canal.
- Avon River water will be available for 2-3 hours per tide (every 12 hours) 2-3 weeks per month.

Appendix C - Vegetation

The native floating fern azolla blanketing a small pond in the southern wetland.

Vegetation - General Points

- Locally sourced seed will be used whenever possible in order to improve seedling survival chances and to enhance the biodiversity of the region.
- Moss growth will be encouraged in suitable habitats (all except Coastal Bush) as it provides an important habitat for invertebrates.
- All planting will be done using younger nursery plants to minimise risk of contaminating the soils with flightless introduced weevils now common in Christchurch.
- In order to help reduce the occurrence of manuka blight, seeds from resistant plants should be gathered and used as the seed source.
- *Sophora microphylla* (kowhai), *Pittosporum* sp., five-finger, *Pseudopanax, Phormium tenax* planted together will provide a good sequence of flowers for native bees, flies, parasitic wasps, moths and bellbirds.
- Where possible, vegetation should be tiered to provide potential habitat for such species as the fernbird. This will also aid the task of establishing more fully representative ecosystems.

Grazing Marsh

Description:

Extensive area of seasonally wet, short meadow (around 0.15 m), with scattered tussock rushes and sedges (to 1m) on gleyed mineral soil.

Purpose:

- Provides feeding, roosting and nesting habitat for large numbers of wetland birds; notably flocks of pukeko, waterfowl (paradise shelduck, grey duck, mallard, Canada goose), herons (white faced heron, white heron, cattle egret) and waders (pied stilt, spur-winged plover).
- NZ pipits will also make use of this habitat.

Planting:

- Plant rushes sparsely to provide invertebrate habitat, nesting for pukeko and more natural appearance.
- The following native plants are non-palatable to cattle and will thus provide an attractive native element to grazed areas. Maori Onion (*Bulbinella angustifolia*) is a tufted herb with yellow flowers and grows to about 40cm tall. The sedge, *Carex coriacea* grows to about 50 cm tall and can be prolific. Also rushes (*Juncus gregiflorus, J. sarophorus and J. australis*).
- Establish scattered populations of *Carex secta,* toetoe (*Cortaderia richardii*), rushes and NZ flax (*Phormium tenax*) over the peat and mineral soil areas. The *Carex secta* and toetoe will need to be fenced from cattle. This will visually enhance these areas with natives while providing additional cover for birdlife.

Design Guidelines:

- Scattered island plant populations will need to be fenced or otherwise out of reach of cattle to prevent grazing.
- For the benefit of feeding pukeko, plant populations other than grasses favoured by stock should be monitored to ensure they do not become dominant.
- Light cattle grazing will be sufficient to control weeds but limited to ensure survival of native sedge and grasses. Initially, fifty cows will be grazed all year round while 50 calves will be grazed for 30 weeks of the year. Future stocking densities will depend on the results of monitoring weed control effectiveness and side effects such as pugging and native plant damage. Stock densities should be reduced during wetter periods.
- Sheep may be trialled for turf management around ephemeral ponds. It is envisioned that sheep would be brought in to the wetland for grazing as required.

Ephemeral ponding will aid weed control and encourage native turf species. A system of weirs will be used to provide winter ponding for feeding birds and spring ponding for breeding birds.

Tussock/Reed Swamp

Description: Tall (2-3m), dense tussock sedges, rushes, NZ flax, reeds and ferns along margins of streams, ponds and springs.

Purpose:

- Provides feeding, roosting and nesting habitat for native waterfowl (grey duck, NZ shoveler, grey teal, NZ scaup), coot, harrier and swampbirds (pukeko and potentially bittern, marsh crake and fernbird).

Soils: Fertile saturated peats and gleyed soils near waterways or ponds.

Purpose:

- Essential for the nesting and roosting of pukeko, crake and bittern and waterfowl, especially, grey teal, scaup and shoveler.
- Useful as screens and nutrient sink.
- Necessary for the foraging of marsh birds.
- Important habitat for invertebrates particularly raupo and tussock sedge.

Planting:

- Raupo (*Typha orientalis*), NZ flax (*Phormium tenax*), toetoe (*Cortaderia richardii*), *Carex secta*, tall rushes (*Juncus pallidus, J. gregiflorus, J. sarophorus*), cabbage trees (*Cordyline australis*), *Coprosma propinqua*, ribbonwood (*Plagianthus regius*), also karamu (*Coprosma robusta*) and kohuhu (*Pittosporum tenuifolium*) on drier margins and lake clubrush (*Schoenoplectus validus*) on water margins.

Design guidelines:

- Plant along waterways, stream margins and pond edges.
- Once this type of vegetation is established it can tolerate light peripheral grazing. It should be fenced for the first 10 years.

Sedge-Rush Marsh

Description: Sward of turfy sedges, rushes, grasses and herbs with recolonising tall tussocks of sedge and rushes (1m), on permanently wet peat.

Purpose:

- This will provide additional feeding and nesting habitat for waterfowl, swampbirds and and harrier.

Soils: Deep peat soils (Waimairi Series).

Planting:

- Silver weed (*Potentilla anserinoides*), onion orchid (*Microtis unifolia*), willow herb (*Epilobium billardiereanum*), *Centella uniflora* (a creeping herb), *Sphagnum cristatum.* Note, onion orchid and willow herb will seed naturally. The native buttercup *(Ranunculus sp.)* currently present should be spread further in this area and into the western marshland where it is not grazed (as it is possibly too toxic for cattle).
- Establish scattered populations of *Carex secta*, toetoe (*Cortaderia richardii*), rushes and NZ flax over the peat areas. This will visually enhance these areas with natives while providing additional cover for birdlife.

Design Guidelines:

- This area is too boggy for cattle grazing.
- Woody weeds will continue to invade and these and their sources will require on-going vigilance and control. Continue current contract weed control.
- Most of the small herbs mentioned above will be difficult to plant and establish. The main effort must be to manage existing populations so that they are sustained, especially *Ranunculus glabrifolius.*

New Zealand Scaup

Manuka Tall Shrub Swamp

Description: Dense to open woodland of manuka, mikimiki, cabbage tree and ribbonwood on permanently wet peat.

Purpose:

- Provides feeding, roosting and nesting habitat for swampbirds - particularly pukeko but also potentially bittern, marsh crake and fernbird.
- Waterfowl (particularly native ducks) will use this habitat for nesting where it adjoins open water.
- Native bush birds and introduced passerines will feed and nest.

Soils: Waimairi and peaty Taitapu soils (saturated peats and gleyed soils).

Planting:

Manuka (*Leptospermum scoparium*), cabbage trees (*Cordyline australis*), mikimiki (*Coprosma propinqua*), *Baumea rubiginosa,* sundew (*Drosera binata*), spider orchid (*Corybas macranthus*), wood rush (*Luzula picta*), arrow grass (*Triglochin striata*). Plant NZ flax (*Phormium tenax)* and toetoe *(Cortaderia richardii)* along the drain edge.

Design Guidelines:

Manuka blight may be a problem. Experiment with varieties to minimise proportion of local population with blight.

Broadleaved Swamp Forest

Decription: Dense low forest (10m) of karamu, kohuhu, cabbage tree and ribbonwood on permanently wet peat.

Purpose:

- To provide feeding, roosting and nesting habitat for a range of native bush birds and introduced passerines.
- Native species expected to colonise naturally include bellbird, silvereye, grey warbler, fantail, shining cuckoo and kereru.
- Species with potential for reintroduction (depending on forest habitat size and quality) include tomtit, rifleman, brown creeper, morepork and tui.

Soils: Deep peats and peaty soils.

Planting:

Kohuhu (*Pittosporum tenuifolium*), lemonwood (*Pittosporum eugenioides*), five finger (*Pseudopanax arboreus*), lancewood *(Pseudopanax crassifolius)*, whiteywood/ mahoe(*Melicytus ramiflorus*), ribbonwood (*Plagianthus regius*), karamu (*Coprosma robusta)*, rohutu (*Neomyrtus pedunculata*), seven finger/pate (*Schefflera digitata*), kaikomako (*Pennantia corymbosa*), turepo/small leaved milktree (*Streblus heterophyllus*).

Kahikatea Swamp Forest

Decription: Tall forest dominated by emergent kahikatea (25m) and canopy of pokaka, ribbonwood and broadleaf on seasonally wet mineral soil.

Purpose:

- See Broadleaved Swamp Forest.

Soils: Permanently moist, gleyed Taitapu subsoils.

Planting:

Kahikatea/white pine (*Dacrycarpus dacrydioides*), pokaka (*Elaeocarpus hookerianus*), lemonwood (*Pittosporum eugenioides*), kohuhu (*P. tenuifolium*), ribbbonwood (*Plagianthus regius*), broadleaf *(Griselinia littoralis)*, cabbage trees *(cordyline australis)*, kaikomako *(Pennantia corymbosa)*, lancewood *(Pseudopanax crassifolius)*, rohutu *(Neomyrtus pedunculata)* and karamu *(Coprosma robusta)*.

Design Guidelines:
The Central Kahikatea Area will be gradually phased in as individual crack willow die or are removed.

Totara–Matai Hardwood Forest

Decription: Tall forest dominated by totara and matai (25m) emergent over a canopy of lemonwood, broadleaf, hinau, kowhai and broadleaf on seasonally wet mineral soil.
Purpose:
- See Broadleaved Swamp Forest.

Soils: Freer draining, but permanently moist, mottled subsoils.
Planting:
Ribbonwood (*Plagianthus regius*), hinau (*Elaeocarpus dentatus*), lemonwood (*Pittosporum eugenioides*), broadleaf (*Griselinia littoralis*), totara (*Podocarpus totara*), matai/black pine (*Prumnopitys taxifolia*), narrow-leaved lacebark (*Hoheria angustifolia*), *Pseudopanax* spp., rohutu (*Neomyrtus pedunculata*), karamu (*Coprosma robusta*), kohuhu (*Pittosporum tennuifolium*).

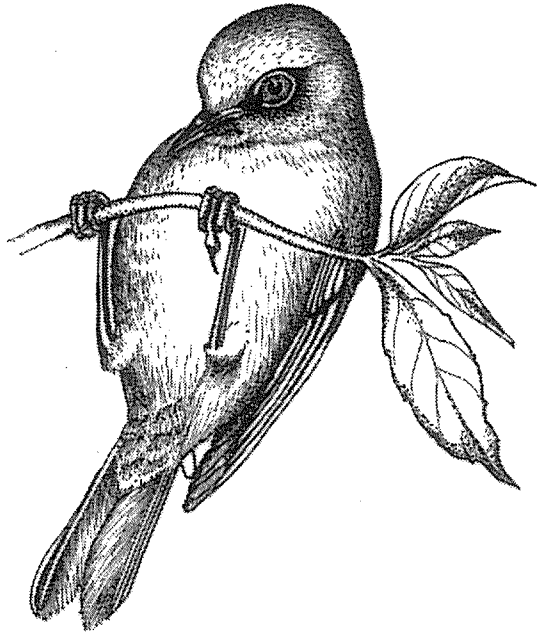
Coastal Bush

Decription: Low forest (10m) of hardwood trees such as akeake, ngaio and olearia on dry sandy soil.
Purpose:
- See Broadleaved Swamp Forest.

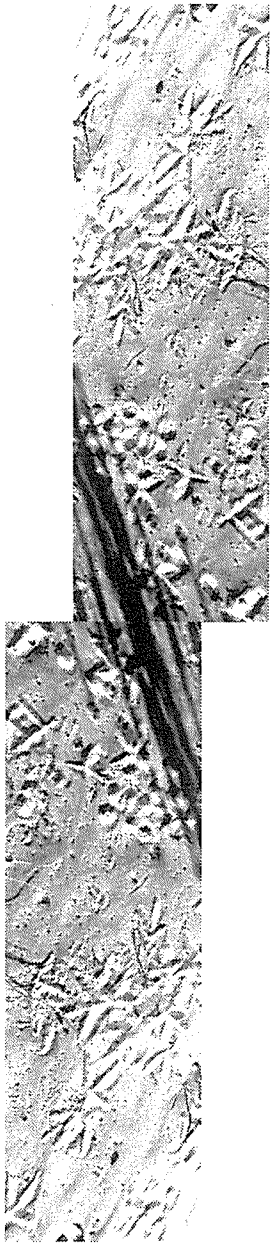
Planting:
cabbage tree (*Cordyline australis*), bracken (*Pteridium esculentum*), poroporo (*Solanum laciniatum*), kanuka (*Kunzea ericoides*), akeake (*Dodonaea viscosa*), kowhai (*Sophora microphylla*), ngaio (*Myoporum laetum*), matagouri (*Discaria toumatou*), kohuhu (*Pittosporum tenuifolium*), karamu (*Coprosma robusta*), taupata (C. repens), akiraho (*Olearia paniculata*), rohutu (*Neomyrtus pedunculata*), cottonwood/tauhinu (*Cassinia leptophylla*), mingimingi (*Coprosma propinqua*).

Weed Control

"Manuka Area"
- The proposed walkway through this area has been routed in order to avoid rare and/or sensitive plants. Any such plants which do exist in the vicinity of the walkway should be removed to other sites in the area or to a nursery for cuttings to be made. Seed should be collected and cuttings made for propagation from these and other similar plants in the area. For the benefit of visitors these propogules should then be planted out to positions viewable from the proposed walkway. Natural populations of vulnerable natives will need to be screened from sight for their protection. Contact should be made with nurseries and interest groups to see if they can be of assistance in this respect.
- On the border of the current "manuka area" and the willow woodland, native shrubs should continue to be planted to help contain willow spread and to initiate the self-seeding of natives. These shrubs include cabbage tree (*Cordyline australis*), karamu (*Coprosma robusta*), manuka (*Leptospermum scoparium*), mingimingi (*Coprosma propinqua*).



It is hoped that native forest plantings will attract bush birds to the wetland.



- The Travis Wetland Trust and "Manuka Group" activities will gradually move further into the Willow Woodland and into the area between the Manuka Area and the Anne Flanagan Walkway. Expansion into other areas will be contingent on being able to maintain control in existing areas.

Swamp-wide

- Female grey willows in all areas are to be exterminated. Remove all new willow seedlings.
- Some of the larger dead exotics should be left to provide cormorant resting sites.
- Hand tools are to be used in preference to motorised tools and herbicide. This will become a more important consideration once sensitive wildlife communities have been established and visitor numbers necessitate the maintenance of satisfactory visitor experience levels. Initial weed clearance over large areas may necessitate their use however.
- Depending on resource availability, weeds should be brought to at least manageable levels at a particular site before commencing weeding in other areas.
- Ongoing research will be undertaken into improving the effectiveness of weed control.
- See also, Weed Control Asseessment prepared for Lotteries grant application.

Appendix D - Walkways

- Raised compacted grit walkways are cheaper to construct than boardwalk and will be used where ground is dense enough.
- Two grades of compacted grit paths will be used; Type A consists of approximately 100mm of base material with crusher dust overlay and a filter fabric (Terra-mat) underlay, Type B uses a rigid geo-grid underlay and includes an additional 100mm of crushed gravel base. The two types are distinguished by cost in the full budget (not included in this plan).
- Walkways would be constructed to 30cm above high water level. Bunding material must be sourced free of weeds.
- The use of drains through walkway base will maintain water flow.

Clarevale to Manuka area walkway

Passing through sensitive areas, the walkway will avoid proximity to rare plants. Once established in sufficient numbers, seedlings and cuttings from these plants can be planted adjacent to the walkway for the benefit of visitors.

The ground immediately adjacent to the proposed viewing area is dense enough for a raised walkway. This could be used as a connection to a strip of fill running East-West between two drains. The remainder of the walkway will be constructed partly as boardwalk and partly raised walkway.

Beach Road extension and existing metalled CPA track

Construction of CPA is likely to result in damage to these tracks from large trucks and machinery. Will have to be reconstructed suitable for vehicles. These tracks will be used by walkers and service vehicles. Very occasionally heavy machinery may need to access this part of the wetland using these tracks. The existing track south of the CPA will be upgraded down, or near, to Travis Road for service machinery.

Walkway Screening
Perimeter walkways will be sheathed in trees to reduce visual intrusions and minimise disturbance to wildlife. Gaps will occur at strategic points to allow views into the wetland. Tree screens should be planted out into the wetland to compensate for these gaps. Because the screens will be located a considerable distance out, the view of the wetland itself will not be compromised.

The walkway ridge between the Telecom property (see Landscape Development map) and the Sedge/Rush Herbfield will be planted with tall fast growing trees in order to reduce the visual intrusions of housing. Suggested species are ribbonwood (*Plagianthus regius*) and kahikatea (*Dacrycarpus dacrydioides*), but may include other dryland species on the reclamation.

The line of willows adjacent to the Inwoods Road extension, will be replaced by a screen of broadleaved trees and kahikatea with Tussock Reed Swamp planted at the base of the trees on the swamp side.

Cycleway alternatives
There are several possibilities for incorporating cycle commuters and mountain bikers in the wetland. The safest and most appropriate alternative to accommodate cyclists as well as pedestrians is to separate the two different types of park users. Potential clashes from the Beach Road entrance through the Visitor Centre area and Inwoods Road extension to Mairehau Road would be minimal. The possibility of a cycle track from the Central Ponding Area to Travis Country Estates will be investigated. A separate track for cycles would have to be run roughly parallel to the walkway of the same route along the eastern side.

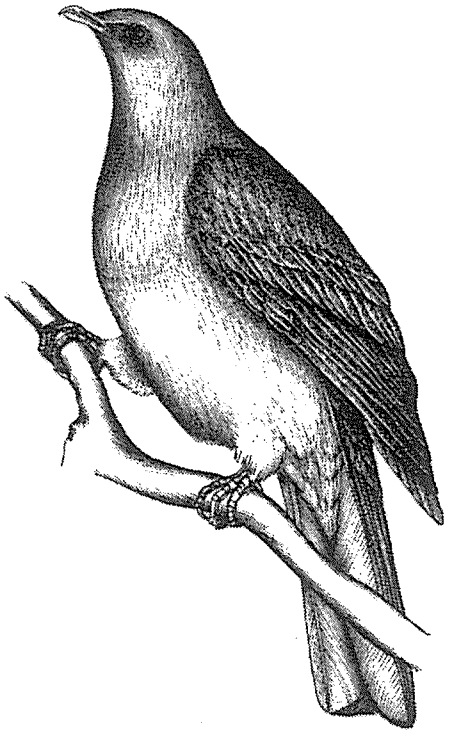
All walkways not designated as cycleways will incorporate stiles or barriers sufficient to impede cyclists but allow free access for wheelchairs and pedestrians.

Appendix E - Stock Fencing & Predator Control

Stock Fencing
Seven strand wire should be used in preference to five-wire to allow for the future possibility of sheep grazing. The western grazing marsh and sedge-rush marsh areas should be given preference if this is an issue as cattle grazing is not as suitable in these areas.

Relevant guidelines for barbed wire are that it cannot be used within 1 metre of a public access way or at less than 2.5m above the ground if within the 1 metre.

Clearly visible warning signs indicating the presence of electric fences will have to be posted before the public are encouraged to visit the wetland. It is envisaged that electric fences in the vicinity of public access ways will be restricted to early stages of development. If however, public are encouraged to visit these or adjacent sites prior to development completion, such signage will become particularly important.



New Zealand Pigeon

Predator Control

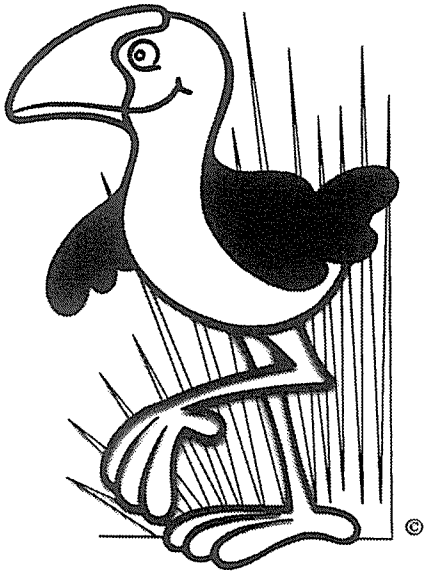
Initially 2 types of possum and rat traps will be trialled. The first uses poison bait (Rentokil Rodent Bait Station); the second incorporates a spring to snare the rodent (a Timms trap). Both are designed not to be accessible to cats. 1 dozen of each will be trialled. Initially 3 cage traps for cats will be trialled. If effective further traps will be installed. All traps will be located away from public walkways.

Appendix F - Relevant By-laws

Basic by-law signs should be placed at entrance points. "No Cycling" signs should be added to current by-law signs. More detailed information can be provided at the visitors centre. Relevant rules will be listed along with other interpretative information at specific sites of interest.

General Rules:

- Keep to tracks at all times,
- Dogs are not permitted,
- Feeding of wildlife is restricted to the margins of the pond immediately adjacent to the Visitors Centre,
- All plants and wildlife are totally protected. Visitors' Centre pond-dipping and approved removal for scientific study excepted,



Pooky on patrol.

The following will not be permitted in the Park;

- skateboarding,
- running,
- cycling,
- motor vehicles beyond the designated car-park,
- horse riding,
- firearms,
- fires,
- rubbish dumping,
- boating,
- flammable substances,
- camping,
- pets or wildlife,
- model boats or aircraft,
- swimming or ice-skating,
- selling or offer for sale any goods or services without prior written permission of an authorised officer,
- consumption of alcohol away from any licensed premises,
- public meetings except for the designated seminar room,
- musical instruments, or amplified music shall be played on the reserve,
- ball games or any other game that might interfere with other visitors enjoyment of the reserve,
- remaining within the bounds of the reserve beyond the posted opening hours.

Other by-laws also apply. Refer to Christchurch City Parks and Reserves By-laws.

Appendix G - Soil Types of Travis Wetland

Soil Legend

Soil Series	Map Unit	Soil Phase
Waimairi	P	very deep peat
	P1	deep peat
	P2	moderately deep peat
	P3	shallow peat
	P4	sandy peat
Taitapu	H	silt loam
	H1	very poorly drained
	H2	shallow topsoil
	H3	peaty topsoil
	part H4	silt loam
Waikuku	S	eroded phase
Kaiapoi	Part H4	fine sandy loam

(Soil names and correlation follows Kear et al 1976)

PONDS AND WATERWAYS

No.	Name	NORMAL Min. WL	NORMAL Max. WL
1	Angela Stream 1	9.70	10.10
2	Angela Stream 2	9.85	10.10
3	Angela Stream 3	10.00	10.10
4	Angela Stream 4	10.15	10.40
5	Corsers Stream	9.70	10.10
6	Travis Stream	9.85	10.10
7	Central Ponds	9.85	10.10
8	North West Pond	9.85	10.30
9	West Pond	9.85	10.30

TRAVIS WETLAND LANDSCAPE DEVELOPMENT

NOTES

1. Main entrance to park. Approximate site of Visitors Centre. See 4.3.2 in document.
2. Option for small pond/wetland adjacent to Frosts Rd.
3. Inwoods Road entrance. Pedestrian and cycle path to be constructed. Option for small car park.
4. Central Ponding Area. See 4.1.2 and Appendix B.
5. Stock yards and race retained and screened from wetland with shrub plantings.
6. Travis Stream/Eastern Wetlands. See 4.1.3 and Appendix B. Includes Grazing Marsh (see 4.2.1, Appendix C).
7. Barkers Drain. Link between Wetland and Avon River. See 4.1.1 and 5.1.4.
8. Anne Flanagan Walkway. Relic sand dunes planted with coastal bush. NB: Development includes Southpower property. Access point with small car park.
9. Western high ground (Telecom property - potential subdivision). Perimeter walkway to traverse high ground overlooking wetland. To screen houses and enhance the Park's natural values Broadleaved Forest associations will be planted along the edge of the fill.
10. Manuka Area. Sensitive ecological area. See Appendix C, 4.2.7, 4.2.8.
11. Willow Swampland to be revegetated with Kahikatea Swamp Forest and Manuka Tall Shrub associates. Watertable raised and controlled by control structures at outfalls.
12. Broadleaved Swamp Forest to replace existing willows. Manuka Tall Shrub associations along eastern and northern margins. See 4.2.7, 4.2.8.
13. Margins of open drains to be redefined, pond to be formed, and fenced to exclude stock and establish Tussock Reed Swamp communities.
14. Clarevale Park entrance. Access from Travis Country Drive and Clarevale Park. Off-street parking will be located within Clarevale Reserve.
15. Travis Country Estates. Swale/moat constructed 1997. Planted with Broadleaved associations and Tussock Reed Swamp. Perimeter pathway on subdivision side with link to Central Ponding Area.
16. Travis Road Frontage. Existing open drain to be relocated north to allow for road widening.
17. Future road widening along Frosts and Travis Road will form part of the proposed Woolston/Burwood Expressway.

LEGEND

Permanant watercourses, streams ponds and lake. Earthworks to widen and modify edge of existing drains infill others and construct Central Ponding Area.

Control structures within drainage system to manipulate water tables.

Sedge-Rush Marsh
On low fertility peatlands Carex spp, Eleocharis, and Juncus spp tussock, and turfs. Occasionally grazed.

Grazing Marsh
Grass/Rush/Sedge associations. Permanently fenced and seasonally grazed.

Tussock / Reed Swamp
On fertile saturated peats and gleyed soils. Carex spp (secta dominant), flax, toe toe, raupo and swamp fern.

Manuka-Tall Shrub Swamp
On saturated peats and gley soils. manuka, cabbage trees, miki miki, flax, and Baumea reeds.

Broadleaved Swamp Forest
On peaty soils and deep peats. kohuhu, tarata, five finger, mahoe, ribbonwood and coprosma spp.

Kahikatea Swamp Forest
On gley and saturated soils (Taitapu) along margin of swamp and toe of dunes (silt loams) includes Pittosporum spp, pokaka, ribbonwood, lemonwood.

Totara-Matai Hardwood Forest
On mottled soils (Kaipoi silt loams). Includes ribbonwood, hinau, taupota poroporo.

Coastal Bush
On dry sandy soils (Relic sand dunes) Includes ngaio, tauputa, akiraho, tauhinu, akeake, poroporo, coprosma.

Walkways
Includes gravel paths and boardwalks. Hides overlooking wetland ponds and raised viewing platforms in shrubland and forest.