

11

Current situation

11.1 ECOLOGICAL BACKGROUND

Christchurch and Banks Peninsula were once a place of great natural abundance. Forest ecosystems covered much of the area. The biodiversity also encompassed a vast mosaic of freshwater and tidal wetlands, lowland native grasslands, coastal dunelands, cliffs and headlands, subalpine shrubland and grasslands, as well as expansive patches of stony ground in riverbeds and along beaches.

However, over the last 700 years, the district has suffered enormous loss in the extent and quality of its indigenous biodiversity.

The Christchurch, Te Waihora/Lake Ellesmere and Banks Peninsula areas held one of New Zealand's richest diversities of birdlife in pre-human times. The pre-human avian diversity is thought to have included many flightless birds (e.g. moa, adzebill and buff weka); coastal birds (e.g. white-flipped penguin, crested penguin and mottled petrel); and some large predatory birds (e.g. Haast's eagle, the world's largest known eagle, and Laughing Owl – both of which are now extinct).

Waterway, wetland and coastal birds were particularly abundant in the area around Christchurch City, Te Waihora/Lake Ellesmere, Te Roto o Wairewa/Lake Forsyth and Lyttelton Harbour/Whakaraupō. Some species were long time New Zealand endemics, while others such as red-necked avocet and pied stilt colonised from Australia. Forest birds were abundant on the Port Hills and Banks Peninsula as well as in native forest on the plains.

Massive ecological changes came about with human settlement (both Māori and European) and the introduction of exotic predators. The Polynesian rat (kiore) probably caused the extinction of many endemic bush birds and seabirds while the Māori dog (kuri) probably depleted populations of vulnerable ground-dwelling birds.

The use of fire also modified habitats and by the 1840s there was only a small amount of forest left on the plains and Port Hills, surrounded by swamp, scrublands and grasslands. Colonisation by European settlers in the 1850s brought rapid destruction of biodiversity due to habitat destruction, introduction of mammalian predators, hunting, and avian disease caught from introduced birds.

During the 1850s ornithologists such as Walter Buller and Thomas Henry Potts reported that the old growth forests of Banks Peninsula supported some of the most prolific birdlife found anywhere in New Zealand.

In 1859 Buller found saddleback to be "very abundant" and brown creeper to be "particularly numerous". He also recalled "counting upwards of 20 kākā at one time on the Port Hills" (1888). In 1869, Potts reported that prior to the destruction of the Peninsula forests, kōkako "once abounded" in the neighbourhood of his home near Governors Bay.

The old Black Maps of Christchurch City dating from the 19th Century show extensive areas of wetland with very limited areas of forest such as small remnants at Riccarton and Papanui. Tens of thousands of resident and migratory wetland birds used the extensive coastal wetlands, estuaries and lagoons, and the waterways were rich with tuna (eels) and other fish.

Even in Central Christchurch's Hagley Park and the Botanic Gardens, J B Armstrong recorded some 54 species of indigenous plants in 1864 including matagouri and mānuka bushes.

By 1919 the number had been reduced to 29 species. Today there is only a small number of naturally occurring indigenous species in Hagley Park and the Gardens, mostly occurring along the Avon River/Ōtakaro banks.

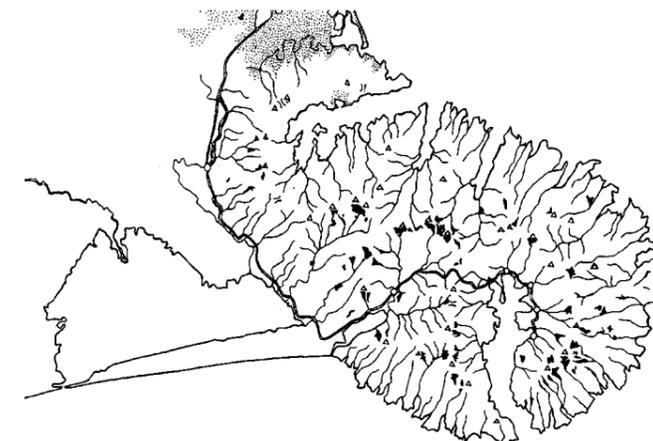
Penguins, seals and seabirds were plentiful around the coast and the headlands prior to European settlement. Sooty shearwaters were widespread on the Peninsula and probably nested at Godley Head and Whitewash Head on the Port Hills up to the 1920s. (Crossland 1996, Museum records).

Sealing around the Banks Peninsula coastline had a detrimental impact on fur seal numbers, and only in recent years have seal numbers increased and started to re-establish in their former habitats. Shore-based whaling from the Banks Peninsula bays started at Little Port Cooper in 1836 and Peraki Bay in 1837.

Biodiversity reached its lowest ebb on Banks Peninsula around 1920, with only 1 per cent of its original forest remaining and with the local extinction of many of its bush bird species.



c.1830



c.1920



1996

IMAGE: SADDLEBACK IS A SPECIES THAT IS LOCALLY EXTINCT BUT USED TO BE ABUNDANT IN LOCAL FORESTS.



PHOTO: FOREST COVER CHANGE ON BANKS PENINSULA.

11.1.1 Ecological regions and districts

The habitats and ecosystems that maintain this remnant biodiversity occur within two ecological regions (Canterbury Plains and Banks Peninsula) and are comprised of five ecological districts (Low Plains, Port Hills, Ellesmere, Herbert and Akaroa), each with their own characteristic landscapes and biological features. The low plains district is drier, based on the alluvial gravels of the Canterbury rivers and topographically flat, whereas the three Banks Peninsula districts have volcanic geology and wetter climates with the Port Hills the driest. Ellesmere Ecological District is comprised of a gravel and sand barrier and Te Waihora/Lake Ellesmere which it encloses from the sea. The district is typified by dunes, sand plains, stony beach ridges, and lake margin wetlands and waters of the shallow brackish lagoon in an exposed dry climate.

11.1.2 Ellesmere and Low Plains ecological districts

The above two districts form part of the Canterbury Plains Ecological Region.

Ellesmere Ecological District

The southern portion of Te Waihora/Lake Ellesmere and all of Kaitōrete Spit is contained within Christchurch City Council boundaries. This coastal environment falls within Ellesmere Ecological District and is extremely important ecologically and culturally.

Te Waihora/Lake Ellesmere is the largest lake in Canterbury and the largest coastal lagoon in New Zealand covering some 20,000ha. The lake is shallow and brackish and has a tenuous connection to the sea at its mouth, which is artificially opened from time to time in order to manage water levels.

It is an internationally important wildlife habitat and is an important link in the chain of coastal lagoons and estuaries along the Canterbury Coast. The 2006 Ornithological Society survey counted 38,600 birds.

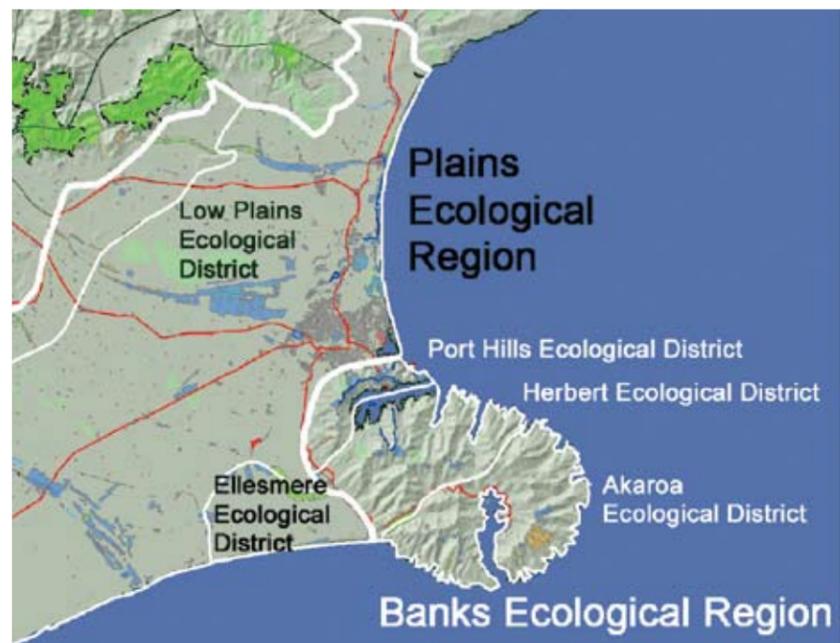
The lake and its associated wetlands support a wide range of freshwater and salt-marsh plant species and are a rich habitat for 15 fish species and numerous insects, including some endangered and vulnerable species. Te Waihora/Lake Ellesmere is also used for eeling, floundering and recreational shooting.

Te Waihora is of deep cultural importance to Ngāi Tahu (who own the bed of Te Waihora/Lake Ellesmere and part of the lake shore at the mouth of Lake Forsyth/Te Roto o Wairewa) and especially to Taumutu and Te Roto o Wairewa Rūnanga and is an important source of mahinga kai. A Te Waihora Joint Management Plan was recently developed by Te Rūnanga o Ngāi Tahu and the Department of Conservation.

Kaitōrete Spit contains the largest continuous area of sand dune in New Zealand dominated by the now rare endemic sand binder pīngao (*Desmoschoenus spiralis*).

This is the only National Priority Beach System in Canterbury (Partridge, 1992, Johnson 1992) and one of only 12 in the South Island. It is the only known location for the two vascular plants (*Carmichaelia appressa*, *Craspedia sp.*) and some endemic insects. It also contains threatened dune deflation hollows and dryland grasslands that include the only remaining large population of the endangered shrub *Muehlenbeckia astonii*.

At the nearby Birdlings Flat, a long sequence of gravel ridges carries Coprosma shrubland in quantities not seen elsewhere in New Zealand. This area also harbours other rare plants and lizards (see Plants and Lizards sections).



Low Plains Ecological District

Christchurch City is situated within the Low Plains Ecological District, largely formed by the coalesced fans of glacial outwash gravels and alluvial deposits from the Waimakariri River.

Prehistoric vegetation ranged from short tussock and shrubland to alluvial forest and dry woodland depending on the degree of disturbance from the Waimakariri River, climatic conditions and sea levels. Recent ecosystems with indigenous remnants include the coastal systems containing the Avon Heathcote Estuary/Ihutai and Brooklands Lagoon; dunes, lowland swamps such as Travis and Styx Mill basin; an alluvial floodplain forest at Riccarton; and recently formed droughty grasslands, shrublands and woodland on the lower terraces and flood plain of the Waimakariri River at McLeans Island.

Christchurch City contains some very important representative examples of Low Plains Ecological District biodiversity, including the McLeans Island grasslands/shrublands.

11.1.3 Port Hills, Herbert and Akaroa ecological districts

The above three ecological districts make up the whole of Banks Ecological Region. Generally the Port Hills is drier than the other two districts. Akaroa district has mild, moist, oceanic microclimates not matched in either Herbert or Port Hills districts. The volcanic nature of the region and its history as an island for the majority of its existence make the Peninsula unique in Canterbury.

The majority of the natural land environments found on the Peninsula are not replicated anywhere else in New Zealand. The Peninsula is a notable biodiversity haven with a wide range of indigenous plants, animals and ecosystems, including more than 71 threatened species and rare and representative ecosystems.

Whilst formal protection of biodiversity on the Peninsula outside of the Port Hills District is low (4.5 per cent of the land in Akaroa and Herbert districts is protected compared to 22 per cent in the Port Hills Ecological District), its biodiversity overall is still in a more robust state than that of the Canterbury Plains and parts of Kaitōrete Spit within Ellesmere Ecological District. Generally Peninsula biodiversity loss has been greatest in the lower altitude parts of the Peninsula and on coastal margins and headlands (see Threatened Environments map, section 11.4.2).

Some ecosystems on the Peninsula face environmental issues such as pollution, siltation and toxic algae in Te Roto o Wairewa/Lake Forsyth. Despite this, the natural environment has proved remarkably resilient and Te Roto o Wairewa/Lake Forsyth, for example, can be regarded as a functioning ecosystem. Likewise, the remnant forests of the Peninsula are recovering and there is now much more native forest cover than in 1920.

Some recent community-driven initiatives have been very effective in allowing native vegetation to re-assert itself, while other initiatives to control animal pests have had major wildlife benefits. There is however, still pressure from forestry, agriculture and urbanisation.

IMAGE: FRESHWATER WETLAND, BEXLEY.

Habitat and ecosystem linkages are an important aspect of biodiversity protection and enhancement on Banks Peninsula. In the 1970s, in a report on the Scenic Reserves of Canterbury, Kelly (1972) wrote of reserves being the last scattered vestiges of the forests of the peninsula. He predicted that they would become so isolated in time that each would be considered more as a 'museum piece' rather than a functioning ecosystem.

However, the ongoing recovery and conservation efforts on the Peninsula should result in connected areas of biodiversity that are self-sustaining at the local and regional level.



**Special places: Te Roto o Wairewa/
Lake Forsyth and Southern Crested
Grebe/Kāmana (*Podiceps cristatus*)**

In spite of its degraded condition Te Roto o Wairewa/Lake Forsyth has high biodiversity values. The reestablishment of the southern crested grebe/kāmana in the Canterbury lowlands is an example of nature's resilience in the face of habitat degradation.

Although recorded in the Christchurch area during the very early days of European settlement, this nationally endangered species became locally extinct by 1860 and was confined to a scattering of high country lakes for most of the last 150 years.

In the mid 1980s a small number began to appear in autumn-winter on Te Roto o Wairewa/Lake Forsyth. This flock has increased in every subsequent year to the point where 220-300 adult and immature crested grebes (approx ¾ of the entire total New Zealand population) now spend winter on Te Roto o Wairewa/Lake Forsyth, with a small number spilling over to the Kaituna and Atāhua areas of Te Waihora/Lake Ellesmere.

A change in the wintering strategy of this species has occurred. This has involved a shift from a sedentary distribution pattern where birds stayed in the high country year round to a migratory pattern where a large component of the total population now undertakes a seasonal movement from the Canterbury High Country and Central Otago to the milder, nutrient-rich, lowland coastal habitats of Lakes Forsyth/Te Roto o Wairewa and Ellesmere/Te Waihora.

PHOTOS:
CRESTED GREBE (ABOVE)
TE ROTO O WAIREWA/
LAKE FORSYTH.

A very recent development, and one which has generated much excitement for future conservation of the southern crested grebe, is that rather than migrate back inland at the beginning of spring several pairs have taken up residence on tributary waterways flowing into the lakes and have commenced breeding.

With careful management of disturbance and predator control it is foreseeable that crested grebes may one day return as a resident breeding species on many waterways in the Greater Christchurch area.

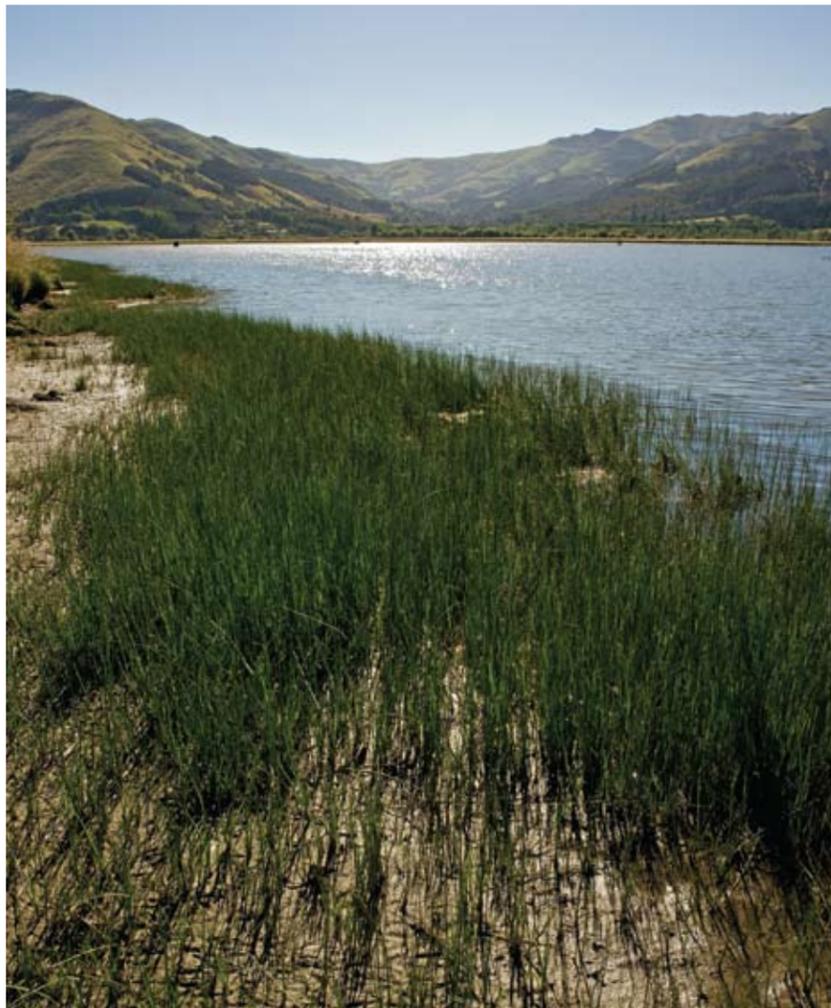


PHOTO: SNOW COVERS A
PATCH OF INDIGENOUS
FOREST ON BANKS PENINSULA.



PHOTO: PŪTARINGAMOTU /
RICCARTON BUSH IS THE ONLY
SUBSTANTIAL REMAINING
ALLUVIAL FLOOD PLAIN
FOREST IN THE LOW PLAINS
ECOLOGICAL DISTRICT.



PHOTO: A FENCELINE AND ROCK OUTCROPS SHELTER COPROSMA SHRUBS. THE MAJORITY OF BANKS PENINSULA WAS FOREST COVERED. TODAY SHORT TUSsock DOMINATES MANY EXTENSIVELY GRAZED BANKS PENINSULA LANDSCAPES.



11.2 ECOSYSTEM AND HABITAT MANAGEMENT

(Dr Trevor Partridge)

An ecosystem approach to biodiversity management is essential to maintain the remnant natural habitats in Christchurch and Banks Peninsula. It is important to maintain functioning ecosystems, as these play a vital role in preserving the essential energy, nutrient, species and environment interactions that support life. People are an integral part of Christchurch ecosystems and have a controlling influence on many aspects that affect biodiversity. The human impact on Banks Peninsula tends to be different in both scale and type. How urban development, farming, forestry, water use, transport and open space is planned is important for long term indigenous biodiversity survival.

Within Christchurch, and even on Banks Peninsula, relatively few habitats are ecologically similar to those that occurred in pre-human or even pre-European times. Places such as Pūtaringamotu/Riccarton Bush, Hays Bush at Pigeon Bay, some sites at McLeans Island, and the pīngao dunes of Kaitōrete Spit are the closest examples we have of ecosystems that represent a pre-human natural state.

However, many areas contain indigenous species interacting with their environment even though the ecosystems of which they are a part are highly modified from their pre-human state. Such situations are frequently referred to as 'novel ecosystems' and comprise a mixture of native and exotic species in various proportions. The Biodiversity Strategy values the indigenous component, but also recognises that its existence is often the result of the presence of exotic species, and that attempts to remove such species may be detrimental to the native components.

In some cases native species are now reliant on totally modified ecosystems. For example, recent surveys of invertebrates on a stretch of Christchurch sand dunes found 158+ species including three that are little known or seldom recorded, and a number of undescribed species, but no naturally occurring indigenous plants.

Eighty two per cent of the invertebrates found on the dune survey occur only in New Zealand. In these places ecosystems are functioning using different assemblages of species from the pre-human state.

The majority of Banks Peninsula's forest is second-growth (with kānuka a key species) which has developed in the presence of widespread human activities. The Peninsula's ecosystems are modified by grazing animals, and animal and plant pests.

Tall growing species such as tōtara and mataī are present in only small numbers and there are few indigenous forest bird species present. In some areas native forest vegetation is establishing well, using the existing gorse as an early successional species.

These factors, such as continuous grazing and presence of exotic shelter plants, can and do alter forest composition and structure with the end result potentially being a new type of indigenous dominated system.

Modified ecosystems are often very important for the survival of remaining indigenous species that survived the extinctions of previous eras. However, as important as it is to restore ecosystems that have become degraded, priority needs to be given to those that retain as much of their natural composition as possible. On Banks Peninsula, these areas are very few and therefore very special.

PHOTO: SMACKS CREEK WETLAND IS A NOVEL ECOSYSTEM WHERE EXOTIC AND INDIGENOUS PLANTS OCCUPY THE SAME HABITAT.



TE HUINGI MANU WILDLIFE REFUGE (BROMLEY OXIDATION PONDS)

(Andrew Crossland)

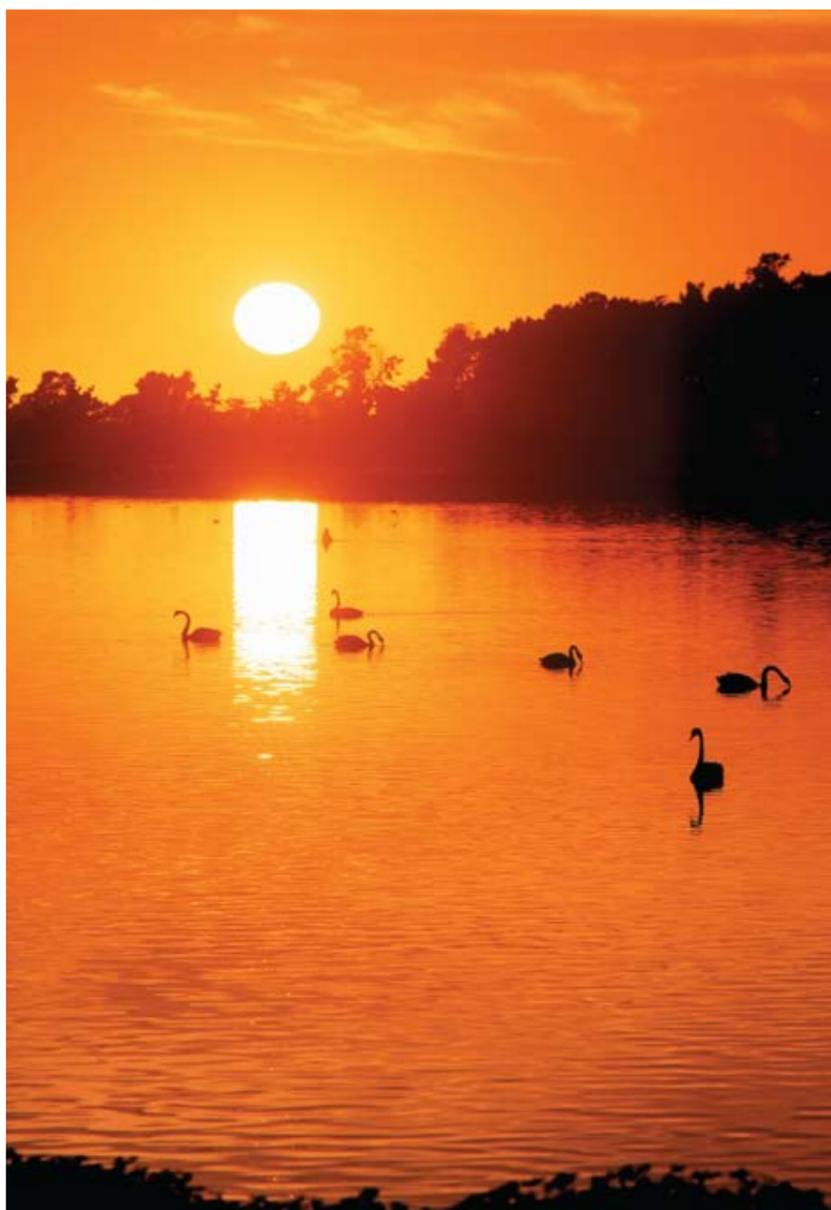
The 240 ha Bromley Oxidation Ponds comprise the Te Huingi Manu Wildlife Refuge. The site is located adjacent to the western shoreline of the Avon-Heathcote Estuary/Ihutai and is managed by the City Council. The main function of the oxidation ponds is to treat the wastewater generated by a city of 350,000 people. However, an important secondary function is to provide breeding, feeding and roosting opportunities for wetland birds.

Currently some 5000 New Zealand scaup (*Aythya novaeseelandiae* comprising 15–20 per cent of the world population), 7000 Australasian shoveler (*Anas rhynchos*), 4000 grey teal (*Anas gracilis*), 2500 paradise shelduck (*Tadorna variegata*), 2500 Canada goose (*Branta canadensis*) and 1000 black swan (*Cygnus atratus*) moult or winter on the ponds, establishing the site as one of New Zealand's most important sites for waterfowl.

Three of the six ponds have well-vegetated islands, which provide nesting habitat for eight species of waterfowl and three species of cormorant.

A predator control programme (in place for seven years), and an abundant source of food in the form of aquatic invertebrates, combine to produce high rates of breeding success. 150–200 pairs of the endemic New Zealand scaup breed annually on the ponds, producing more than 1000 fledglings. Scaup have spread to re-colonise waterways throughout Christchurch and the Canterbury Plains, leading to an unprecedented population recovery in this once near-threatened species over the last ten years.

PHOTO: TE HUINGI MANU WILDLIFE REFUGE WITH INDIGENOUS BLACK SWANS.



Significant systems and habitats that support indigenous biodiversity in Christchurch

Significant systems and habitats that support indigenous biodiversity in Christchurch are kahikatea forest at Pūtaringamotu/Riccarton Bush; freshwater wetlands and estuaries in the east; dry grasslands and savannah woodlands in the north and west; silver tussock landscapes and remnant forests on the Port Hills; riverbed communities of the Waimakariri River; dunelands and dune slacks along the coast; and the regenerating indigenous wetland communities under willows in the north and east.

Of the above, the kahikatea forest at Pūtaringamotu/Riccarton Bush, the Avon Heathcote Estuary/Ihutai, Brooklands Lagoon, the dry grasslands and remnant savannah at McLeans Island, and the remnant freshwater wetlands of Travis Wetland and Styx Mill are probably of greatest importance as representatives of indigenous ecosystems originally found on the plains of Christchurch.

All existing remnant ecosystems are highly modified and require management intervention to ensure their ongoing functioning. Some are under greater threat than others. In particular, the long term viability of the dry grassland ecological system needs evaluation as events such as the flooding that initiated and perpetuated it are now highly restricted.

Many of the unique combinations of plants and animals that were a part of this system have also been lost to development in recent years. The City Council's purchase of a core area of grassland habitat and tightening of lease conditions on land owned by Environment Canterbury has provided better protection for some grassland areas at McLeans Island at least in the short term.

PHOTO (L): NATIVE BROOM SURVIVES IN SMALL NUMBERS AT MCLEANS ISLAND.

PHOTO (R): JANET STEWART RESERVE, STYX RIVER.



The Christchurch wetlands require continuing plant and animal pest management to ensure their viability. In the saline wetlands the threats of spartina and sea lavender are under control, leaving tall fescue as the main plant pest. In the freshwater wetlands, however, some very aggressive pest plants such as grey willow, beggars ticks and purple loosestrife are major threats to biodiversity values. Animal pests such as rats and mustelids are also a major threat to conserving biodiversity.

Remnant forested areas such as Pūtaringamotu/Riccarton Bush are less threatened. However, exotic seed dispersed from adjacent gardens is a major problem. One of the main weeds in Pūtaringamotu/Riccarton Bush is the New Zealand native lacebark (*Hoheria populnea*) that is not native to Christchurch. It was mistakenly planted there in early attempts to enhance the area's values. Some bird-life in Pūtaringamotu/Riccarton Bush has, however, benefited considerably from the predator-proof fence that has been constructed there.

Christchurch ecosystems that collectively support nationally important concentrations of wetland and coastal birds include the eastern waterways, coastal wetlands and estuaries, and the lower Waimakariri River system.

The five main Christchurch rivers, wetlands and their tributaries also support regionally important numbers and diversity of water birds along with indigenous plant communities. They also retain assemblages of invertebrates some of which are rare elsewhere.

Water quality and quantity, siltation, runoff from roads and human-generated disturbance and pests are issues for these systems.

The increase in impervious surfacing as a result of urban development makes it difficult to mitigate adverse effects on aquatic systems, as waterway systems are not easily restored after contamination from excess silt and pollutants from roads and other urban activities.

Significant Banks Peninsula ecosystems

The main ecosystems of Banks Peninsula contrast considerably with those of the plains. Grassland, shrubland and forest are the representative ecosystems with wetlands being uncommon.

One of the main biodiversity issues on the Peninsula involves the successional changes taking place within these vegetation types. The original forest has been all but lost and the present vegetation patterns comprise mostly a mixture of regenerating shrubland/forest and grasslands. The native silver tussock grasslands are mostly induced and if left will become replaced by woody vegetation in all but the driest of headlands. Likewise the high altitude hard and snow tussock grasslands will also be replaced by woody vegetation, albeit fairly slowly.

The residents of Christchurch and the Peninsula, however, have become accustomed to grasslands and semi-wooded pastoral landscapes. The challenge will be in balancing the amenity, farming and biodiversity values, between preserving the induced ecosystems and allowing the natural replacement process to occur.

Although the Port Hills contain large tracts of land in Council ownership, the same cannot be said for the rest of Banks Peninsula where most of the land is in private ownership. Aspirations of individual landowners therefore play an

important role in managing biodiversity. To ensure improved biodiversity management in rural areas, it is essential to maintain good relationships between rural landowners and Council.

This often involves using methods other than District Plan rules and regulations. In some situations, Council can purchase land, as has happened with Misty Peaks at Akaroa. Such purchases allow greatest freedom to protect biodiversity, but opportunities to purchase land are often limited and expensive; therefore, there is the need to partner with others in the biodiversity conservation effort.

The biodiversity priority on Banks Peninsula will be to protect the last remnants of original indigenous forest vegetation. Most are already protected by Department of Conservation reserves such as Hays Bush or by covenants on private land. The greater challenge will be to protect the secondary regrowth forests in their various stages of succession. This involves protecting forests dominated by kānuka, broadleaf shrubs or scattered shrubland of early successional divaricate shrubs. Securing biodiversity values for such ecosystems is difficult as many landowners see these species as weeds, but some successional stages provide rich habitat for fauna such as lizards. A better idea of how grazing levels relate to maintenance of small leafed shrubland communities is required.

In addition, experience at Hinewai Reserve demonstrates that gorse (generally regarded as a weed) can be a cost effective means of aiding forest regeneration, although sometimes creating management issues involving adjacent land use. Further discussion on the role of gorse and broom in encouraging forest regeneration is needed for Banks Peninsula.

The tussock grasslands vary from those that comprise tussocks alone to others that have a suite of native species including many that are rare, such as the speargrass (*Aciphylla subflabellata*) and native carrot (*Daucus glochidiatus*). There are difficulties in establishing grazing management regimes that are appropriate to both biodiversity protection and agricultural productivity as these grasslands have considerable grazing value to their owners and many rare species are able to tolerate only periodic grazing.

In addition to these widespread vegetation types, Banks Peninsula holds a suite of scattered special ecosystems that are small but significant. One example is the rock outcrops and associated boulder fields. These are often the refuge for some very rare species such as the recently discovered sedge *Carex inopinata*. Such habitats are likely to be the last places that species intolerant of grazing occur and are thus highly localised centres of biodiversity. They are, however, small and scattered and require innovative conservation management techniques.

Key conservation actions needed

- » Assess the long term viability and trajectories of grassland ecosystems on the plains and Banks Peninsula.
- » Assess the viability and trajectories of small leafed shrub communities in relation to their existing biodiversity value.
- » Explore options with Environment Canterbury and landowners for integrated management of the plains grassland ecosystems.
- » Examine options to create/ expand and link grassland systems to the south of McLeans Island through lifestyle areas and quarry sites and ensure continuity with remnants in Selwyn District.
- » Prioritise biodiversity projects to ensure that they provide maximum benefit toward sustaining core biodiversity objectives in the Christchurch and Banks Peninsula.
- » Ensure ecosystems that support nationally and regionally important species diversity and/or populations are protected and enhanced.

Prioritise biodiversity projects to ensure that they provide maximum benefit toward sustaining core biodiversity objectives in Christchurch and Banks Peninsula.

PHOTO (L): REGENERATING KANUKA IN GRAZED PASTURE.

PHOTO (R): BOULDERS PROVIDE PROTECTION FROM GRAZING ANIMALS.



11.3 BIRDS

(Andrew Crossland, Ornithologist)

Background

Since human colonisation of Christchurch and Banks Peninsula a pattern of declining bird species richness and declining populations has continued for 200 years until the mid 1980s. On the plains indigenous waterfowl were outnumbered by introduced mallard and Canada goose while forest birds such as kererū and cuckoo became very confined.

On Banks Peninsula land clearance resulted in local extinctions and the retreat of many native bird species to isolated wooded gullies. Few natives were able to adapt to the human-created urban and farming landscapes and these environments instead became dominated by an assemblage of exotic bird species. Even on the coastal estuaries and lakes where native birds remained in good number, the more vulnerable species like shore plover, avocet, dabchick and fairy tern disappeared in the mid-late 1800s and have never come back.

Current situation

Since the mid 1980s there has been a remarkable comeback in bird populations. Local populations of at least 28 native birds have begun to expand and re-populate habitats within and around Christchurch, Te Waihora/Lake Ellesmere and Banks Peninsula (including a mix of “original” natives and recent colonists from Australia).

Comparison between past and present bird populations indicates significant changes and the emergence of a new 21st Century avifauna that is constantly changing and evolving.

An important characteristic has been (and continues to be) the regular natural acquisition of new species including self-introduction of birds from other parts of New Zealand, as well as from Australia and other countries.

The combined areas of Christchurch City, Te Waihora/Lake Ellesmere and Banks Peninsula have a higher species richness than almost any area of comparable size in New Zealand. Including seabirds occurring in adjacent coastal waters, some 224 bird species have been recorded in the area since the 1840s. Of these, some 135 species occur regularly, comprising 29 seabirds, 4 penguins, 66 wetland and coastal birds, and 36 species of land bird.

This impressive list of bird species recorded includes many threatened species. Those in the Department of Conservation’s four most threatened categories which breed locally or occur annually in winter or on migration include: white heron, black stilt (both category 1 nationally critically endangered); grey duck, Australasian bittern, crested grebe, Hutton’s shearwater, black-fronted tern (all category 2 nationally endangered); wrybill, northern royal albatross, reef heron, white-flipped penguin, yellow-eyed penguin, Caspian tern, Salvin’s albatross (all category 3 nationally vulnerable); and black-billed gull (category 4 serious decline). (Species breeding locally are underlined).

A notable characteristic is the high proportion of wetland and coastal bird species. Upwards of 100,000 wetland and coastal birds occur at peak times in the Christchurch-Te Waihora/Lake Ellesmere-Banks Peninsula area, with many species occurring in nationally and internationally significant concentrations. In fact, the local area supports the largest concentrations found anywhere in New Zealand of no less than 14 species:

Australasian crested grebe, spotted shag, black swan, Canada goose, paradise shelduck, New Zealand shoveler, New Zealand scaup, grey teal, banded dotterel, sharp-tailed sandpiper, pectoral sandpiper, curlew sandpiper, red-necked stint and white-winged black tern). This confirms the status of the Christchurch City, Te Waihora and Banks Peninsula area as the “wetland bird capital of New Zealand”.

The Christchurch-Te Waihora/Lake Ellesmere-Banks Peninsula area has always been a major migration node, moulting site and wintering area for populations of wetland and coastal birds. An exciting recent trend, and one of rising conservation significance, is the growing number of species that have responded positively to habitat creation and predator control programmes and have begun to expand breeding populations locally.

As time passes and more conservation projects are implemented, Christchurch City is likely to become increasingly important as a core breeding area.

Threatened species such as wrybill, black-billed gull, black-fronted tern, Australasian bittern, crested grebe, white-flipped penguin and yellow-eyed penguin are likely to benefit greatly from this, as are nationally important concentrations of more common species like New Zealand scaup, banded dotterel and black cormorant, pied cormorant and little cormorant.



PHOTO: ABOUT 70 BIRD SPECIES HAVE BEEN RECORDED USING THE URBAN BEXLEY WETLAND, INCLUDING NESTING BY ENDANGERED BLACK-BILLED GULLS.

Key bird habitats

Waimakariri Braided River: This large braided river on the northern boundary of Christchurch City is one of the best examples of braided riverbed and associated riparian wetland habitat in New Zealand.

The Waimakariri River supports many wetland birds and a majority of the threatened species breeding within Christchurch City, including wrybill, black-billed gull, black-fronted tern and Australasian bittern.

Rivers and streams: This habitat type includes the five main spring-fed rivers of Christchurch (Ōtukaikino, Styx, Avon/Ōtakaro, Ōpawaho/Heathcote, and Halswell) and their tributaries, as well as numerous rivers and streams draining Banks Peninsula catchments. Until about 15 years ago, these waterways held very little in the way of native birds, being dominated largely by introduced mallard ducks. A dramatic change has occurred over recent years and many native species are actively re-colonising these rivers. Some rivers now support up to six species of native waterfowl, five species of cormorant, herons, swallows, kingfishers and, most unexpectedly, the nationally endangered crested grebe has commenced nesting on streams entering Te Waihora/Lake Ellesmere.

Beaches: The wide sandy beaches of the Pegasus Bay coastline and some of the peninsula bays, as well as the multitude of stony beaches around much of Banks Peninsula and Kaitōrete Spit, are important habitats for waders, gulls and terns.

Dunelands: Formerly an extensive habitat type on the Christchurch coastline, at a few peninsula sites like Okains Bay and on Kaitōrete Spit, duneland habitats are now greatly reduced and in most areas are smothered by exotic vegetation. The Kaitōrete Spit remains an extensive and nationally important habitat. Native birds characteristic of dunelands such as pipit, harrier and banded dotterel are still quite common along Kaitōrete Spit.

Coastal estuaries and tidal flats: Brooklands Lagoon, Avon-Heathcote Estuary/Ihutai, Upper Lyttelton Harbour/Whakaraupō, Port Levy (Potiriwi)/Koukourārata, Akaroa Harbour, Ōpara Estuary (Okains Bay) and LeBons Estuary collectively support large numbers of wetland and coastal birds, including international migratory species like godwit. The Avon-Heathcote Estuary/Ihutai-Bromley Oxidation Ponds complex, Brooklands Lagoon-Kaiapoi Oxidation Ponds complex and Upper Lyttelton Harbour/Whakaraupō support nationally/ internationally significant concentrations of many bird species.

Lakes and oxidation ponds:

Te Waihora/Lake Ellesmere and Te Roto o Wairewa/Lake Forsyth, as well as the Bromley, Belfast and Kaiapoi (adjacent to Brooklands Lagoon) oxidation ponds support huge numbers of wetland and coastal birds. Te Waihora/Lake Ellesmere is the most important waterbird habitat site in New Zealand, while Te Roto o Wairewa/Lake Forsyth, Bromley oxidation ponds and Kaiapoi oxidation ponds are all within the top 25 sites nationally.

Sea cliffs and coastal slopes: The sea cliffs of Scarborough, Godley Head and Banks Peninsula are immensely important for nesting seabirds and coastal birds, particularly spotted shag, red-billed gull and a range of other species. The tītī or sooty shearwater hangs on by a thread as a resident breeder but could be restored to healthy population levels if protected from mammalian predators and other threats.

PHOTO (L) : WHITE FRONTED TERNS, BIRDLINGS FLAT.

PHOTO (R): VARIABLE OYSTERCATCHER, TE OKA BAY.



PHOTO: THE LOWER WAIMAKARIRI RIVER PROVIDES IMPORTANT HABITAT FOR THREATENED BIRD SPECIES.

Islands and islets: Quail, King Billy, Ripapa, Horomaka, Island Nook, Pā and Crown islands, as well as a scattering of rocky islets around the peninsula coastline, have much importance to birdlife and great future potential. Colonies of terns, gulls, cormorants, shags, penguins, prions and sooty shearwaters are found on some of these islands as well as occasional breeding pairs of reef heron, white-faced heron, variable oystercatcher, etc. These islands would benefit greatly from eradication of mammalian predators as has occurred on Quail Island.

Kaitōrete Spit: This large and distinctive habitat mosaic is a biodiversity treasure house supporting many species of rare plants and animal. It also provides important breeding habitat for native birds such as black swan, pied stilt, banded dotterel and pipit. Various habitat types found along Kaitōrete Spit are covered under headings below. The mudflat and salt meadow patches along the spit are regarded by ornithologists as some of the best sites anywhere in New Zealand for observing rare migratory waders and terns from the Northern Hemisphere.

Saltmarsh and saltmeadow: These distinctive habitats, found on the shorelines of estuaries and coastal lakes, as well as in small pockets around the Banks Peninsula shoreline, were historically important for swampbirds including rails, fernbird, bittern and brown teal. These habitats have suffered from drainage, reclamation, erosion and fire resulting in local extinctions of most of the bird species they supported. There is much potential however to restore these habitats and reintroduce some of the lost bird species.

PHOTO: BLACK CORMORANT ON THE HEATHCOTE RIVER .

Freshwater wetlands and wet grasslands: A wide range of freshwater wetlands and wet grasslands are found throughout greater Christchurch. Some of the best examples include Travis Wetland, Styx Mill Basin, Henderson's Basin and a long strip along Kaitōrete Spit behind the saltmarsh zone. In terms of bird habitat, these freshwater sites hold the next highest number of species and population densities behind the estuaries and lakes. They are particularly important for bittern, pied stilt, pūkeko, rails, herons and grazing waterfowl.



Lowland indigenous forest: This habitat type has suffered disproportionately from clearance and loss of bird species. Formerly the habitat of moa, tūi, kākā, parakeets, saddleback, kōkako, South Island thrush, buff weka and many other species, few native birds now remain and exotic birds are numerically dominant. Developments such as the predator-proof fence which now encircles Pūtaringamotu/Riccarton Bush and restoration of lowland forest patches, such as Hay Reserve in Pigeon Bay, are already seeing an increase in native birdlife.

Higher altitude indigenous forest: Sizeable patches of higher altitude indigenous forest remain on the Port Hills and Banks Peninsula. Being larger and less degraded, these patches now tend to be ornithologically richer than lowland forest and locally uncommon bird species such as rifleman, morepork, tomtit and occasionally falcon and tūi are more often found there. Kennedy's Bush on the Port Hills and the Misty Peak area beyond Akaroa are two good examples of sizeable indigenous forest blocks which, with careful management, could one day support reintroduced populations of locally extinct bird species such as yellowhead, robin, parakeets and kākā.

Kānuka woodland: An abundance of insects make kānuka woodland a productive habitat for native bush birds. On Banks Peninsula these woodlands tend to support high native bird densities, particularly of grey warbler, brown creeper, shining cuckoo, silvereye and fantail.

Indigenous shrublands: Indigenous shrublands are well used as foraging habitats by native birds, particularly silvereye, grey warbler, fantail, bellbird, tomtit and harrier. They also appear to be extremely important for lizards, particularly geckos.

Exotic and mixed woodlands: Much of urban Christchurch and Banks Peninsula, and the surrounding belt of lifestyle blocks, smaller acreage farms and orchards, are now well-wooded and becoming increasingly useful as native bird habitat. Over recent years observations of species such as bellbird, kererū and shining cuckoo have been more frequent in these habitats, a trend which bodes well for the future.

PHOTO: INTERCONNECTED GULLY BUSH AND PLANTINGS PROVIDE IMPORTANT BIRD HABITAT ON BANKS PENINSULA.

Plantation forests: The large exotic plantations at Bottle Lake, Chaney's and South New Brighton have recently been colonised by bellbird, a welcome addition to the small assemblage of native species already occurring. These plantations have great untapped potential as habitats for other native birds, particularly buff weka, tomtit, brown creeper, rifleman and falcon.

The many exotic plantations on Banks Peninsula also support native birds, whereas urban plantations have been planted on old dune wastelands and the peninsula forests are increasingly advancing over indigenous habitats which generally offer more to birdlife than the plantations could.

Rocky outcrops and boulder fields: These open air habitats are of particular importance to the New Zealand pipit. This species uses them extensively as both breeding and feeding habitat.

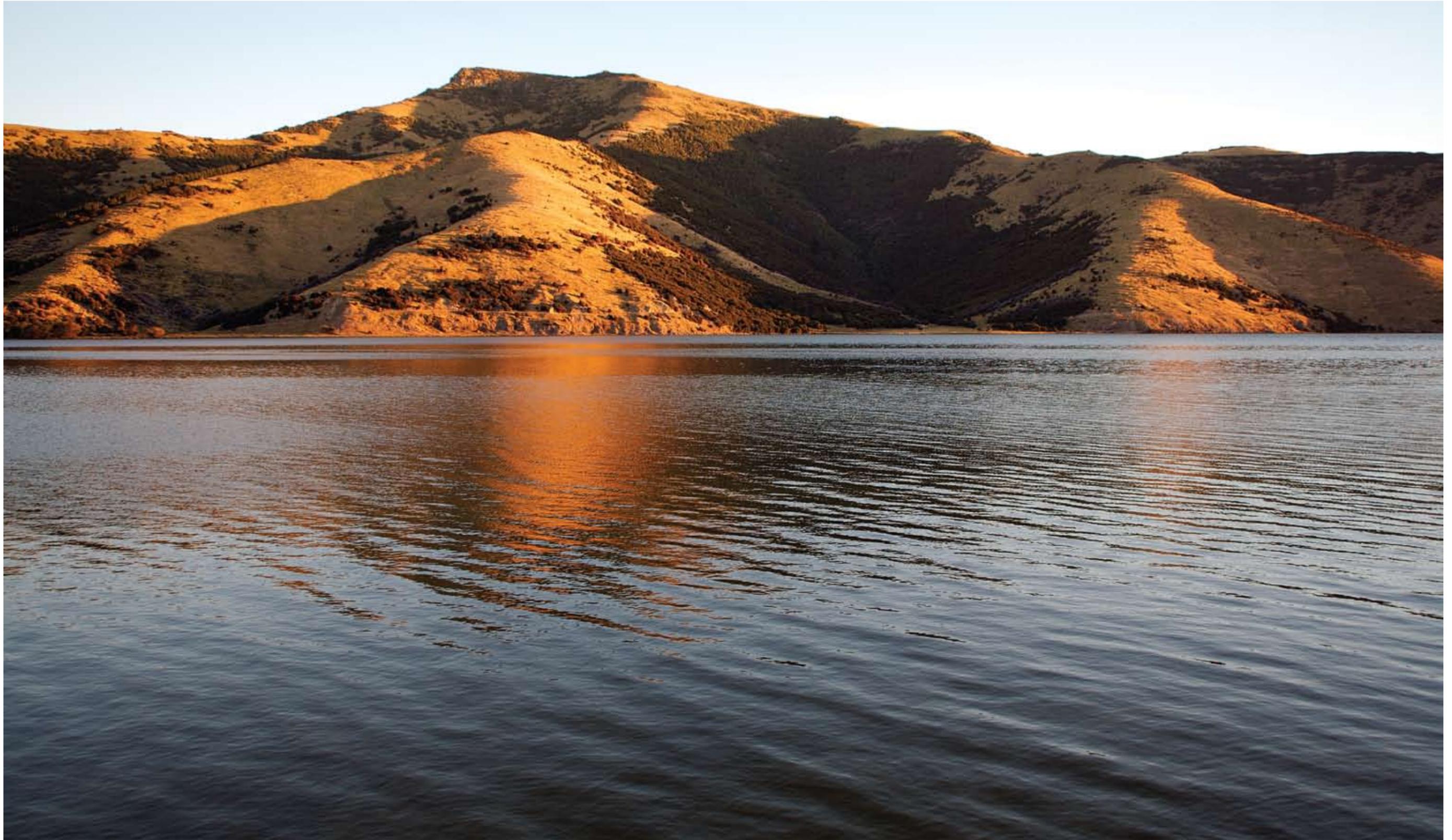
Dry native grasslands and dry riverbed channels (stonefields): The dry native grasslands of the Canterbury plains, along with the stony old riverbed channels (stonefields) that crossed the plains, were formerly key habitats for native birds such as New Zealand dotterel, banded dotterel, black-fronted tern, New Zealand quail, buff weka, harrier and pipit. Some of these species have disappeared but several still occur and make limited use of the dry grasslands that remain.

There is much potential for restoration of these habitats and a rebuilding of the bird species assemblage that once utilised them. A sizeable area of native dry grasslands also remains on Kaitōrete Spit, which is particularly important as breeding habitat for pipit and banded dotterel. In terms of bird habitat values, the main threats at this site are weed incursions and rank grass growth when grazing regimes (essential in the modern era to maintain a short sward height) are too light.

Tussock grasslands: A widespread habitat type on the Port Hills, Banks Peninsula and in pockets on Kaitōrete Spit. Bird species such as moa and New Zealand quail that once utilised this habitat type are now long extinct. Only the native pipit and harrier, along with a range of exotic bird species, currently use these habitats.



PHOTO: PATCHES OF KANUKA
AND SECOND GROWTH FOREST
PROVIDE BIRD HABITAT ABOVE TE
ROTO O WAIREWA/LAKE FORSYTH.



FEATURE SPECIES

New Zealand Pāpango/Scaup

(Aythya novaeseelandiae)

One of the spectacular species recovery stories in Christchurch is the population recovery of the endemic New Zealand scaup.

In the mid-1980s there were no more than 200 scaup on Christchurch waterways. This species had undergone 130 years of decline in the face of hunting, habitat loss and predation. Much of the literature stated that scaup in the South Island had retreated to high country lakes and were not supposed to be able to recolonise shallow lowland waterways because of competition with dabbling ducks. In 1991, the first pair of scaup were observed nesting in the Bromley oxidation ponds.

In 2002 more than 200 pairs bred and produced more than 1000 young. During the 1990s and 2000s this species appears to have broken all those rules and the Christchurch population has undergone a 35-fold increase from 200 birds to more than 7000.

The oxidation ponds where the first scaup nested have had a predator control programme in place for ten years. The area can therefore be seen as constituting a “wet mainland island”. Rats, mustelids, feral cats and domestic animals are all controlled, aiming to prevent predation of eggs, chicks, fledglings and adult birds on nests.

At the same time, the oxidation ponds have abundant food for scaup in the form of midges and their larvae. The adult scaup have a dozen islands on which to nest and more than 200 ha of ponds to raise their young.

Together these conditions generate a tremendously productive breeding population, which has been the powerhouse behind the recolonisation of Christchurch waterways and now a recolonisation of the Canterbury hinterland.

For the first time in a century, scaup are widespread and abundant on Christchurch ponds and waterways. Furthermore, they have expanded their habitat preference to include shallow water, flowing water and latterly even salt water.

The scaup population has recovered to the point where 20 per cent of the estimated world population occur on Christchurch urban waterways and further afield; they are spreading over the Canterbury Plains and wintering flocks have recently returned to Te Waihora/Lakes Ellesmere and Te Roto o Wairewa/Forsyth where they hadn't been seen for many decades.

It is suspected that it is either unprecedented, or one of the few cases in the world, where an endemic waterbird has increased and undertaken such a fast and large-scale population recovery generated from within an urban environment. Most instances where native waterbirds have restored their populations are in wilderness areas where they are fully protected, but in this case scaup have achieved that in the urban environment of the city.



PHOTO: CHRISTCHURCH URBAN WATERWAYS AND WETLANDS PROVIDE HABITAT FOR ABOUT 20 PER CENT OF THE NATIONAL POPULATION OF NEW ZEALAND SCAUP.

Kōparapara/Bellbird (*Anthornis melanura*)

The farmland, parks, gardens, riparian and wayside environments of Christchurch and Banks Peninsula comprise an enormous habitat mosaic that is becoming increasingly attractive to native bush birds. The bellbird is an iconic native passerine and a characteristic inhabitant of indigenous forest patches on the Port Hills and Banks Peninsula. This is one of several native birds that reside in the Port Hills bush reserves during the breeding season and then undertake an altitudinal migration down slope to the base of the Port Hills and across the city in autumn-winter.

Until the early 1990s the bellbird was a species only rarely encountered within Christchurch City, and then only as a visitor to gardens and parks around the base of the Port Hills. From the mid 1990s onwards a new trend began to develop whereby, year after year, sightings of bellbirds were reported from further and further out into the urban area. Initially observed mainly in the southern and eastern suburbs, (Sumner to Mt Pleasant, Southshore and Upper Riccarton), by 2003 bellbirds were being recorded in most parts of the city at locations as far apart as Brooklands, Burwood, Harewood, Prebbleton and Spreydon.

By 2007 bellbirds were reported or suspected to be nesting at sites like the Botanic Gardens, Pūtarīgamotu/Riccarton Bush, Bottle Lake and Spencer Park. It is now likely that the bellbird will colonise Christchurch City as a breeding resident and it may eventually become a common sight and sound in many neighbourhoods around town.

Penguins

(Summarised from an article by Dr Frances Schmechel)

There are four penguin species or subspecies occurring along the Banks Peninsula and Christchurch coastline; the little blue, white flippered, yellow eyed and very rarely the Fiordland crested penguins. All except the Fiordland crested penguin are known to nest locally.

However, predator impacts on penguins have been severe. White-flippered penguins were once much more common around the peninsula and even in the 1950s they were still nesting on most headlands and around the foreshore of Akaroa Harbour. Long term monitoring by Chris Challies has shown that most of these colonies have since disappeared.

Challies & Burleigh (2004) noted that of the four colonies with more than 50 nests they were monitoring, one disappeared and the nest numbers in the other colonies declined by more than 70 per cent.

The total number of nests in these colonies declined from 489 to 85 between 1981 and 2000.

Mammalian predators were the main cause of these declines. Challies & Burleigh (2004) estimated that mammalian predators had access to 50 per cent of the colonies and noted evidence of such predation at 41 per cent of these. Ferrets are thought to be the key predators, although feral cats, stoats and dogs account for some deaths.

At sea, birds face their natural predators as well as entanglement in nets and flotsam.

Predator trapping started at Stony Bay in 1988 and at Flea Bay in 1991 in a cooperative control and monitoring programme between the Department of Conservation and local landowners, particularly Shireen and Francis Helps and Mark and Sonya Armstrong.

More recently Environment Canterbury staff are providing support in the continuing battle against predators with extensive trapping to protect the nest sites and form a buffer.

Fortunately the number of penguins counted at Flea Bay increased from 717 to 892 and at Stony Bay from 27 to 31 between 2000 and 2004, respectively. Similarly, penguin nests on Quail Island have increased from 11 in 2001 to 32 in 2003 since mustelids have been removed. The Harris Bay colony has been protected by Chris Challies and latterly City Council rangers.

Unfortunately, other unprotected colonies around the Peninsula coastline are likely to continue to decline in the face of predator attack. Ironically, however, it would appear that penguins are starting to repopulate areas along the Christchurch coastline where they haven't been noted in recent years.

Dog control is a major issue in urban areas if penguins are again to form a prominent part of our urban wildlife.

Key conservation actions

- » There is a need to establish a mosaic of habitats across greater Christchurch to accommodate resident bird species and seasonal visitors.
- » There are at least 20 major environments in which particular groups of bird species need to be managed: (Waimakariri braided river; rivers and streams; beaches; dunelands; coastal estuaries and tidal flats; lakes and oxidation ponds; sea cliffs and coastal slopes; islands and islets; Kaitōrete Spit; saltmarsh and saltmeadow; freshwater wetlands and wet grasslands; lowland indigenous forest; higher altitude indigenous forest; kānuka woodland; indigenous shrublands; exotic and mixed woodlands; plantation forests; rocky outcrops and boulder fields; dry native grasslands and dry riverbed channels; and tussock grasslands).
- » Complete a Christchurch and Banks Peninsula bird management strategy for key bird species assemblages and link it with a habitat matrix.
- » Complete a detailed local conservation plan for all threatened species or for which 1 per cent of the national and/or international population occurs annually in Christchurch.
- » Develop a management programme to more effectively protect braided riverbed birds.
- » Restore bush bird species assemblages within Christchurch and Banks Peninsula and prepare for re-introduction of locally extinct species.
- » Create lowland wooded habitat patches (including native and mixed native/exotic) by developing new or existing sites.
- » Protect and/or restore neglected or lost habitats including plains dry grasslands, stonefields, dune slacks, sea cliffs, coastal slopes and sand spits.
- » Explore opportunities for new habitat creation including residential gardens, riparian strips, golf courses, pine plantations, gullies and valleys at the base of the Port Hills and within peninsula valleys, lowland wet grasslands and exhausted shingle pits.
- » Develop key regional avian biodiversity reserves to protect full species assemblages and wildlife assets of high conservation value, i.e. Waimakariri River; Brooklands Lagoon; Travis Wetland; Styx Mill Basin; Avon-Heathcote Estuary/ Ihutai-Bromley oxidation ponds; a new wetland basin in the Halswell area; Te Waihora/Lake Ellesmere-Kaitōrete Spit; Te Roto o Wairewa/ Lake Forsyth; Upper Lyttelton Harbour/Whakaraupō; Upper Akaroa Harbour; Quail Island; Pohatu/Flea Bay Marine Reserve; core peninsula islands and islets; core peninsula sea cliffs; and core areas of indigenous forest such as a Southern Port Hills Temperate Rainforest; a Central Banks Peninsula Temperate Rainforest and a South-eastern Banks Peninsula Temperate.

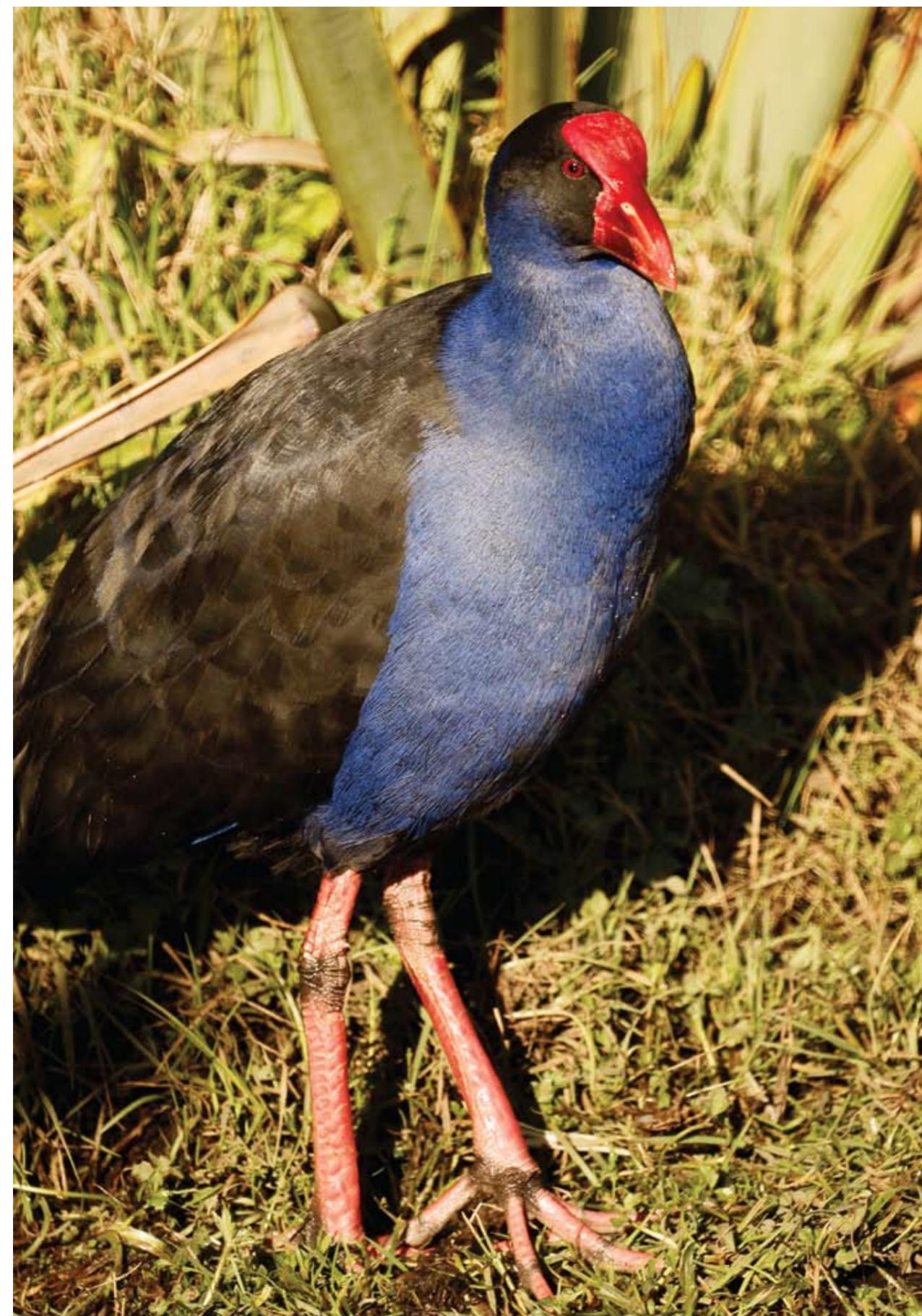


PHOTO: TRAVIS WETLAND IS ONE OF FOUR KEY WINTERING GROUNDS FOR PUKEKO IN THE CHRISTCHURCH AREA.

11.4 MARINE MAMMALS

(Andrew Crossland)

Marine mammals are a major wildlife feature of Banks Peninsula and, to a lesser degree, the shorelines of Pegasus Bay and Kaitōrete Spit. By far the most abundant and widespread animal is the New Zealand fur seal (*Arctocephalus forsteri*). Over the last 10-15 years this species has made a remarkable recovery from many decades of depleted populations. Recent census work by the Department of Conservation indicates a fur seal population exceeding 6000 animals with many breeding colonies scattered around the southern, eastern and north-eastern shorelines of the peninsula.

With the increase in fur seal numbers there seems to be an increase in the species that prey on young fur seals. Small numbers of Hooker's sealion (*Phocarctos hookeri*) and up to four individual leopard seals (*Hydrurga leptonyx*) have been recorded seasonally in peninsula and Pegasus Bay waters over recent years. Anecdotal reports suggest that another predator of the fur seal, the great white shark, has become more common around the peninsula shoreline in recent years.



The open wetlands were predominantly swamps with tall species such as flax (*Phormium tenax*) and raupō (*Typha orientalis*) being dominant. Drier sandy ridges supported broadleaf shrubland with some kānuka (*Kunzea ericoides*). The other main habitat type was along the coast with the estuaries containing extensive areas of salt marsh and native sand binders such as pīngao (*Desmoschoenus spiralis*) dominating the active dunes. Other habitats were scattered and included grassland savannah along the Waimakariri River and wetland fens such as at Styx Mill.

The Port Hills and Banks Peninsula were mostly forested. The three podocarps on the plains were joined by others such as miro (*Prumnopitys ferruginea*), rimu (*Dacrydium cupressinum*), native cedar (*Libocedrus bidwillii*) and Hall's tōtara (*Podocarpus hallii*). Associated with these and perhaps dominating on their own in places would have been a wide variety of broadleaved shrubs such as māhoe (*Melicactus ramiflorus*) and broadleaf (*Griselinia littoralis*). In warm gullies, warm temperate species such as titoki (*Alectryon excelsus*) and nīkau (*Rhopalostylis sapida*) would have stood out. On drier sites such as rock outcrops, tussock grasses and divaricate shrubs would have dominated.

The coastal lagoons of Te Waihora/Lake Ellesmere and Te Roto o Wairewa/Lake Forsyth were much larger and carried a mixture of freshwater and brackish plants. Kaitōrete Spit had sand dunes on the coastal side, rushes on the lake margin and danthonia (*Rytidosperma spp.*) grassland with scattered shrubs in the middle. The activities of Polynesian settlers had major impacts on this pattern, mainly through the widespread use of fire for clearing the land of woody vegetation.

PHOTO: ELEPHANT SEAL RESTING ON A BANKS PENINSULA BEACH.

A fourth seal species, the southern elephant seal (*Mirounga leonine*), occurs annually around the Banks Peninsula coastline and occasionally in Pegasus Bay. Favoured haul out sites are secluded stony beaches, although occasionally elephant seals venture on to Christchurch suburban beaches and even up the Avon/Ōtakaro and Ōpawaho/Heathcote rivers.

11.5 BATS

Native bats were resident in Christchurch and Banks Peninsula during the 1800s and probably into the early 1900s. There are currently no bats present on Banks Peninsula and Christchurch.

11.6 PLANTS

(Dr Trevor Partridge)

In pre-human times the Canterbury Plains in the vicinity of Christchurch comprised a complex mosaic of forest, shrubland and wetlands. Forest was dominated by podocarps (conifers that are the Southern Hemisphere equivalent of pines), especially kahikatea (*Dacrycarpus dacrydioides*) on the wetter sites, tōtara (*Podocarpus totara*) on the drier areas and mataī (*Prumnopitys taxifolia*) between.

The 'Black Maps' of Christchurch City show only fragments of the original forest were present when Europeans arrived. Wetlands remained, but much of the drier wooded vegetation was replaced by shrubland of kānuka, toetoe (*Cortaderia richardii*), bracken (*Pteridium esculentum*), tutu (*Coriaria arborea*) and grassland. On Banks Peninsula, forest was also replaced mostly by silver tussock (*Poa cita*), especially on dry headlands. The shrubs, especially the divaricating species and kānuka, would have expanded from outcrops to assume a successional role to forest.

These trends continued at an even more rapid pace during European settlement. On the plains, forest was reduced to two main patches at Pūtarangamotu/Riccarton Bush and Papanui Bush. Since that time the latter has also gone. On Banks Peninsula, forest was forced to retreat to refugia in isolated gullies. But unlike Polynesian impacts, Europeans brought new plants in abundance and these were used to replace the original flora. The plains became the 'Garden City' with its emphasis on cultivated plants brought from Europe and elsewhere. The surrounding lands and much of Banks Peninsula saw native forest, shrublands and grasslands replaced by pasture.

The introduction of herbivorous animals (such as cattle and sheep) had major impacts upon the remnants of vegetation. Many plants were pushed back to inaccessible rock outcrops. Many exotic plants became wild in their new environment and dominated vast areas of marginal land. Even extreme habitats were not immune.

The need to drain the swamps and fens for urban development saw the decline of the wetlands, and coastal instability at Pegasus Bay necessitated establishing marram on the dunes. Despite some reclamation, the salt marshes of Avon/Heathcote/Ihutai and Brooklands Lagoon remained with much of their vegetation intact.

A major change in philosophy occurred during the 1980s when the decline in biodiversity was recognised and acted upon. The awareness coincided with major changes in farming practices which saw large tracts of marginal land, especially on Banks Peninsula, being farmed less intensively, with the consequence that successional shrubland and forest started to spread from their gully refugia. In the city, the change in attitude resulted in improved protection for biodiversity, such as the creation of Ecological Heritage Sites in the City Plan.

There was also a concerted planting programme involving native species that had declined. The wetlands and waterways in particular have since undergone concerted vegetation restoration programmes. Coupled with this have been important land purchases at places like Travis Wetland, and some major restoration projects such as at Bexley and Charlesworth wetlands.

These projects have also occurred in other habitats. The sand dunes of Pegasus Bay have seen major native plantings of both sand binders and back-dune species. New areas of forest have been established at Addington Bush. There have been major forest and tussock revegetation projects on the Port Hills.

There has also been a greater use of native species as amenity plants within the urban areas. These events, when added together, constitute a major change in attitude which is resulting in major biodiversity gains for the city.

Much like the area around the city, there have been losses of Banks Peninsula biodiversity (for example there is only one rimu and few cedars remaining). Although there has been less effort in actively restoring native vegetation on the Peninsula, natural regeneration of remnant native bush has increased the area of native habitat within farmland.

Many farmers however treat regenerating native bush species in pasture such as kānuka as weeds because they reduce the area available for grazing stock. Over the last 30 years there has been considerable effort to protect old growth forest remnants by the former Lands and Survey Department, the Department of Conservation, QE II Trust and latterly by Banks Peninsula Conservation Trust (BPCT) on private land.

Covenants over areas that have regenerating native bush provide the protection these areas need. This form of protection has been accepted by most of the Peninsula's residents and it is highly likely that the Peninsula's existing biodiversity will be safeguarded and will continue to improve.



The advent of rural residential blocks has also led to a more wooded landscape on the plains and Banks Peninsula which may benefit some forest birds and act as treed corridors between natural remnants.

Biodiversity restoration, however, involves much ongoing effort not only in native plant recovery programmes but also in education. In many cases practitioners are still ignorant with regards to what and how to protect and restore. Native species, especially small plants, are continuing to disappear from the city. For example, the last population of sand gunnera (*Gunnera arenaria*) disappeared from its only known location in Spencerville in 1998, just after cuttings were taken for cultivation. Others such as the black orchid (*Gastrodia cunninghamii*) and the hairless buttercup (*Ranunculus glabrifolius*) hold on in single vulnerable locations.

Rare habitats such as fens and dryland ecosystems are still under threat. Fens have only recently been recognised for their value and are vulnerable to surrounding land use changes. The dryland ecosystems of the north-west are continuing to be under threat from development.

The discovery of a new species of shrubby daisy (*Olearia adenocarpa*) of very limited distribution in the dryland ecosystems has made protection of that vegetation even more important.

PHOTO: REMNANT PODOCARP FOREST INCLUDING THE LARGEST STAND OF ADULT MIRO LEFT ON BANKS PENINSULA.

Restoration and amenity plantings within the urban environment have involved not only the planning of the planting programmes (including maintenance, climatic constraints and weed control issues) but also educating residents of the importance of native species.

Although some residents support native plantings within the city, others oppose such projects and have ensured that they do not proceed in some locations by removing plants and vandalising planted areas. A few native plants [such as North Island lacebark (*Hoheria populnea*), taupata (*Coprosma repens*) and karo (*Pittosporum crassifolium*)] that are not indigenous to Christchurch have a tendency to behave as weeds. Although they were used in some early plantings they are, however, mostly spreading from domestic gardens.

Some residents also regard native species as generally unattractive and some self-establishing natives such as wind grass (*Anemanthele lessoniana*), karamū (*Coprosma robusta*) and poroporo (*Solanum laciniatum*) are sometimes regarded as weeds. Nothing portrays this dilemma better than the cabbage tree, which is regarded as a glorious city icon by some and distained as an unattractive nuisance by others.



Key conservation actions

- » Establish recovery plans for each of the vulnerable or locally rare species in the Christchurch region.
- » Engage in ongoing public education and encourage and provide opportunities for participation.
- » Protect all significant habitats and ecosystems that are representative of Canterbury and are under threat.
- » Expand and improve the range and species used in restoration plantings.
- » Develop cooperative land protection programmes on Banks Peninsula involving Banks Peninsula Conservation Trust and other agencies and organisations.
- » Improve restoration and amenity planting planning and maintenance templates to reduce losses of plants and ensure better outcomes.
- » Protect roadside biodiversity remnants.
- » Plan for optimal configurations of sanctuary, patches of habitat and native tree groves throughout the city and surrounding districts to enhance the overall long term sustainability of nature in the city, and provide areas of habitat and species suitable for customary use and wider utility.

11.7 LIZARDS

(Sourced from Alastair Freeman, Rod Hitchmough, Marieke Lettink and Tony Whitaker)

Lizards are a significant example of the endemic fauna of pre-human Canterbury that have remained in Christchurch and Banks Peninsula despite the significant modification of natural habitats which has occurred over the last 200 years. There are five confirmed species of lizard in the Christchurch area, including two species of gecko: Canterbury gecko (*Hoplodactylus aff. maculatus* 'Canterbury') and jewelled gecko (*Naultinus gemmeus*); three species of skink: spotted skink (*Oligosoma lineoocellatum*), common skink (*O. nigriplantare polychroma*) and McCann's skink (*O. maccanni*).

It is very likely that the forest gecko still exists in isolated parts of Banks Peninsula, as a shed skin has been found. However, forest geckos are difficult to find so it may be some time before their presence can be confirmed by a sighting.

Distribution of the above species was once, undoubtedly, wider than at present with records indicating the existence of jewelled geckos at New Brighton. However there are several recent recordings of the jewelled gecko on the Port Hills and numerous sightings on Banks Peninsula. Spotted skinks were rediscovered in 2005 at McLeans Island after a 21 year absence of verifiable sightings. On Banks Peninsula spotted skink are known from Kaitōrete Spit, Hinewai Reserve, Armstrong Reserve and a small offshore island.

Abundance and conservation status

The most common and widespread species is the common skink, which is still found at a number of localities in Christchurch and Banks Peninsula. As this lizard is an inhabitant of dry open areas, populations probably increased as suitable habitat was created with the removal of forest and draining of wetlands associated with early development. Today, as a result of ongoing urbanisation, the common skink is almost certainly declining in Christchurch. However, it is very unlikely that it would become extinct in the Christchurch area as long as suitable habitat remains protected from urban development (for example Banks Peninsula rural areas, the New Brighton dunelands, Port Hills and McLeans Island areas). McCann's skink is still found on the Port Hills although it is difficult to differentiate from the common skink. The common and McCann's skinks are not regarded as threatened species.

The Department of Conservation has listed spotted skink populations identified from Birdlings Flat, Kaitōrete Spit and Ashburton as a distinct but taxonomically indeterminate entity, named *Oligosoma aff. lineoocellatum* "Central Canterbury", and ranked them as "Nationally Endangered" in the NZ Threat Classification System. It is possible that the McLeans Island spotted skinks are part of this group (pers. comm. Rod Hitchmough 2005).

The Canterbury gecko remains relatively common on the Port Hills and Banks Peninsula but does not appear to be found in substantial numbers, if at all, anywhere else in Christchurch City. The structure of the habitat on the Port Hills is probably the main reason this species has remained here in good numbers. This lizard is susceptible to disturbance and will abandon sites if refugia are constantly disturbed.

The crevices and rocks that Canterbury geckos inhabit are largely impervious to disturbance while also providing protection from predators. Twenty four geckos discovered at Pūtarīngamotu/ Riccarton Bush in the early 1980s were either a relict population or perhaps captive animals which had been released.

A paucity of recent records of the jewelled gecko indicates that this species is far rarer than the Canterbury gecko, although sightings on parts of Banks Peninsula appear to be more common. Its past distribution encompassed both Banks Peninsula and the Port Hills extending even to New Brighton. The Canterbury and jewelled geckos both have a Department of Conservation national threat classification of Gradual Decline (Hitchmough 2002). Their conservation status within the Canterbury Conservancy is rated as moderate.

Areas of importance for lizards

The most important habitats for the conservation of lizards are the rock outcrops, boulder fields, shrublands and forest remnants of Birdlings Flat, Kaitōrete Spit and rural Banks Peninsula generally. Dense mixed species shrublands found in grazed pasture land are important for jewelled gecko. Canterbury geckos and jewelled geckos are still found on the Port Hills close to the urban areas. Undeveloped areas in New Brighton, McLeans Island and parts of Redcliffs and Sumner are also of importance particularly for the common skink, and McLeans Island for the spotted skink. These sites combined with the "green" corridors associated with the rivers and railway tracks will ensure the continued presence of at least common skink in Christchurch City and Banks Peninsula townships for the medium term. Whereas the rural areas of Banks Peninsula are likely to retain the existing diversity of lizard species in good numbers provided extent and continuity of habitat is maintained.

Issues

The biggest threat to lizard populations in Christchurch is destruction of habitat and the continued development of rural land for residential purposes. This type of development destroys habitat by replacing natural and semi natural areas with an urban "desert" bereft of suitable microhabitat sites for lizards. The associated influx of domestic cats also decimate lizard populations. Destruction of mature mixed species *Coprosma* shrubland and forest remnants, isolation of lizards by removal of suitable habitat, and cover between refuges and predators are likely to be detrimental to the longevity of lizard populations in the rural areas of Banks Peninsula.

PHOTO: JEWELLED GECKO. IN CANTERBURY THE MALES AND FEMALES HAVE DIFFERENT COLOURS. BELOW IS A FEMALE JEWELLED GECKO.

**Key conservation actions**

- » Identify lizard numbers and population dynamics to identify where management intervention is required.
- » Field check sites where populations of the less common species may still exist.
- » Support research which identifies lizard habitat needs and preferences.
- » Examine the viability of reintroduction of lizards into protected areas in the greater Christchurch area.
- » Support research on lizard management in an urban situation.
- » Encourage the public to implement lizard predator protection measures and plantings.
- » Avoid isolating important lizard populations from each other.
- » Protect and restore habitat suitable to maintain corridors between populations.
- » Protect appropriate mature small leaved *Coprosma* shrubland habitat as refuges for jewelled geckos.

11.8 FISH

(Dr Robert McDowall)

There are no complete records of the fish species that lived in Christchurch and Banks Peninsula lakes, rivers and wetlands in the times of early European settlement. Many fish had (and continue to have) traditional values to Ngāi Tahu including piharau (lampreys), tuna (eels), kōkopu, inanga (whitebait) and paraki (ngaiore or smelt).

Fish found today

Because of major differences in types of habitats, fish species present in the fresh flowing waters of the plains, wetlands, and in the streams of the peninsula are somewhat different, though there are broad overlaps.

The main species in the whitebait fishery - the inangā is widespread through the lower rivers from spring through to early autumn. This fish is found in virtually all waterways, usually not far upstream from the sea. It is known to spawn among vegetation along the tidal reaches of the rivers during autumn. Other whitebait species that are found only in bush-clad Peninsula streams are banded kōkopu and kōaro. Both longfin and shortfin tuna (eels) are also very widespread and still abundant, although due to loss of habitat (and habitat quality) and exploitation by commercial eel fishers they are now less abundant.

Adult piharau (lampreys) are occasionally reported from the Avon or Heathcote as they make their way upstream to spawn. Also, there are populations in some Banks Peninsula streams including those that drain into Te Roto o Wairewa/Lake Forsyth – despite piharau spending much of their lives at sea. Giant bullies are found in the lower reaches of rivers throughout the district (mostly tidal reaches); common bullies are widespread; bluegill bullies sometimes, especially in the cobble streams on the peninsula, as also are redfin bullies, a species that is otherwise absent from Canterbury streams.

Paraki (common smelt) move into the lower reaches of the rivers from the sea during spring and summer and there is a landlocked population in Te Roto o Wairewa/Lake Forsyth. Torrentfish are also widespread, mostly in shingly streams. Pātiki (flounder) are also widely present, mostly in estuaries, though black flounder may penetrate surprising distances inland.

The upland bully is the only full-time river resident; it is one of the most common fish in the streams of the plains, but is rarely present on the Peninsula. Several primarily marine fish species make their way into the lower reaches of the Avon/Ōtakaro and Ōpawaho/Heathcote, including yelloweye mullet (aua), cockabullies, stargazers and sand flounders.

Introduced fish include salmonid sports fish such as brown trout and, occasionally, chinook salmon. Goldfish are widespread and perch and rudd are present.

Issues

Fish populations are affected by water quality, particularly by polluting discharges from industry, flushing of chemicals and pollutants from roadways, and escape of effluents from drainage systems.

- » A key water quality issue includes sedimentation from development, which has major impacts on fish. Sedimentation smothers habitats occupied by some fish species that live in the spaces between stream bed stones. It also smothers coarse gravels used by spawning trout as well as gravels thereby reducing insect populations that are the food for most fish. Fish passage is an important issue as most native fish species (and brown trout) migrate up and down stream to complete their life cycles, with native fish species moving regularly to and from the sea.
- » Features that hinder fish passage have harmful impacts on fish populations. Trout can jump and thereby get past barriers, but native fish climb, exploiting wetted margins associated with weirs and other barriers.
- » There is a growing concern about pest fish such as rudd, catfish, koi carp and gambusia invading waterways in Canterbury and throughout New Zealand. Rudd have been found in several shingle pits and ponds. One single koi carp has been picked up from the Port Hills in an artificial pond. There is a possibility that catfish are present in the Te Waihora catchment.
- » The quantity and flow of water is an issue for some streams, springs and wetlands and lakes.

Key conservation actions

- » Increase the availability of instream habitat, maintain and create natural meander patterns and provide habitat diversity.
- » Engage the public in an education programme to improve water quality and quantity.
- » Control sediment discharge from development and stormwater runoff throughout Christchurch and Banks Peninsula.
- » Improve fish migration past barriers such as weirs, dams, culverts and pipes.
- » Restore habitat quality through riparian, margin and instream re-vegetation.
- » Monitor and, where appropriate, control and prevent the spread of pest fish species.
- » Advocate for good environmental flows.
- » Protect and restore important freshwater habitat for threatened fish species and other fisheries.
- » Fence stock out from waterways and protect waterways from stock crossing.
- » Maintain forest cover on peninsula streams to conserve banded kōkopu and kōaro populations.
- » Recognise the biodiversity value of eels, rather than treating them as vermin to be removed from streams.

PHOTO: THE COMMON BULLY IS WIDESPREAD IN LOCAL WATERWAYS.



11.9 FRESHWATER INVERTEBRATES

(Sourced from Dr Alastair Suren, and papers and reports by Harding, Main, Meredith & Hayward)

The Canterbury rivers were an important food source for early Māori with their wide diversity of stream life including freshwater invertebrates and fish [e.g. kōura (crayfish) and tuna (eels)]. A wide range of caddisfly larvae and mayfly nymphs, typically found in good quality habitat, were an important part of fish diet in waterways.

These waterways have been highly modified over time and many now lack good habitat and riparian cover and have poor stream flows. Consequently, invertebrate fauna diversity has declined, even in relatively recent years. Christchurch river surveys in the 1980-1990s found 70 freshwater species. Recent surveys have recorded only 50 species. The invertebrate fauna has changed from including “sensitive” species such as mayflies, stoneflies and caddisflies to more “pollution tolerant” species such as worms, midges and snails.

In Banks Peninsula streams it is likely that a number of species unknown to science have been lost due to past deforestation. However, Banks Peninsula still has important remnant stream biodiversity in forested areas such as Hinewai which has all the endemic Peninsula mayflies.

A 2003 study of streams in nine Peninsula catchments indicated that species richness is significantly greater in forested streams than in agricultural streams, especially for mayflies, stoneflies and caddisflies. Generally forested streams were narrower than agricultural streams and had much lower spot water temperatures.

Issues

- » Loss of stream flow due to factors such as increased impervious areas (carparks, roads, roofs) and less infiltration of rain into the ground has meant many urban streams have very low base flows and dry out in parts. The Avon River/Ōtakaro is an example of changes to flow as the source once consisted of five distinct springs in the headwaters. These have now dried up and the new source has moved more than 1 km downstream.
- » Contamination from storm water runoff containing sediments, nutrients and toxic material impacts freshwater invertebrate diversity in Christchurch and Banks Peninsula.
- » Studies of heavy metal contamination of sediments in Christchurch have shown high levels of copper, lead, zinc and poly-cyclic aromatic hydrocarbons. These pollutants enter into the food chain and transfer from invertebrates to fish, birds and other animals.
- » Banks Peninsula streams are generally high in phosphorus (from the volcanic geology) and have low summer flows resulting in low capacity to assimilate nutrients.
- » Generally water quality is good with the exception of some Lyttelton Harbour/Whakaraupō basin streams. Stream beds on the Peninsula are vulnerable to stock damage especially in their lower reaches. Management of stock in streams is important to improving water quality.
- » Highly modified habitats have impacted on food and shelter for invertebrates, as well as the opportunity for invertebrates to hide from predators.
- » Culverts and roads are affecting movement of aquatic invertebrates in their terrestrial stage when they are trying to fly upstream to lay eggs. There is a need to maintain and enhance connectivity within aquatic ecosystems.
- » Shade from indigenous vegetation will assist the persistence or reinstatement of in stream biodiversity in many Peninsula streams.
- » Forest fragments appear to be acting as refuges for some Banks Peninsula endemic aquatic invertebrates. Removal of these forest remnants would result in their extinction. It is essential that forest streams are not contaminated by the effects of upstream development.



Key conservation actions

- » Restore flow regimes by constructing detention dams to hold back flood flows and gradually release collected runoff into streams during low flows.
- » Reduce the amount of storm water that enters urban streams and integrate storm water management into design for new urban developments.
- » Restore water quality using detention ponds and constructed wetlands to remove suspended solids and other pollutants. Monitor their performance for effectiveness.
- » Restore riparian corridors and implement sensitive stream maintenance to retain habitat for freshwater invertebrates and fish.
- » Restore habitat quality and connectivity and create ecologically diverse waterways.
- » Retain forest fragments and riparian vegetation along Banks Peninsula streams.

11.10 TERRESTRIAL INVERTEBRATES

(From studies by Dr Rod Macfarlane, Warren Chin, Ward et al and Peter Johns)

Invertebrates provide the greatest contribution to diversity in any terrestrial animal community. Only limited investigation has been undertaken on the biodiversity of terrestrial invertebrates in Christchurch and Banks Peninsula. Detailed studies have been undertaken on the McLeans Island dry grassland and woodlands, Travis Wetland and Styx Mill Basin, Southwest Christchurch waterways, the New Brighton dunes and Hinewai Reserve.

An inventory of the arthropods of Banks Peninsula reserves was undertaken in 1986 (Johns, University of Canterbury). Johns recorded more than 1400 species and estimated the number of species only found on the Peninsula (endemics) as at least 2.2 per cent and possibly as high as 4 per cent. However, some individual Banks Peninsula invertebrate groups have endemism rates as high as 14.3 per cent.

Background

- » An estimated 40 per cent or more of New Zealand's insect species remain undescribed, including many of the rarer, endangered or less common species.
- » Surveys of four habitat areas in the Christchurch City area over the past 20 years have recorded species that encompass 20-30 per cent of New Zealand's known insect species, including more than 1367 insects, 50 spiders, and 14 snails and slugs.
- » The ratio of insect species to native vascular plants is high (7.5:1 for wetland-swamp and 10:1 for danthonia grassland) compared to the national ratio of introduced plant species and insects (about 1:1). Introduced plants support a considerably less diverse insect and invertebrate fauna than the native vegetation.

PHOTO: SPIDERS ARE ABUNDANT IN LOCAL COASTAL MARSHES.



Threats

Main threats include changing land-use and habitat modification (e.g. reduced areas of remnant vegetation, introduced plants, drainage and contamination of waterways), causing many habitats to become reduced to fragmented areas of restricted size. However, in some cases, remnant fragmented habitat patches may carry high numbers and diversity of invertebrates (Walker, 2006). There are some invertebrate pest species present as well, e.g. Argentine ants.

Key sites and species

Travis Wetland – documented invertebrate fauna of this wetland includes a remarkable number of endemic insects and spiders, including the endemic Christchurch crane fly which has a very limited distribution.

Pūtaringamotu/Riccarton Bush – an important area of native bush of reasonable size within an urban setting with more than 300 moth, butterfly and scale insect species.

Hinewai Reserve – more than 885 invertebrate species have been recorded from the reserve, including a rare spider, Banks Peninsula weta and two endemic caddisflies.

Kaitōrete Spit – the environment of Kaitōrete Spit is rich in Lepidoptera with at least 130 species of butterflies and moths of which six species are restricted to the spit.

New Brighton Sand Dunes – at least 158 species of invertebrates have been recorded from the dune system. Eighty-two per cent of the invertebrate species recorded were endemic. Changes to the vegetation of sand dunes and the increased removal of driftwood and kelp has caused a depletion in katipo spider numbers and impacted on populations of kelp feeding flies and their predators.

Threatened species - several of the insect species found in Christchurch and Banks Peninsula and at least one spider are known to be vulnerable or endangered.

Issues

Invertebrates in remnant fragmented and degraded vegetation are potentially at risk from development or 'restoration planting' efforts. Biological surveys of these areas rarely include an assessment of their value to invertebrates but are primarily based on vegetation diversity and quantity. For example, an invertebrate survey of Styx Mill Basin wetland habitats has shown a surprising diversity of invertebrates including rare and uncommon species in an ecosystem with few indigenous plants.

Restoration of degraded environments with indigenous planting can run a high risk of eliminating or severely reducing remnant populations of indigenous invertebrates that depend on the existing mix of remnant and exotic vegetation.

Planted indigenous forest, without an associated natural remnant for insect dispersal, should not be assumed to be recolonised readily by more than a minority of the more ecologically flexible native insects (Macfarlane, 2007).

Key conservation actions

- » Undertake surveys in the following priority areas to fill gaps in information and provide better protection for remnant invertebrate populations:
 - Saltmarsh, grey shrublands and fragmented habitats** - little is known about the invertebrate fauna of these areas which would be relatively easy to survey due to the limited variety of plant species.
 - Native forest** – likely to contain a considerable portion of the undocumented insect and spider fauna of Christchurch and Banks Peninsula e.g. a study of eight small Christchurch bush remnants revealed at least 95 species of beetles alone.
 - Wetlands** – need better information on bugs, beetles and caterpillars, as nationally there is a lack of knowledge about the herbivores of wetland plants.
 - Tussock grasslands** – especially the flighted insects associated with these areas.
- » Establish the importance of forest/shrubland age and size on insect diversity.
- » Establish how rapidly various insect species colonise new plantings and under what circumstances.
- » Ensure protection of a representative range of ecosystems and invertebrate - supporting habitat as part of biodiversity survey, evaluation and conservation efforts.
- » Ensure that important invertebrate habitats are not subject to inappropriate planting that reduces habitat values for remnant invertebrate biodiversity.
- » Maintain habitat corridors and connectedness between habitat patches – habitat proximity even at the small scale of 100s of metres can be important to retain invertebrate biodiversity.

11.11 PEST ANIMALS

(Paul Devlin, Port Hills Head Ranger)

Pest animals (covered under plant and animal pests in Objective 1.4 targets and actions) are a pervasive and destructive risk to indigenous biodiversity in Christchurch and Banks Peninsula. Successfully established pest animals include rats, possums, rabbits, deer, goats, mustelids, hares, hedgehogs, mice and pigs. Pest animals browse on palatable plant species, reducing the success rate of new plantings and degrading existing habitats. They also prey on native birds, invertebrates and aquatic wildlife, reducing indigenous diversity and limiting sustainable reintroduction of native wildlife. For example, cats prey on native birds, reptiles, frogs and the larger invertebrates.

Biodiversity pests in Banks Peninsula and Christchurch

Rats – found in almost all habitats where they threaten birdlife, lizards and invertebrates. They also eat, collect and store large quantities of seed and fruit, preventing successful regeneration.

Possums – introduced from Australia and protected until 1921, now thought to number between 60 and 70 million nationally. They are known to prey on the eggs and chicks of native birds, eat insects and defoliate trees (by nationally consuming more than 20,000 tonnes of foliage each night). They also carry and spread tuberculosis. The mild climate and mix of pasture and regenerating bush on Banks Peninsula provides optimum habitat for possums.

Mustelids – weasels, stoats and ferrets are all present, although the weasel is not a regular pest in Christchurch. Stoats are the most common of the mustelid predators and are known to eat birds, mice, rabbits, hares, possums, rats and insects. Ferrets are the largest of the three and are locally common in farmland, small areas of bush, tussocklands and coastal dunes. While ferrets are more likely to prey on rabbits and mice, they still pose a threat to native birdlife and invertebrates and are a key predator of penguins.

Goats – while goats do browse broom and gorse, they have little impact on mature plants and will browse more palatable species of grass and native plants when available. Their impact is most visible within bush fragments, where they browse on regenerating vegetation and strip and ring bark more established trees. The Banks Peninsula Goat Plan has made major inroads toward eliminating wild goats on the Peninsula. Being adept climbers they can access rock refuge and browse endangered plants in those sites.

Cats – prey on birds, insects and lizards. They can be a pest in Council conservation reserves. Periodic abandonment of domestic cats creates ongoing problems.

Dogs – there is evidence that dogs can have a detrimental effect on birdlife in conservation areas. It is likely that impacts at open sites (beaches, estuaries, lowland grazing marsh) would be higher as birds in these habitats feed, roost, sleep, nest and raise young on the ground.

Black-backed gulls – although a natural indigenous predator they can have a significant localised impact on other species. For example, in 2007 they had a major effect on nesting black-billed and red-billed gulls and pied stilts at several sites near the Avon Heathcote Estuary/ lhutai. They take scaup, shoveler and paradise shelduck ducklings off the water on the rivers. They are also an important predator around the Banks Peninsula coast, especially of prions and nestlings of other birds.

Magpies – introduced in the 1860s to control pastoral insect pests, their aggressive and territorial nature can disturb the successful nesting of native birds and they have been known to drive away resident native bird populations. The successful removal of magpies from Bottle Lake Forest Park saw the rapid re-instatement of bellbirds (kōparapara). Generally magpies are only controlled where they present a health and safety risk to park users when nesting. They are currently not controlled in rural, non-reserve areas.

Pigs – numbers are low at the moment but they are prolific breeders and can increase rapidly. Even small numbers can have a detrimental impact on an area, being able to root up large areas of ground in a night, up-rooting regenerating bush and destroying soil invertebrate communities.

Deer – numbers are relatively low. Fallow and red deer occur south of Victoria Park on the Port Hills. Small herds of deer occur on Banks Peninsula.

Rabbits and hares – can be a problem in the district. Rabbits are especially problematic in drier areas. Hares and rabbits can have a severe impact on restoration plantings.

Key conservation actions (see Objective 1.4 targets and actions)

- » Develop a collective strategy to allow for greater coordination, control and recognition of pest animal problems. A cooperative approach is the only viable means to achieve long term control of pests across large areas.
- » Public awareness and participation is important. A trap loan scheme is already in place and an education programme is needed.
- » Monitoring of pest numbers should be ongoing, along with exclusion fencing, capture, poisoning and trapping programmes where appropriate.
- » Consideration is needed on the extent and degree of pest control that can be sustainably maintained over the long term before control programmes are initiated.
- » Where intensive pest control strategies are implemented both internal and external review of pest control operations and biodiversity response will need to be carried out annually for the first five years.

PHOTO: COUNCIL'S DOG BYLAW AIMS TO REDUCE DISTURBANCE TO VULNERABLE SPECIES IN PLACES SUCH AS THE OKAINS BAY TIDAL MUDFLATS.



11.12 PEST PLANTS

(Dr Trevor Partridge)

Pest plants (covered under plant and animal pests in Objective 1.4 targets and actions) are a major threat to biodiversity in New Zealand and many of the remaining native habitats in Christchurch and Banks Peninsula would become degraded without ongoing weed control. However, management of weeds requires careful analysis and prioritisation on an ecosystem and habitat basis to determine where the greatest threats lie. Plants that are a threat to one habitat are not necessarily a problem in another. An example is gorse which has the capacity to cover some grasslands and wetlands but facilitates natural forest regeneration on wetter parts of the Port Hills and Banks Peninsula and may also provide valuable invertebrate habitat.

Biodiversity weeds change environmental conditions by shading, smothering or preventing other species from establishing. Within natural communities they affect vegetation structure and composition, regeneration, plant and animal biodiversity, hydrology and nutrient regimes.

There are already more exotic species naturalised in New Zealand than there are native species. Of the 20,000 introduced species about 1-2% are expected to become significant weeds.

Successful weed management requires a coordinated approach with other agencies, landowners and the public. The *Canterbury Regional Pest Management Strategy 2005-2015* lists the plant pests for which action is required. Six species of "Total Control" pests are those which are present in low amounts and which will be actioned should they appear. The only "Progressive Control" pest is nassella tussock (*Nassella trichotoma*) which is present as a few small populations on Banks Peninsula and Port Hills. The "Containment Control" pests are mostly problems in agriculture and include gorse, broom and some thistles. The "Biodiversity Pests" many of which are listed below (indicated with an asterisk) are the greatest threat to biodiversity.

Important weeds in Christchurch and Banks Peninsula

Exotic grasses (e.g. tall fescue, veld grass, cocksfoot) – capable of smothering small herbaceous plants. Grass can make it difficult for other plants to establish. Mowing or close grazing can be useful as management tools, although palatable native species can be lost with grazing.

Grey willow - is one of several willow species which are a problem along waterways and in Christchurch wetlands. Grey willow is the worst of the willow species because it produces abundant seed and disperses readily.

Freshwater aquatic weeds – are an increasing problem with recent arrivals including egeria* and lagarosiphon*. These weeds are often spread by recreational users of the waterways and control of underwater weeds, especially in running water, is difficult.

Gorse and broom – are widespread in a range of Christchurch's and Banks Peninsula's natural remnants from wetlands to hillsides. Gorse and broom need ongoing control in grasslands, riverbeds and some wetlands; however, in other circumstances they can facilitate the re-establishment of indigenous forest. The City Council needs to work with the Regional Council and other agencies toward a greater understanding and consensus on the role of gorse and broom in indigenous forest regeneration. This is especially important where these shrub weeds are entrenched in the landscape and ecosystem, and where potential for serious biodiversity damage can occur if pest management regulations are inflexible and solely agriculturally based.

Purple loosestrife – is long-lived and produces millions of seeds, this weed has the potential to block waterways. Eradication is being attempted in Christchurch City.

Yellow flag iris – was initially used to stabilise banks but has spread to colonise large sections of waterway.

Boxthorn – is found along the coastal margins, including the Port Hills (especially Godley Head area) and some of the drier headlands of Banks Peninsula. It is a major potential hazard for seabirds and difficult to control.

Vines – include a number of species of both climbing vines and those that grow along the ground which will smother other plants and even collapse host plants with their weight. Vines are often spread by the dumping of garden waste. Old man's beard* is a continual problem for native forest patches over the whole city and the six types of banana passion fruit* are a problem on Banks Peninsula.

Sycamore – is widespread in gardens and along the roadsides of Banks Peninsula. It has abundant wind-distributed seed which is capable of germinating and growing in shaded environments. It is highly invasive and able to dominate indigenous forest patches.

Boneseed* – is established on the eastern end of the Port Hills, especially on Godley Head and above Lyttelton. It is also widely spread on some of the exposed dry headlands and coastal bays of Banks Peninsula especially Lyttelton Harbour/Whakaraupō. It is a potentially serious threat to tussock grassland and rock outcrop habitats. However its palatability when young means that establishment can be reduced with effective grazing management.

Hawthorn – is found on the Port Hills especially above Sumner. This small tree has the ability to colonise shaded forest habitats as well as open grasslands. It is widely spread by birds and a serious potential threat to most ecosystems and habitats including core forest stands.

Beggar's ticks – a recent arrival in the city, this has established at Travis Wetland and is appearing elsewhere. Difficult to control it is a major pest elsewhere in New Zealand.

Reed grasses – these are spreading in the city's waterways and are displacing indigenous riparian plants. Reed canary grass (*Phalaris arundinacea*) is widespread in the Ōpawaho/Heathcote River and is spreading in the Avon River/Ōtakaro. The more vigorous reed sweet grass (*Glyceria maxima*) is in the Ōpawaho/Heathcote River. The very large phragmites (*Phragmites australis*) is now very rare.

On Banks Peninsula, a strategic list of 12 weeds has been identified for control to prevent further damage to the region's biodiversity including: old mans beard, sycamore, yellow passionfruit, grey willow, banana passionfruit, Japanese honeysuckle, tradescantia, smilax, yellow ginger, selaginella, Darwin's barberry* and Khasia berry.

Key conservation actions (see Objective 1.4 targets and actions)

- » Long-term cross boundary commitment to management of existing weeds is needed.
- » Eradication of new biodiversity weeds prior to their becoming widely established.
- » Issues regarding control of gorse and broom on Banks Peninsula in relation to their positive roles in succession to indigenous forest needs to be resolved.
- » Implement a surveillance and monitoring programme for key pests (including new arrivals).
- » Implement a control programme of problem weed species and ensure sufficient resources are allocated for the long-term.
- » Increase understanding of weed issues through an ongoing education programme and promote appropriate actions by the public such as: careful disposal of weeds, no dumping of aquarium material into waterways, and use of non-weedy species in gardens.

PHOTO: SYCAMORE IS WIDESPREAD ALONG BANKS PENINSULA ROAD AND IS A POTENTIAL WEED OF FOREST PATCHES AND UNGRAZED AREAS.

