Ecological Values and Wildlife Opportunities

of the

Lower Heathcote Valley Floodplain

Report for Parks & Waterways Unit

Christchurch City Council

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Parks & Waterways Unit. March 2003

1.0 Introduction

This report was commissioned by the Parks and Waterways Unit, Christchurch City Council to provide an overview of ecological values of the lower Heathcote Valley Floodplain and to outline opportunities for wildlife as part of the proposed redevelopment of the valley.

This report updates and builds upon information presented in Crossland (May 1998): *Heathcote Valley Rezoning and Opportunities for Wildlife.* It also incorporates developments over the intervening five years – specifically landuse rezoning; CCC acquisition of ex-Port Company land and other blocks; and continued monitoring of wildlife populations and habitats.

The purpose of this first report is to investigate the following:

a. To define the existing and potential ecological values of this area, and outline opportunities for restoration of wildlife.

b. To define potential enhancement and restoration of these ecological values, and identify what opportunities should be progressed and where.

c. To further develop previous ecological reports including Crossland (1998).

d. To develop a database of past and present photos of this area to monitor ecological changes to the landscape.

1.1 Overview of changes to habitats and Birdlife: 1840 - 2003

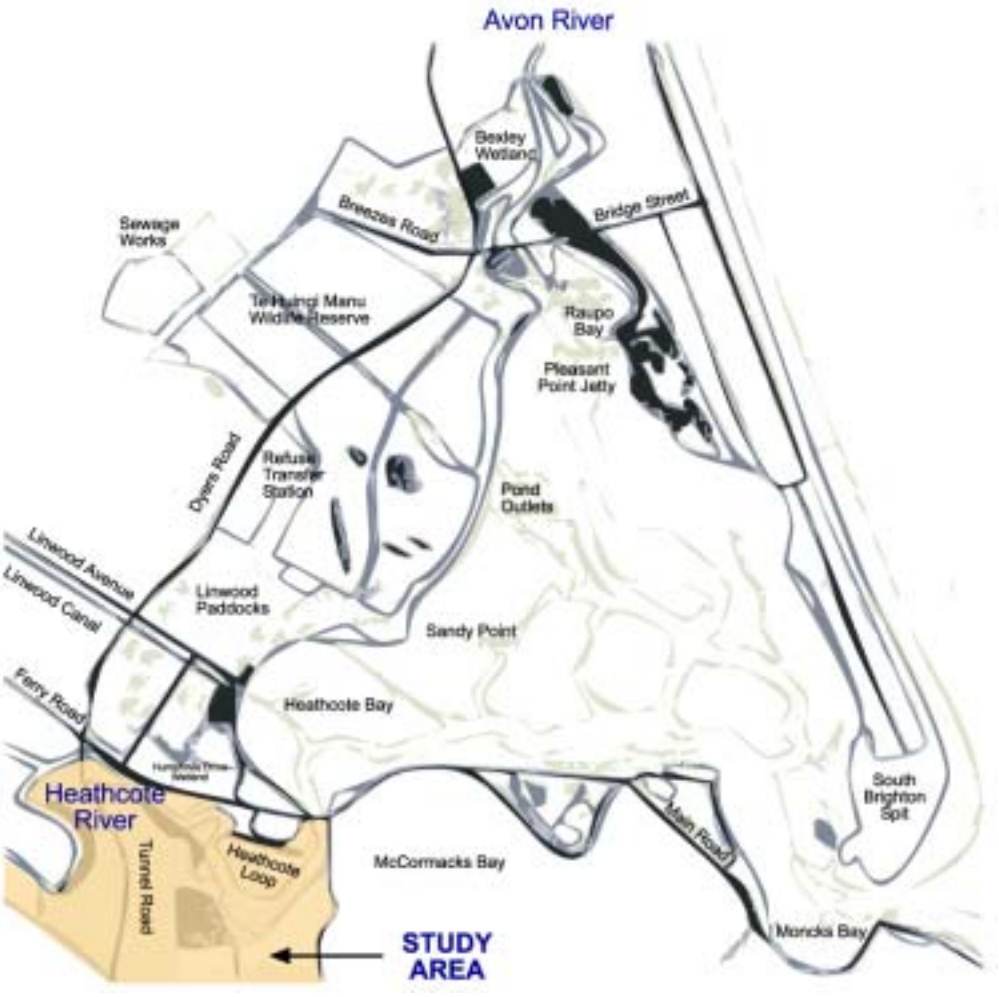
Prior to the arrival of European settlers, the landscape of the Lower Heathcote Valley floodplain comprised a mosaic of freshwater and tidal wetlands, native grasslands and bracken fern. This area supported up to fifty-seven species of native bird, including abundant populations of waterfowl and swamp birds. The advent of organised European settlement heralded a rapid period of change which saw the conversion of native grasslands and bracken to farmland, and the drainage and burning of almost all wetlands. This rapid habitat loss, combined with the impacts of predation, shooting pressure, avian disease and discharges of industrial pollutants had a catastrophic effect on birdlife. Approximately 25 native bird species became locally extinct in the Lower Heathcote Valley and populations of many others were depleted.

Probably because of their saline soils, vulnerability to flooding and perpetual muddiness, a chain of tidal wetlands along the Lower Heathcote River and tributary streams escaped destruction and have survived into the 21st Century. Ironically, while these wetlands have survived destruction by humans, most are threatened by dieback of sea rush (causative factors not clear) and possibly also by sea level rise.

The remaining wetland remnants buffer a narrow zone of mudflats on the Heathcote River and this postage stamp area of habitat supports a small but varied community of waders, cormorants, herons, kingfishers, swamp birds and waterfowl. Although species richness and bird numbers are generally lower than in other parts of the Avon-Heathcote Estuary, an upward trend has been recorded over recent years, probably linked to improvements in habitat conditions and food resources following the completion of the Woolston Industrial Sewer in 1971 and the closure of the Christchurch Gas Works in 1981, which ended direct discharge of pollutants and wastewater into the Heathcote River.

The dryland parts of the Lower Heathcote Valley floodplain now comprise farmland, which is used principally for horse grazing. Housing subdivisions are eroding the fringes while golf course, recreational and cultural developments have been proposed for much of the central area. Currently, small wetland bird populations persist, with Pukeko, Paradise Shelduck, Mallard, Kingfisher and Spur-winged Plover being the most obvious species. Potential exists for the creation of wetland and coastal bush habitats, particularly along the Heathcote River and Avoca Valley Stream riparian zones and adjacent to storm-water retention basins.

Figure 1. Study Area: The Lower Heathcote Valley Floodplain



1.2 Current significance of the Lower Heathcote Valley Floodplain within the Avon-Heathcote Estuary wetland system

Although less species rich and with a lower bird/hectare density than some other parts of the estuary, the study area makes three important contributions to the overall ecological richness of the Avon-Heathcote system. Firstly; this area contains a little less than half the surviving saltmarsh and saltmeadow habitats found within the estuary and environs; Secondly, the area comprises a core breeding ground for wetland birds; and thirdly, several important high tide and night roosting sites exist there (see Crossland 1993).

a) Saltmarshes and Saltmeadows

Seven remnant saltmarshes survive in the study area: Five (Ferrymead Esplanade, Heathcote Loop, Devil's Elbow, Ferry Road and Stilt Island) comprise mainly sea rush (*Juncus maritimus)*, with small areas of jointed rush (*Leptocarpus similis*) and Shore Ribbonwood (*Plagianthus divaricatus*). The remaining two (Ferrymead and Tunnel Road Saltmarshes have more diverse plant communities (see McCombs & Partridge 1992). Recently "discovered" is an area of saltmeadow at Ferrymead comprising mainly glasswort (*Sarcocornia quinqueflora*), bachelor's button (*Cotula coronopifolia*) and buck's horn plantain (*Plantago coronopus*). Additional patches of saltmeadow vegetation are found along ditches and in low-lying hollows and swales (former beds of tidal creeks) at various locations within the lower Heathcote Valley.

b) Wetland Bird Breeding

The Lower Heathcote River, Heathcote Loop and undeveloped parts of the Heathcote Valley floor, are particularly important for nesting Pied Stilts (up to 20 pairs annually) with smaller numbers of Pukeko (several breeding groups), White- faced Heron (5+ pairs), Spur-winged Plover (6+ pairs), NZ Shoveler (2+ pairs), Grey Duck (3+ pairs), Paradise Shelduck, (3+ pairs), NZ Kingfisher (10+ pairs), Welcome Swallow (5+ pairs), Southern Black-backed Gull (4+ pairs). This represents one of only a few core breeding areas for wetland birds in the environs of the Avon- Heathcote Estuary.

c) Roosting Sites

Important secondary high tide roosting sites for wetland birds are located within the Heathcote Loop and lower river. These are mainly utilised by waders (4 species), cormorants (3 species) and herons (1 species). The locations of these roosts are shown on fig. 54. In addition, eucalypts and pines on the true right bank of the Heathcote at the Kennaway Farm site support a large night roost (up to 100+ birds) of Little Cormorant. Birds gather at this area just on dusk, roost through the night, then disperse to feeding

grounds at sunrise (see Crossland 1993). Management requirements of roosting sites are discussed in greater detail in section 6.5.

Current Names Reserve for Wetlands discussed in this Report

Tunnel Road Saltmarsh	= Tunnel Road Reserve
Ferry Road Saltmarsh	= Ferry Esplanade Reserve
Devil's Elbow Saltmarsh	= Calder-Green Reserve (owned by Forest & Bird Society)
Stilt Island Saltmarsh	= not named (within C.M.A.)
Heathcote Loop Saltmarsh	= Settlers Reserve
Ferrymead Esplanade Saltmarsh	= Ferrymead Esplanade Reserve
Ferrymead Saltmeadow	= not named
Ferrymead Saltmarsh	= not named (within C.M.A.)

2.0 Habitat and Wildlife in the 1840's – 1850's

The Black Maps (based on land surveys made in the late 1840's – early 1850's) were drawn up in 1856 under the direction of J. Thomas and T. Cass, Chief Surveyors, and late re-compiled by Ken Sibley in 1989. They give a generalised description of the vegetation types existing in Christchurch and its environs during the first decade of European settlement (refer to figure 2). This survey information, combined with written landscape descriptions from early settlers and an examination of old photographs, gives a fairly detailed account of habitats as they existed in the 1840s – 1850s.

Within the Lower Heathcote Valley Floodplain, tidal and freshwater wetland habitats comprised dominant features of the landscape. The major habitat types and the areas they occupied were as follows:

- "Rushes" (i.e.; mainly tidal saltmarsh dominated by *Juncus maritimus*) occurred on both sides of the Heathcote Loop; around the former Avoca Valley Stream mouth; at the Devils Elbow; along part of the true left bank of the Heathcote River near present day Ferry Road; and on the true right bank downstream from the lower end of the Woolston Loop. Aerial photos taken in the 1920s and 1940s of the area now occupied by the Heathcote County landfill site and Ferrymead clearly show a network of former channels. The

meandering courses of these channels are a characteristic drainage feature of saltmarshes.

- At the landward edge of the saltmarsh on the true right bank, the rushes merged into “rough grass”.

- At the landward edge of the saltmarsh on the true left bank, the rushes merged into dense shore ribbonwood (*Plagianthus divaricatus*) in the lower part of the river, and into “swamp” near Steamwharf creek.

- “Raupo” formed an extensive swamp in the middle part of the Lower Heathcote Valley in the area south of an approximate line from the Ferrymead Park Drive/Bridle Path intersection to the Tunnel Road/Port Hills Road intersection and bounded by the railway line and Bridle Path Road.

- An extensive area of “flax and toe toe” occupied the southern part of Lower Heathcote Valley, approximately south of the railway line, and also extended some distance up Horotane Valley.

- An expanse of “flax, toe toe, grass and (bracken) fern” covered what is now Kennaway farm and the paddocks east and west of Tunnel Road

Figure 2. Habitats existing around the Avon-Heathcote Estuary in the 1850’s
(from Owen 1992, after Sibley 1989 and the Black Maps 1856)

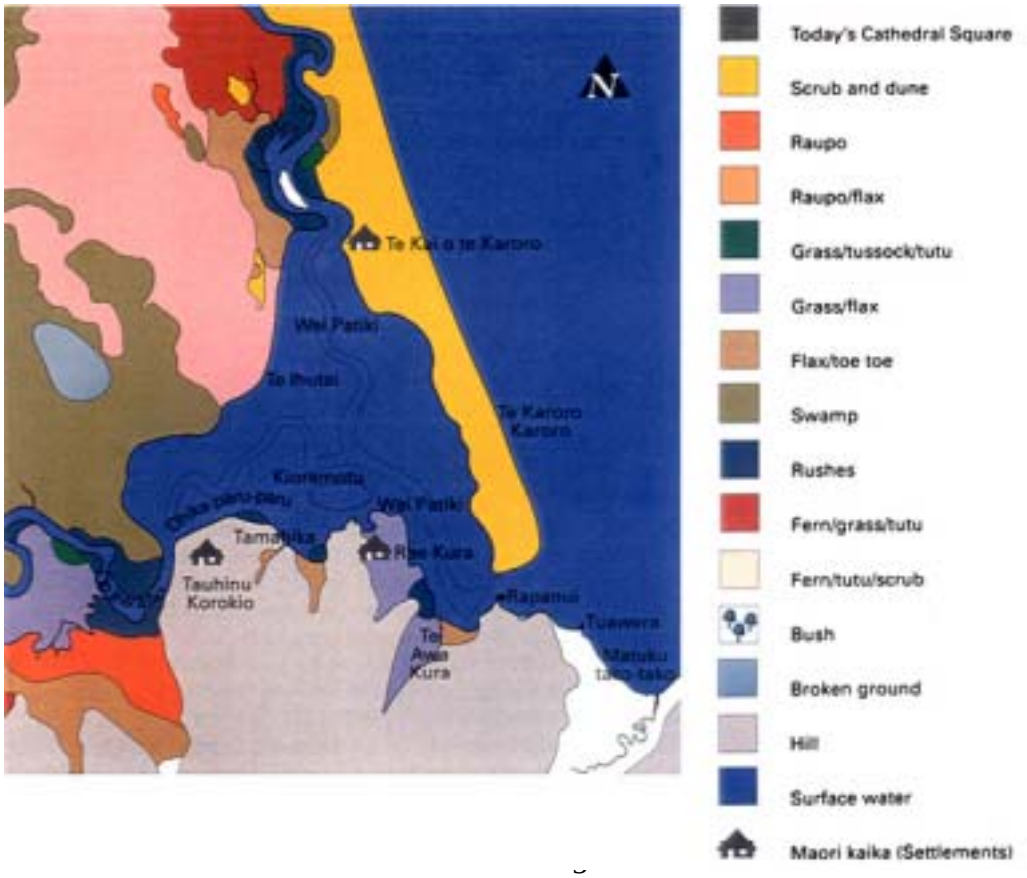


Figure 3. Part of the Black Maps showing the study area and environs

In summary, the 1840's – 1850's landscape involved a band of tidal wetland habitats along the Heathcote river, comprising mudflats and muddy riverbanks with margins of dense rushes. This is not too dissimilar to what is found in the Heathcote Loop today, except that vegetation cover was formerly denser and much more extensive. On the true left bank the margin of rushes gave way to taller *Plagianthus* saltmarsh, and on the true right bank to freshwater raupo swamp, rough native grasses, flax, toe toe and bracken fern.

Early accounts by Deans (1845); Torlesse (1848-51); Strange (1849); Godley 1850; Barker (1850's); Thompson (1867); Potts (1869, 1870, 1882); Greenaway (1874); Innes (1879); Deans (1886); Buller (1888); Hutton & Drummond (1904), Stead (1927), tell of the abundant birdlife that inhabited the woodlands, swamps, grasslands and estuarine areas of Christchurch at the time of first European settlement (see Crossland 1993). Three brief, but informative descriptions accounts are reproduced here:

Dr A.C. Barker in c.1851 wrote: "*This great plain is copiously watered with rivers, two of which, the Heathcote and the Avon, are small but deep……as clear as crystal……*

The plains within a few miles of the sea are very swampy, but as you recede from the coast it gradually improves and opens into meadows of grass interspersed here and there with fern and tutu……. Nearer the swamps there is a great deal of grass called toe toe, very handsome with its flowers often twelve feet high. The ti-palm [= cabbage tree] is a dwarf kind of palm that looks not unlike a giant mop, and is scattered thinly over the plains…." (quoted in Andersen 1949).

Jane Deans (1885) who arrived at Christchurch in February 1853 described habitat and birdlife along Ferry Road thus; "*The Ferry Road was not much more than wide enough for one carriage at a time, with deep ditches on both sides. From about the quay to Christchurch was one large flax swamp, so soft and boggy that it would not carry the weight of a sheep or a cow till those ditches and drains had carried off a great quantity of the water..... It was a great place for shooting wild ducks before the Settlers arrived. So many lagoons made it quite the home of the waterfowl....."*

C. Thomson (1867), describing the Christchurch and Canterbury coastline in the 1850's wrote: *"The coasts abound with fish of large size and good quality, but there is little to be found in the lakes or rivers, beyond eels, a kind of trout of good flavour [= probably Giant Kokopu], and at particular seasons immense shoals of whitebait, so dense that they may be caught in buckets……Several kinds of birds are indigenous to the woods and waters; among them the oystercatcher, bittern, kingfisher, cormorant, quail, wild duck, mocking or parson-bird [= tui], paroquets [= Red-crowned and Yellow-crowned parakeets] woodhen [= weka], pigeon, etc."*

In early-mid 1800s, habitats within the Heathcote Valley and along the lower Heathcote River probably supported resident or visiting populations of most of the following 57 native bird species. The species most likely to have been common are written in italics.

Table 1. Probable Birdlife of the Lower Heathcote Valley Floodplain prior to 1850

Southern Crested Grebe* (Puteketeke)	NZ Dabchick* (Weweia)
Black Cormorant (Kawau)	Pied Cormorant (Karuhiruhi)
Little Cormorant (Kawaupaka)	Spotted Shag (Parekareka)
Reef Heron* (Matuku moana)	White Heron (Kotuku)
Australasian Bittern (Matuku)	*Harrier* (Kahu)
NZ Falcon* (Karearea)	*Paradise Shelduck* (Putangitangi)
Grey Duck (Parera)	*Brown Teal** (Pateke)
NZ Shoveler (Kuruwhengi)	*NZ Scaup* (Papango)
*NZ Quail** (Koreke)	*Buff Weka** (Weka)
*Banded Rail** (Moho-pereru),	Spotless Crake* (Puweto)
Marsh Crake (Koitareke),	*Pukeko* (Pukeko)
Variable Oystercatcher (Torea pango)	*South Island Pied Oystercatcher* (Torea)
NZ Dotterel* (Tuturiwhatu)	Banded Dotterel (Tuturiwhatu)
Pied Stilt (Poaka)	Black Stilt* (Kaki)
Bar-tailed Godwit (Kuaka)	Lesser Knot (Huahou)
Southern Black-backed Gull (Karoro)	*Black-billed Gull* (Tarapunga)
Red-billed Gull (Tarapunga)	Caspian Tern (Taranui)
White-fronted Tern (Tara)	Black-fronted Tern (Tarapiroe)
Fairy Tern*	NZ Pigeon (Kereru)
South Island Kaka* (Kaka)	Yellow-crowned Parakeet* (Kakariki)
Red-crowned Parakeet* (Kakariki)	Shining Cuckoo (Pipiwharauroa)
Long-tailed Cuckoo* (Koekoea)	Morepork* (Ruru)
NZ Kingfisher (Kotare)	Rifleman* (Titipounamu)
Grey Warbler (Riroriro)	NZ Pipit (Pihoihoi)
*Fernbird** (Matata)	Brown Creeper* (Pipipi)
Fantail (Piwakawaka)	*Tomtit** (Ngiru-ngiru)
NZ Robin* (Toutouwai)	*Tui** (Tui)
Bellbird (Korimako)	Saddleback* (Tieke)
NZ Thrush* (Piopio)	

(Species marked with an asterix* are now locally extinct).

3.0 Changes in Habitats & Birdlife: 1850 - 2003

3.1 Changes: 1850's – 1870's

Within the first two decades of European settlement (1850-1860) it seems that most of the freshwater wetlands, indigenous grasslands and scrublands within the Lower Heathcote Valley floodplain were drained, burnt off and converted to farmland (Ogilvie 1978).

Heathcote Valley, as part of a popular route traveled by settlers moving between Lyttelton and Christchurch, felt the impacts of human activity right from the arrival of the first four ships in mid December 1850. Completion of the Bridle Path in mid January 1851, the creation of Bridle Path Road and the establishment of a ferry service near the Heathcote River mouth all bought people and animals through the valley. A punt for ferrying cattle operated from May 1851 onwards (Andersen 1927). A new punt and ferry house was established in 1856. In 1858, 9000 persons/year were reported to use the ferry and in 1860, approx. 50 were reported to cross the Heathcote River daily. (Andersen 1927).

Land at Ferrymead was sold first during the 1850's and the locality quickly developed with wharves and buildings being constructed during the 1850's and 60's (Ogilvie 1978). New Zealand's first locomotive was landed at Ferrymead on 6 May 1863 and the Christchurch to Ferrymead railway service commenced on 1 Dec 1863. The Heathcote swing bridge opened on 18 April 1864, replacing the ferry service (Andersen 1927).

Deely (1991) notes that large-scale wetland drainage in Christchurch began around the Heathcote in 1853, expanded greatly throughout the city in the 1870's and was largely complete by 1885. In 1853 Henry Sewell (quoted in Ogilvie 1978) reported that all land in the Heathcote Valley had already been occupied. A contemporary painting by Dr. J.G. Swain (see figure 4) qualifies this however by showing fields in the upper and mid valley, but also a large area of wetland persisting in the lower valley. Seven years later in 1860, Samuel Butler described the view looking down from the Bridle Path thus; "*a few pretty little box-like houses, in trim pretty little gardens, stacks of corn and fields, a little river with a craft or two lying near a wharf, whilst the nearer country was squared into many-coloured fields*". By the end of the 1860's all freshwater wetlands within the Heathcote Valley had almost certainly disappeared and a band of tidal saltmarshes lining the Heathcote River with a few relict saltmeadows slightly further inland, were the only wetland habitats remaining.

Wetland bird populations (with the exception of Pukeko which quickly adapted to the new grasslands), were unable to withstand the rapid and almost total destruction of habitat and many species quickly disappeared, some like New Zealand Quail, even became locally extinct (Turbott 1969; Crossland 1993).

Before completion of the Lyttelton rail tunnel, considerable shipping traffic passed through the lower Heathcote. Large numbers of vessels used the river in the period

1850 to 1867. In the mid 1850's, the Canterbury Provincial Council provided money for beacons and staking of channels to improve navigation along the river. The course of the river was staked out after the loss of the "Alma" on 06 Jan 1856 (Andersen 1927). It is notable that many stakes and other human-created formations are still found in the lower Heathcote River (pers. obs.) and the area contains many archaeological sites dating from the heyday of early European activity in the 1850's – 1870's (Watson 2002).

Further up valley, Andersen (1927) notes that Heathcote Valley township was initially a private subdivision (presumably in the 1850's) but that allotments initially failed to sell probably due to their small size. Larger allotments were resurveyed and sold from approximately May 1860 onwards (Lyttelton Times, 6 May 1860, quoted by Andersen, 1927). Substantial development arrived with the construction of the Lyttelton Rail Tunnel which brought industrial development to the area around the tunnel portal and including construction of houses to accommodate tunnel workers. Trial shafts for the railway tunnel were constructed from December 1859 onwards and work on the tunnel itself commenced on 17 July 1861. The two ends of the tunnel were joined on 29 May 1867 and the first train passed through on 9 Dec 1867 (Andersen 1927). Meanwhile, stone quarries were established along the Bridle path in the 1860s; a post office was opened in 1863; a school built in 1864-65, and a church was consecrated in 1866 (Andersen 1927).

While Heathcote Valley Township grew over the 7-8 years of tunnel construction and subsequently, Ferrymead and the river trade went into decline. By 1869, few vessels used the lower Heathcote and in 1870 commercial activity ceased (Andersen 1927, Ogilvie 1978). From this period onwards, the Lower Heathcote Valley floodplain became somewhat of a neglected backwater. It also became very badly polluted from the 1860s onwards with tanneries, wool scours, soap and candle works and other industries discharging untreated waste into the Heathcote River (Andersen 1927, de Their 1976, Deely 1991).

Figure 4. 1851 Painting showing the Lower Heathcote Valley Floodplain
(CML collection)

Note: the artist's depiction of extensive areas of marsh and swampland along the river (1) and on both sides of Ferry Road (2). The early stage of European settlement is shown by a cluster of buildings at Ferrymead (3) and a small adjacent area of cultivation (4).

Figure 5a. An early painting of the Heathcote Valley (probably the early 1850's)
(Dr. J.G Swayne, CML collection)

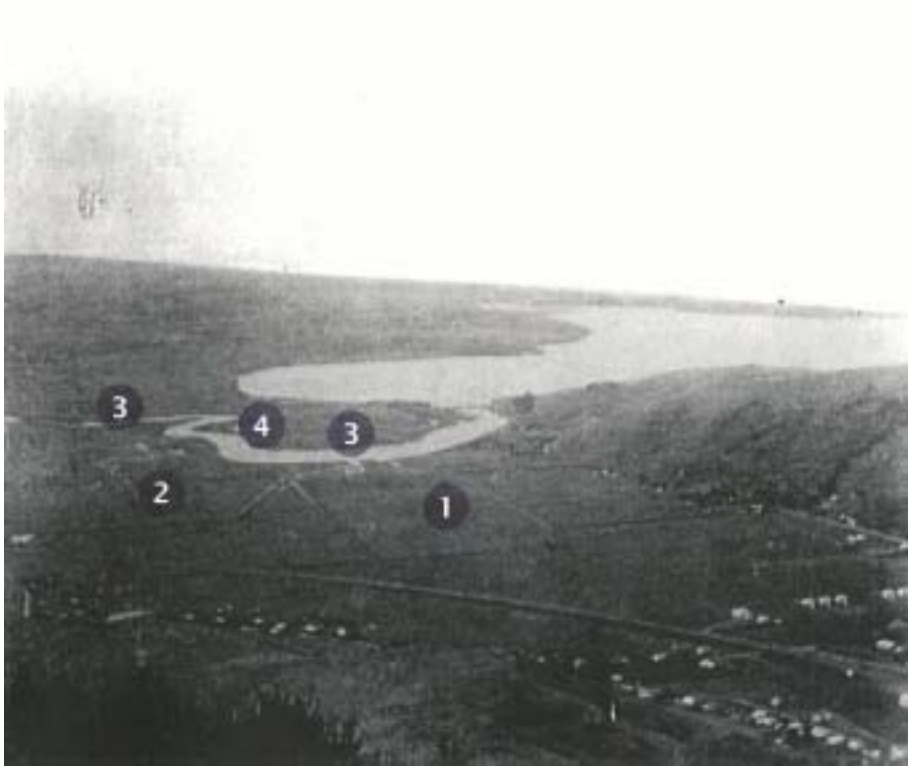
Figure 5b. The same view in 2003 (photo A Crossland)

Note: Farmland in mid valley and extensive wetlands (indicated) bordering the Heathcote Loop.

Figure 6. A photograph of the same view, taken about 1880. (CML collection)

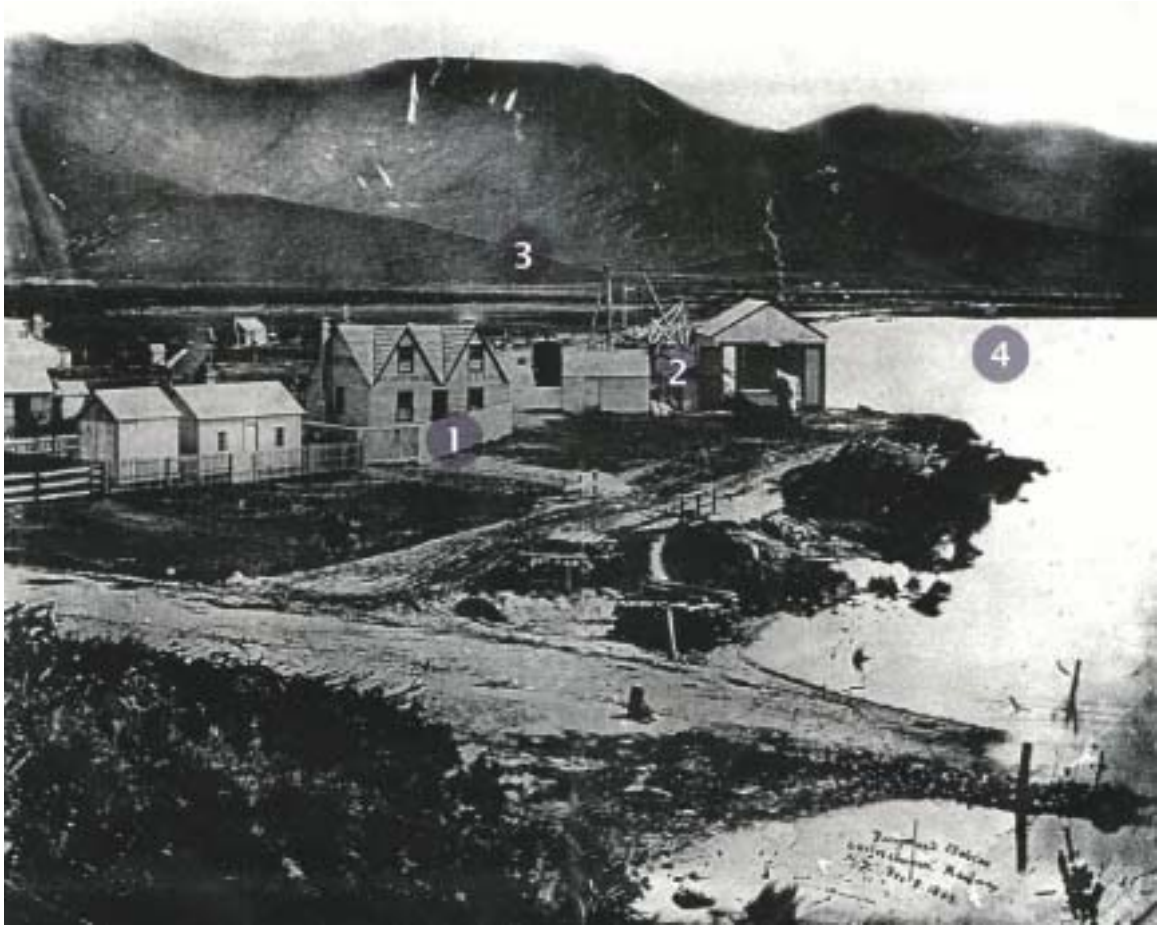
Note that the valley is "*squared into many-coloured fields*" as Samuel Butler described, and that wetland areas are restricted to riparian areas beside the Ferrymead Branch Railway Line (1) and around the original mouth of Avoca Valley Stream (2).

Figure 7. Photograph of approximately the same view taken in probably the 1900's
(CML collection)



Note: the increased extent of drainage ditches in the lower valley (1); the meandering course of lower Avoca Valley Stream (2); the dense riparian saltmarshes along the lower Heathcote (3) and the old Ferrymead racecourse track still intact and contained within bunding (4).

Figure 8. A photograph of the Ferrymead area in 1863. (Dr A.C. Barker, CML collection)



Note: the collection of buildings around the old ferry crossing point (1) and wharf (2). Fields and scattered buildings can be seen in the lower Heathcote Valley beyond (3) with rushes and saltmarsh remnants around the shoreline (4).

Figure 9. c.1865 photo taken looking over Heathcote Valley from above Bridle Path Road toward Castle Rock (J. Elsbee, CML collection)

Note: short grassland and removal of all indigenous vegetation cover by this date. The Black Maps indicate that prior to European Settlement, this area was vegetated in raupo in the lower area; flax and toe toe in the upper valley floor. Note also the severe tunnel and gully erosion on the hill slopes below Castle Rock.

Figure 10. Present day (2003) photo of approximately the same view as shown in fig. 9. (photo: A Crossland)

Note: that this part of the valley is now largely settled and well vegetated with garden and parkland trees. Poor quality grassland (mainly used as horse paddocks) remains the principal ground cover in the lower part of the valley and seems little changed in 140 years.

3.2 Changes: 1880's – 1960's

The tidal wetlands along the Lower Heathcote River and the Heathcote Loop escaped the wholesale destruction that befell freshwater wetlands further inland and to a large degree (judging by old photographs reproduced here) seem to have survived into the 1900s fairly well intact and without any obvious visible deterioration in health. From the 1920s onwards however, the photographic record indicates a progressive deterioration of saltmarshes, involving an apparent dieback of sea rush (*juncus maritimus*), and a second phase of loss to land reclamation and drainage.

The establishment of market gardens in the upper Heathcote Valley from 1912 onwards led to transportation of fine loess soils into the lower Heathcote River. This triggered a process of siltation which accelerated from 1925 onwards when river sweepers began working in the Heathcote River and shifted trapped sediment downstream (Deely 1991, Parks Unit 1992). Edge erosion and die back of sea rush-dominated saltmarshes appears to have started at roughly the same time and may have been at least partially caused by siltation, although causes of this dieback require research.

Birdlife using the Lower Heathcote River and the Heathcote Loop from the late 19th Century to the 1960's was probably fairly limited. Firstly, there was considerable shooting pressure for much of this time and bird populations in wetlands close to the city were hunted heavily (Potts 1882; G. Guy pers. comm. 1992; Crossland 1993). Popular perception of "*gamebirds*" included not only waterfowl, but also swampbirds, waders and terns. In addition, many birds were considered pest or nuisance species (including cormorants, shags, gulls, kingfishers & birds of prey) and these were openly persecuted.

Secondly, water and sediment pollution levels in the lower Heathcote River were severe (Deely 1991), limiting food availability and possibly also causing direct harm to birdlife. In the 1900's a quarter of New Zealand's manufacturing industry was located within the Heathcote Catchment. Factories, including wool scours, metal works, glue works, gas works and tanneries dumped over 4.5 million litres of industrial effluent into the Heathcote every day. This had increased to 10 million litres a day by 1968 (Deely 1991). Pollutants included acids, alkalis, calcium bisulphate, sulphur compounds, tars, oils, arsenic, chromium, copper, zinc, nickel and iron. The Lower Heathcote River was heavily polluted for many decades (Parks Unit, 1992) and has only recently begun to recover.

After the initial massive reduction in birdlife following European settlement, populations of the remaining species probably stabilised and stayed about the same for many decades. Pukeko were abundant (hundreds) while Paradise Shelduck, Mallard, Harrier, Black-backed Gull and Kingfisher occurred in smaller numbers. Introduced passerines were probably abundant too but a general lack of trees would have limited numbers of native passerines such as Fantail, Grey Warbler, Silvereye, Bellbird and Shining Cuckoo, although NZ Pipit (which favour open country) were probably common. They still occur in this area during winter. In more recent decades (since about 1960) Pukeko numbers declined substantially (see 3.5) but three new

native species arrived (Spur-winged Plover, White-faced Heron, Welcome Swallow - all recent self-introductions from Australia), which utilised vacant niches and began to build up local populations.

What follows is a series of photographs (mainly aerial) tracing changes in the Heathcote River tidal wetlands through time from the 1870's to the 1960's.

Figure 11. Location of old watercourse channels in the Heathcote Loop area
(Base photograph = 1965 aerial, V.C. Browne Ltd.)

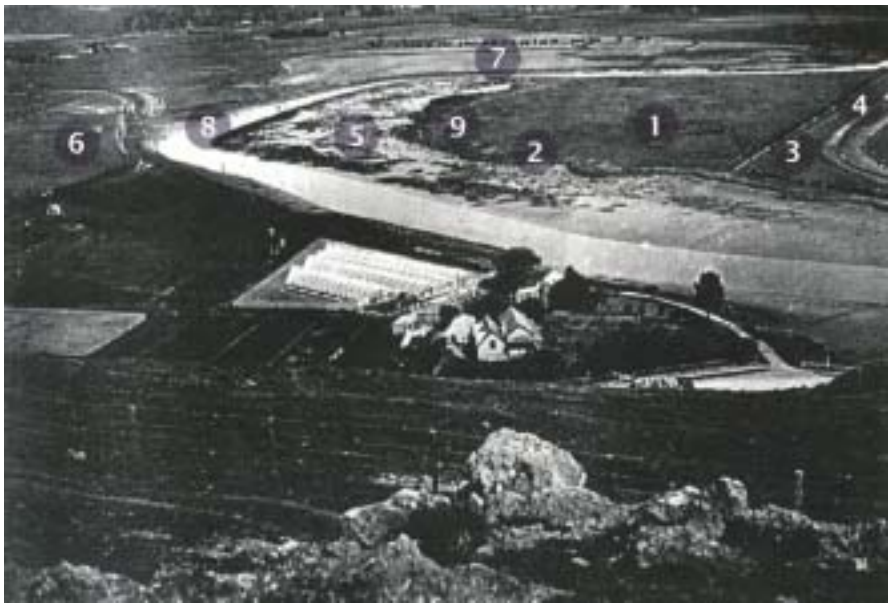
Note: Probable original channels (as determined from aerial photographs and ground checks) are coloured yellow. Watercourses that appear to have been human-created are shown blue.

The former channel of the lower Avoca Valley Stream (1) is intersected by many smaller channels (2). The serpentine nature of these suggests that they comprise a former drainage network through saltmarsh. The straighter channels further south (3) probably drained the freshwater raupo swamps.

Figure 12. An 1880 view of the lower Heathcote Loop looking across to the Ferrymead shoreline and the present Avoca Valley Stream mouth
(Alexander Turnbull Library)

Note the sinuous course of the low-tide channel (1); the extensive weed beds (probably eelgrass or *Gracilaria*) covering the mudflats (2); and the thick density of the sea rush saltmarsh opposite with no obvious edge erosion or dieback (3).

Figure 13. Heathcote Loop sometime after 1910 (CPL collection)



Note: dense growth of sea rush in Heathcote Loop saltmarsh (1); the early stages of formation of a single meandering tidal creek draining the saltmarsh (2); an intact embankment around the racecourse with no signs of erosion (3); the parallel tracks of the old racecourse (4); weed beds (presumably of eel grass or *Gracilaria)* lying between low tide channel and the saltmarsh (5); small tidal creek inlets inland of the railway line (6); the dark coloured swale of the original Avoca Valley Stream channel, passing through what appears to be cultivated land or pasture with a line of small trees or shrubs beyond (7). Note also that the low tide channel of the Heathcote River is very narrow and hard up against the edge of the true right bank (8). Some erosion of the saltmarsh edge or a strand zone (perhaps of driftwood) is evident (9) (see figure 16). Note that this was not evident in the 1880 photograph shown in figure 12.

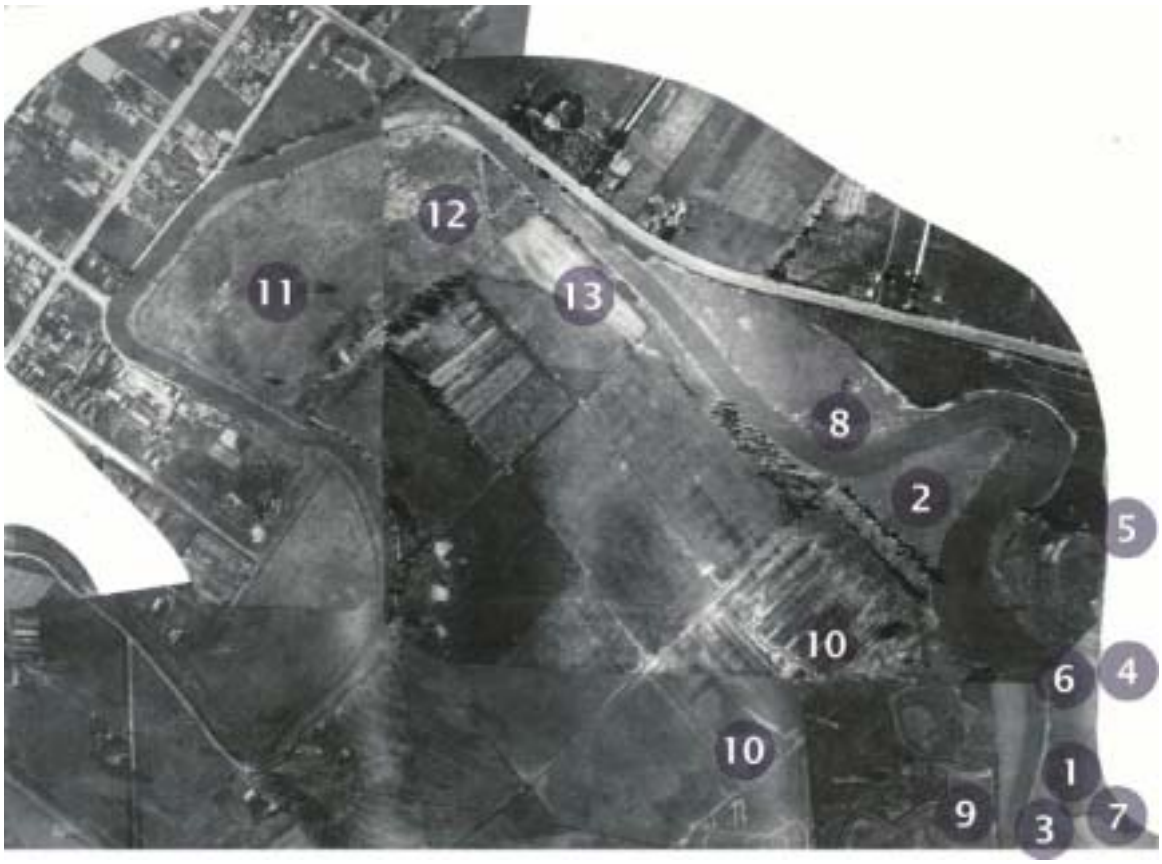
Figure 14. 1904 photograph of horses on the old Heathcote racecourse site looking south (Guy Bliss, from Ogilvie 1978).

Note: The "action" depicted in the photograph is taking place on the edge of the Heathcote Loop Saltmarsh. A uniform and dense expanse of sea rush can be seen stretching to the river edge (1). The opposite bank also appears to have saltmarsh margins (2) and there is little evidence of human activity aside from what appears to be small building or possibly jetty in the centre of the photograph (3). The short-turf under the horse's feet (4) is probably *Sarcocornia*-dominated salt meadow. Most of this area was vegetated in a mix of *Sarcocornia* and grass up until it was reclaimed in c. 1985-1986. Note the absence of trees at this date along the landward margin of the saltmarsh.

Figure 15. 1911 photo looking across Ferrymead and part of the old racecourse site (Weekly Press, CPL collection)

Note: Heavy cultivation on the land behind the Ferrymead wharf buildings (1); intact and dense saltmarshes across the river (2); and the presence of a new northern track at the racecourse, with the older southern track still evident (3) and still protected by a bund (4).

Figure 16a. 1926 aerial photograph (CCC archives)



A year after this photograph was taken, Andersen (1927) described the Lower Heathcote Valley Floodplain area as " *an open, low-lying, level tract of land, very bleak in winter and early spring*". The 1926 aerial photo confirms this description, the landscape being largely bare and open, except for small stands of trees (known to be Eucalypts and mostly still existing in 2003) on the true right bank of the Heathcote River near Devil's Elbow and on the northern boundary of Heathcote Loop Saltmarsh.

Note: Heathcote Loop (1) and Devil's Elbow saltmarshes (2) were still densely vegetated at this date without any obvious deterioration internally. However, the low tide mudflats (3) are now bare and the beds of unidentified vegetation noted in figs. 12 & 13 have disappeared. This may be due to increased siltation in the river following commencement of silt sweeping activity upstream in approximately 1925 (Deely 1991). The racecourse embankment (4) still appears to be intact and the area of saltmarsh enclosed within it may have been isolated from the tide and relatively dry at this time – allowing horses to run on firmer ground (perhaps like the present-day western shoreline of Brooklands Lagoon) rather than in soft mud. A line of trees (5) now separates the northern racecourse track and paddocks/saltmeadow areas from the sea rush vegetation of Heathcote Loop Saltmarsh. Erosion or vegetation dieback appears to be starting along the southern side of the embankment (6) and along the outer edges of Heathcote Loop Saltmarsh (7) and Ferry Road Saltmarsh (8).

Many old tidal channels are evident around the original Avoca Valley Stream mouth and Stilt Island area (9), including two former channels than run westward through the low-lying land behind Devil's Elbow (10).

The photograph also shows that an extensive drainage system had been put in place in the large area of saltmarsh west (11) and east (12) of the site of the present day Tunnel Road Bridge. Some of the vegetation in what is now Tunnel Road Saltmarsh, seems to have been scraped clear (13) or possibly flooded, or may be vegetated in salt-tolerant grasses (this area was indicated on the Black Maps as "rough grasses" and in the present day comprises sizeable patches of salt grass and couch.

Figure 16b. 1926 Aerial photo of the lower valley

Fence lines and shallow drainage ditches indicate that attempts were made at some date prior to 1926 to convert most of the Lower Heathcote Floodplain into farmland. Areas apparently still untouched at this date were Ferry Road Saltmarsh, Devils Elbow Saltmarsh, Stilt Island Saltmarsh, Heathcote Loop Saltmarsh, and Ferrymead Saltmarsh, including marshland on both sides of the Railway embankment (1). Many old tidal creeks and waterways are evident throughout the valley.

Figure 17. c.1920's photograph of Heathcote Loop looking from Stilt Island Saltmarsh to Devil's Elbow (W.A. Taylor, CML collection)

This is one of a series of photographs taken by W.A Taylor of various bends and reaches of the Heathcote River from the upper reaches to the Heathcote Loop, comprising a very useful historical record. Note the line of young Eucalypts (1) (judging by size they were probably planted in the 1910s) and the eroding edges of the saltmarsh (2). The dense area of sea rushes comprising Devil's Elbow Saltmarsh can be seen beyond the trees (3).

Figure 18. c.1920's view of the Lower Heathcote River just upstream of Ferry Road Saltmarsh toward the Devil's Elbow (W.A Taylor, CML collection).

Note: saltmarshes on both sides of the river (1,2); narrow marginal mudflats along the riverbanks (3) with remains of some former structure in the foreground – possibly a jetty. Note also the two stands of Eucalypts (4,5) which still exist (see fig 19.).

Figure 19. The same view as shown in figure 18, taken in February 2003. (photo: A. Crossland)

Note: the disappearance of saltmarsh along the river banks – dredged fill material now comprises the riverbanks and native vegetation has been planted as part of enhancement work. Note also that the two stands of Eucalypts shown in fig. 18 still stand (now approx. 100 years old) and are surrounded by more recent pines. The Eucalypts shown in fig. 17 no longer exist and pines have taken their place.

Figure 20. 1920's view of Heathcote river looking downstream at Kennaway Farm
(W.A. Taylor, CML collection)

Note: young Eucalypts, flaxes and rushes. This stretch of the lower Heathcote River was located upstream of the saltmarsh zone. In the 1920's riparian habitats here appeared to retain some of the original vegetation cover – described as "*rushes, flax, toe toe*" in the Black Maps.

Figure 21. 2003 photograph of approximately the same view of the Lower Heathcote at Kennaway Farm as shown in figure 20
(photo A. Crossland)

Note: The stand of Eucalypts (now close to 100 years old) still stands and in fact serves as an important night roost for cormorants (1). Several original marsh ribbonwoods (2) are still found on the riverbank, while much of surrounding riparian zone has now been successfully replanted with natives and a walking track has been built along the old tow path.

Figure 22. May 1946 aerial photograph of Lower Heathcote River (NZ Aerial Mapping)

Note: Erosion and/or sea rush dieback in and around the edges of Devil's Elbow (1) Heathcote Loop (2), and Stilt Island (3) saltmarshes is clearly evident in this 1946 photograph. Note the disappearance of vegetation on the downstream sides of Ferry Road and Devil's Elbow saltmarshes, and on the upstream sides of Heathcote Loop saltmarsh – these are all areas where substantial volumes of drift wood tend to strand and the effects of smothering as well as possibly siltation may be causative factors. Increased siltation is evident with a build up of mudflats on each bend of the river and the total absence of *Gracilaria* or eel grass beds.

The beginnings of internal dieback of sea rush is evident in Devil's Elbow (4) and Stilt Island saltmarshes. The racecourse embankment in Heathcote Loop Saltmarsh has eroded at the eastern (5) and western ends (6) with tidal penetration now occurring. Tidal creeks have expanded in Heathcote Loop Saltmarsh (c.f. with figs. 7, 13 & 16) and new drainage patterns are emerging – suggesting that the volume of water entering and leaving the saltmarsh with each tide has increased compared to the previous 100 years.

A landfill (7) can be seen marching across the southern end of Ferrymead Esplanade Saltmarsh, while another has covered the western third of Ferry Road Saltmarsh (8).

The full extent of the pond (9) at the eastern end of the paddocks now occupied by the Settlers Crescent Industrial Estate (still largely saltmeadow in this photo) is very evident. Shallow drainage ditches (10) run east-west across these paddocks, indicating that the area (almost certainly still salt meadow) was very damp. A faint oval-shaped depression in the paddocks indicates the former line of the northern race track circuit (11).

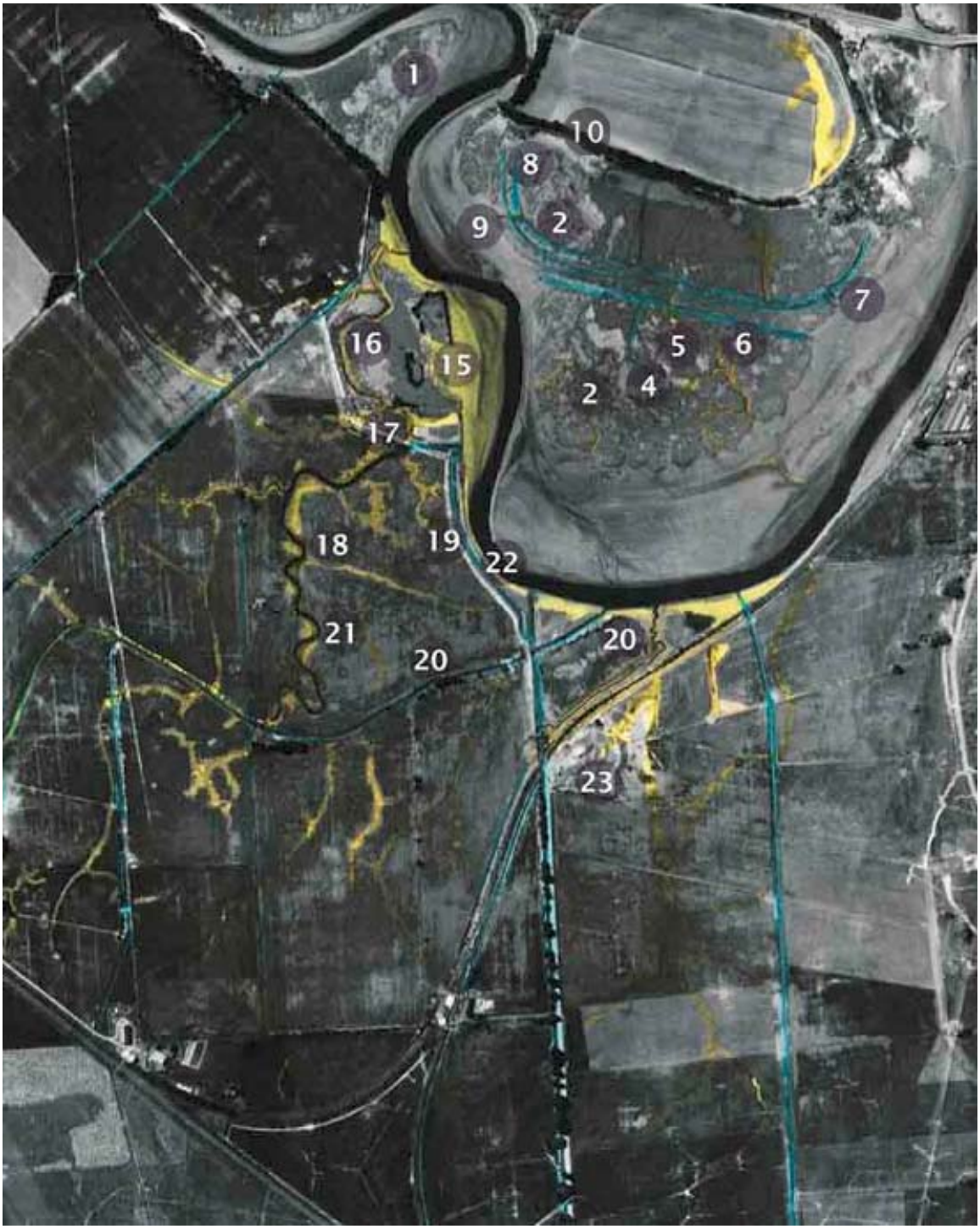
Recent stopbanking works are evident on the true right bank of the Heathcote River, above Devil's Elbow (12). The stopbanks enclose an extensive area of saltmarsh, which appears to be partially flooded in the photo (13). Downstream, smaller scale earthworks are evident on the southern side of Stilt Island saltmarsh (14) and a diversion ditch has been dug (15) linking the original channel of Avoca Valley Stream to a human-created channel at Ferrymead (see fig. 23). From the photograph, it is not clear whether Avoca Valley Stream is still tidal or not. Several former tributary tidal channels are still evident but the link to the Heathcote River is now greatly attenuated and the paddocks on either side (16) appear to be either under cultivation or grazing. Other changes in the vicinity of the former Avoca Valley Stream mouth include the appearance of a new excavated pond (17) near the mouth of a former tidal channel (see fig. 23) and the disappearance of the Eucalypts shown in fig 17.).

The 1946 aerial photo shows that a complex drainage system (18) occupies most of the paddocks now known as the "Port Company Land" and this appears far more extensive than was the case in 1926. Tiny white dots on the paddock to the east appear to be sheep and the tidal channels (19) appear to be very faint, perhaps indicating damp depressions rather than the continued existence of channels which regularly convey water.

Figure 23. May 1946 aerial photograph of Heathcote Valley (NZ Aerial Mapping)

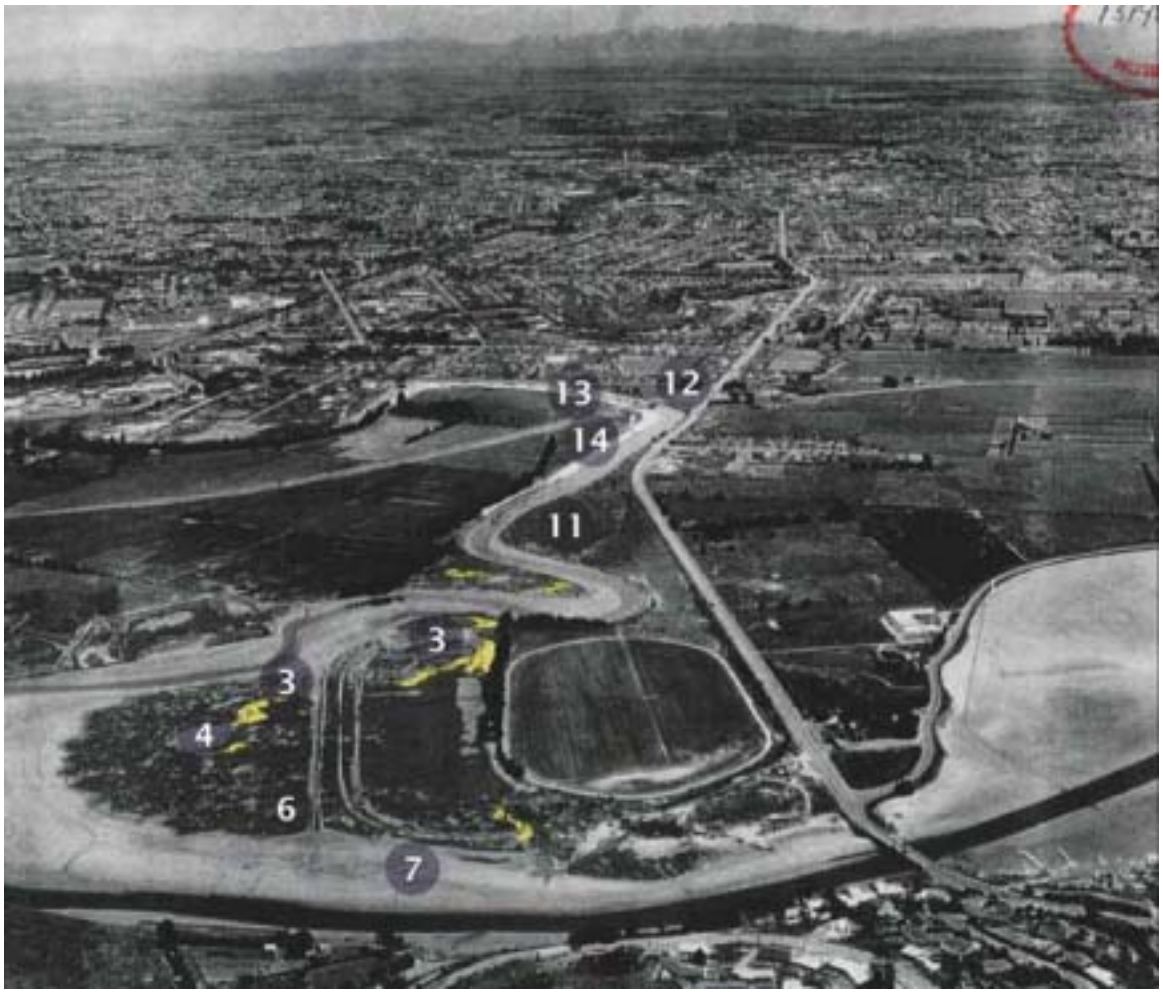
Note: A diversion ditch (1) links the old mouth of Avoca Valley Stream with a new mouth (2) in Ferrymead Saltmarsh. Tidal creek inlets (3) are evident on the landward side of the railway embankment, while depressions and swales marking many former channels are visible all over the lower Heathcote Valley floor.

Figure 24. October 1965 aerial photograph (NZ Aerial Mapping)



Note: Fig 24 & 25 share numbers.

Figure 25. c.1965 oblique aerial photograph (V.C. Browne & Son/CML)



Note: The 1965 series of photographs reveal extensive dieback of sea rush at Devil's Elbow (1) and Heathcote Loop (2) saltmarshes. Shoreline retreat is also evident at these sites as well as at Ferry Road saltmarsh. The accumulation of driftwood is obvious (3 - coloured yellow). This smothers vegetation and may be the possible origin of the bare patch (4) in Heathcote Loop Saltmarsh - although an extremely straight tidal creek (5) draining this patch looks suspiciously artificial and may indicate the work of people rather than natural processes. Erosion of the old racecourse embankment (6) and along the tracks (7) is evident, as is and thinning of sea rush in the north-west corner of Heathcote Loop Saltmarsh (8). A tidal creek (9) now drains the open area on the northern side (10), but the dimensions of this area are still roughly the same as they had been in 1946, if anything perhaps smaller.

Upstream along the Heathcote River, reclamation of Ferry Road Saltmarsh (11) does not appear to have advanced any further since 1946. Erosion and/or dieback has not significantly progressed here either. The Heathcote Valley Motorway (Tunnel Road) is now in place (12), dividing remnant saltmarshes into two blocks (13,14) either side of the road.

Erosion/dieback of sea rush at Stilt Island Saltmarsh is evident on the eastern side (15), but the inner areas (16) seem little changed since the 1946 aerial photo. A new stopbank (17) has been built, apparently isolating the original Avoca Valley Stream (18) from Stilt Island Saltmarsh and the diversion ditch (19) which carried water from these areas to the new Avoca Valley Stream mouth (20). The low-lying paddock (21) around the disconnected section of Avoca Valley Stream (18) appears very wet and may have been in the process of reverting back to saltmeadow and marsh. Avoca Valley Stream itself seems to have held a good flow of water, notwithstanding the partial diversion through an artificial channel to the new outlet (20).

In the Ferrymead area, the outer bank of the diversion ditch (19) has eroded part way along and empties into the Heathcote River (22). The new outlet cut for Avoca Valley Stream (20) takes a direct route straight through the Ferrymead Saltmarsh. Part of the southern side of the saltmarsh, adjacent to the railway crossing on Truscotts Road, is now partly covered by a landfill (23). Elsewhere in the Lower Heathcote valley, old tidal channels are still evident in the landscape and an intricate pattern of shallow drainage ditches continue to carry off water from farmland.

3.3 Changes: 1970's – mid 1980's

A third phase of wetland habitat loss occurred during the period 1970's to 1980's. Figure 26 illustrates the considerable shrinkage in wetland extent that occurred in the Lower Heathcote floodplain over this period. Erosion and/or sea rush dieback continued in the Devil's Elbow, Stilt Island and Heathcote Loop Saltmarshes, and commenced in Ferry Road and Ferrymead Saltmarshes. The Heathcote County Council landfill at Ferrymead closed over this period but a second landfill was opened adjacent to the Heathcote Riverbank between the end of Truscotts road and Stilt Island. This new site covered the lower section of the original Avoca Valley Stream as well as adjacent old tidal channels and associated saltmeadow wetlands. The section of Avoca Valley stream immediately upstream from here disappeared too, replaced by a canalised drain which cut a straight line from Tunnel Road toward Ferrymead Saltmarsh.

The new landfill was not without controversy and the issue went to the Town and Country Planning Appeal Board for a five day hearing in May 1976. The Board dismissed objections and allowed the landfill to proceed with minimal restrictions. In giving its decision the Board made the following observations (p.3621): "*The tip area is....within a flood plain area and the Christchurch Drainage Board has a datum level which it considers to be a minimum fill level for this area. The proposed tip will exceed this level and when covered and grassed will in the view of the Board enhance considerably the environmental acceptance thereof. When filled and grassed the area will be handed back to the Ferrymead Trust.....and will be available for enjoyment by the citizens of the greater Christchurch area. The presence of the tip for a period of five years (if properly policed) is in the view of this Board a small price to pay for the recreational potential of this area.....The Board does not accept that the proposed tip site is any part of the Heathcote River nor is it part of the coastal environment. It is protected from the river by stop-banks and is grassed and used for grazing by animals.....The filling and ultimate use thereof would in the view*

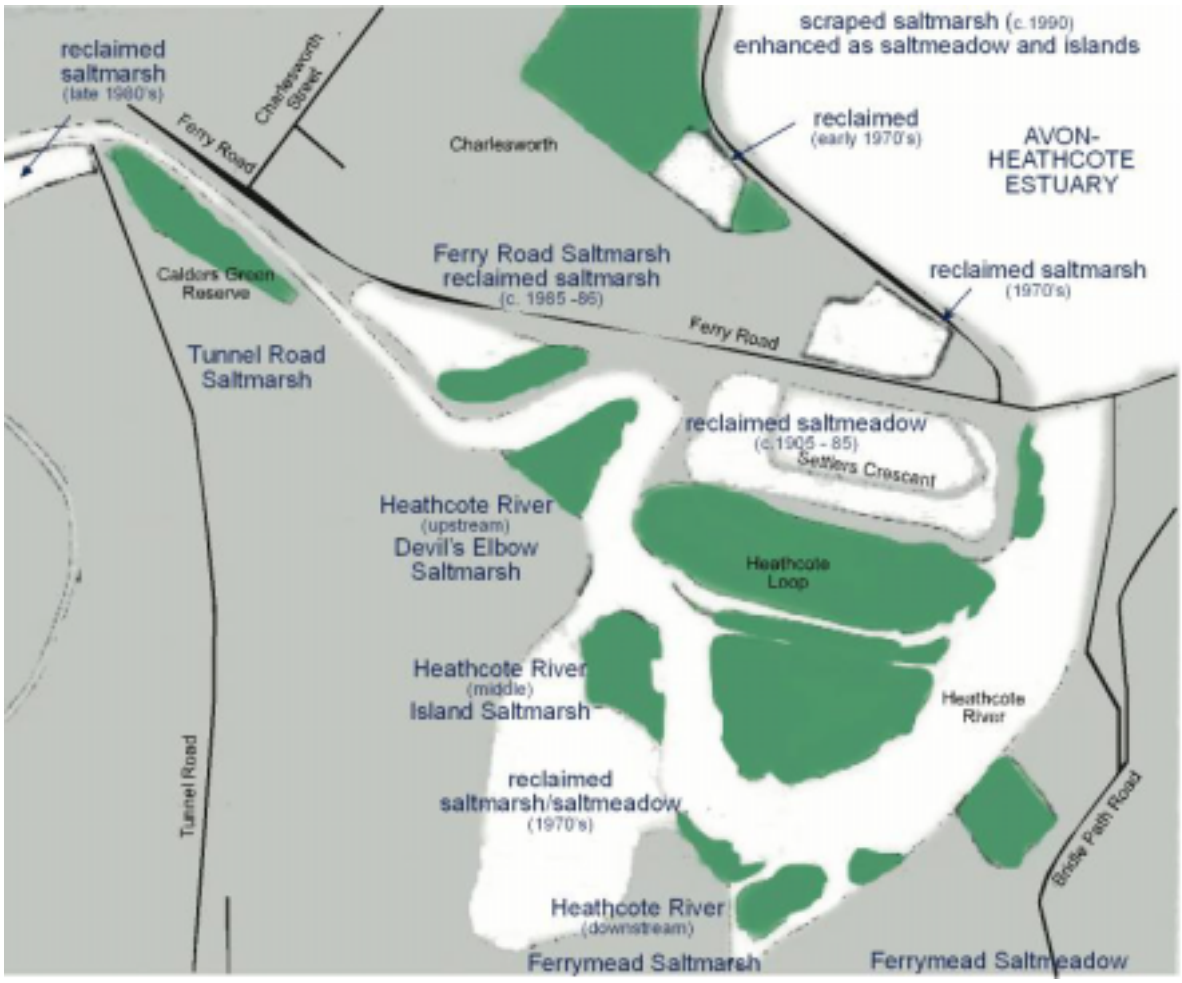
of the Board be desirable. The escape of any matter from the tip on to the true margin of the river is, however, a completely different matter and the Board has suggested conditions.....to prevent any detrimental effect upon the estuary"

The conditions referred to included controls on the emanation of litter and debris; the containment of leachates; and the control of vermin. Unfortunately in practice the Heathcote County Council failed to follow these conditions with sufficient diligence and "matter" did escape from the tip. A large quantity of plastic and paper blew from the landfill and found its way into adjacent saltmarshes - where much of it still remains, smothering estuarine life and taking decades to break down. Leachate enters the Heathcote River from the side of the landfill and vermin, particularly Norway Rats, abounded in and around the tip, becoming serious predators of wetland birds and their young. Black-backed Gull numbers also exploded with a nesting colony becoming established around the edges of the landfill. These gulls exacted a heavy toll on the eggs and chicks of Pied Stilts and waterfowl.

Further inland, farming intensity in the Heathcote Valley appears to have varied at different times over the last 150 years, involving periods of intense activity (indicated by new paddock layouts; intensive cropping, new drainage systems, etc.) and periods when the area almost went into neglect (indicated by deterioration of drainage networks, the proliferation of gorse and rank grass, absence of cattle and sheep, etc. The period, 1970's – 1980's can be considered a period of neglect when "farming" activity was limited largely to horse grazing.

The construction of Ferrymead Historical Park and the development of two Heathcote County Council landfills beside the Heathcote River absorbed sizeable blocks of land and divided the Lower Heathcote Valley into two parts - east and west of Truscotts Road. The lower original section of Avoca Valley Stream and several old tidal creeks disappeared forever as part of these developments.

Figure 26. Loss of Lower Heathcote wetland habitats: 1970's – 1980's



Duck shooting on Lyttelton Harbour Board land between Tunnel Road and the Heathcote River took place until approximately the late 1970's. According to the Royal Forest and Bird Protection Society (*letter to Lyttelton Harbour Board, dated 4/3/1976*), 12-20 shooters hunted over this area each season, targeting ducks (mainly Mallards) flying inland to feed on malt and barley dumped in paddocks near Tunnel Road. The Tunnel Road lights apparently silhouetted the incoming ducks making them easy targets for hunters. Other species (notably Pukeko on the paddocks and other wetland birds in the Heathcote Loop) were disturbed by gunshots and were probably also hit on occasion.

Figure 27. October 1973 aerial photograph (Dept. Survey & Land Information)

Note: This 1973 photograph appears to show a slight recovery in sea rush cover at Ferry Road, Devil's Elbow and Heathcote Loop saltmarshes, although slight erosion and/or dieback is evident around the edges of the latter two. The landfill (1) on the southern part of Ferrymead Esplanade Saltmarsh has ceased operation and only 2 small remnant patches of sea rush remain (2).

Stopbanking (dumped by drag lines) has taken place along the true left Heathcote Riverbank (3), partly in-filling and isolating Ferry Road Saltmarsh. An outlet ditch (4) has been dug on the north-eastern side of this saltmarsh and the block of land adjacent (5) appears to have been recently filled. The wetlands on the true right of the Heathcote River, either side of Tunnel Road (6,7) seem largely unchanged since

1965. The stopbanks here (built up with toxic dredgings from the riverbed) are still devoid of vegetation, approximately 30 years after creation.

In the Stilt Island area, the only apparent changes are the removal of vegetation (probably gorse or small pines) from the two islands (8) and minimal erosion along the eastern edge of the saltmarsh and of the diversion ditch bank (9). Slightly inland, a second set of pylons is now in place (10) and the original Avoca Valley Stream and associated tidal creeks are still much in evidence and obviously wet (11). Downstream, the beginnings of the Ferrymead Historical Park and township have appeared (12) and the landfill adjacent to Truscotts Road has expanded (13), burying two small tidal inlets and all wetland habitat on the southern side of the railway line.

3.4 Recent River Changes: mid 1980's onwards

Appendix 1 gives trend counts of wetland birds using mudflat, saltmarsh and riverbank habitats along the lower Heathcote River and Heathcote Loop between 1985 and 2003 (AC pers.obs.). The counts reveal significant changes in bird populations over this time and the partial replacement of one set of dominant species with another. The most notable changes have been large falls in numbers of gulls and Mallard, with smaller declines of Harrier, Pukeko and nesting populations of Pied Stilt, NZ Kingfisher and White-faced Heron. At the same time populations of most waders (except Pied Stilts), cormorants and native waterfowl have increased, while species rarely recorded before (such as Caspian Tern, Godwit, Scaup, Grey Teal, Paradise Shelduck and Royal Spoonbill) are now appearing more often. The avifauna of the Lower Heathcote River is now more species rich than in the mid 1980's but total bird numbers are lower. These trends (both up and down) can probably be attributed to five main causes:

1) the closure of the Heathcote County Council landfill in 1988/1989.

2) the end of malt and barley dumping in paddocks near Tunnel Road.

3) progressive loss of saltmarsh and riparian habitat through the 1980's and 90's.

4) continued improvement in water and sediment quality following the installation of the Woolston Industrial Sewer in 1971, which ended the direct discharge of industrial waste into the Lower Heathcote River.

5) population recoveries/increases in a number of wetland bird species in the Christchurch area leading to larger numbers occurring in habitats along the lower Heathcote River and within the Lower Heathcote Valley floodplain generally.

In the mid 1980's the dominant wetland bird species in the Heathcote Loop and Lower Heathcote River were Black-backed Gulls (up to 1530 recorded, almost all associated with the Heathcote County Council landfill); Mallards (200-400+ loafing by day and moving away at dusk to feed on dumped malt in nearby paddocks); Pied Stilt (up to 60 nesting and roosting at several sites); Red-billed Gulls (usually 30-40 associated with the landfill); White-faced Heron (typically 20-40 roosting and feeding), Pukeko (viz.30 scattered in small groups through the saltmarshes and riverbanks) and NZ Kingfisher (up to 30+ on riverbanks, mudflats and saltmarshes).

In the early 2000's, the dominant bird species are Mallard (up to 80); Grey Teal (up to 120, usually at night), Pied Stilt (up to 60, but usually less than 30); South Island Pied Oystercatcher (up to 40); White-faced Heron (typically 10-30); Bar-tailed Godwit (up to 30); NZ Kingfisher (up to 30); Black-backed Gull (10-30); Red-billed Gull (10-105), New Zealand Scaup (up to 10); Little Cormorant (up to 20); Black Cormorant (up to 10); and Pied Cormorant (up to 5).

The closure of the Heathcote County Council landfill in late 1988-early 1989 sent the gull population crashing: Numbers of Southern Black-backed Gulls fell rapidly, stabilising during the 1990's at about 10-30 birds, with a small residual breeding population of 3-6 pairs. The Red-billed Gull population fell also, but has since picked up as birds have been attracted back by the daily offering of bread and food scraps by shop workers on the riverbank behind Ferry Road.

Sometime around 1988-1989 the dumping of malt and barley on the Tunnel Road paddocks stopped. The malt came from the Canterbury Maltworks located just up the road near the railway tunnel in the Heathcote Valley. It was dumped on paddocks and used for stock feed. For many years large numbers of Mallards had commuted to these "malt paddocks" from loafing areas in the Heathcote Loop and Bromley Oxidation Ponds every night. Dusk counts of 530 Mallards on 23/12/86 and 680 on 13/1/87 were indicative of the numbers involved and testify to the former importance of this dumped malt and barley as a local food source. Once the malt and barley was no longer available, the nightly feast for ducks ceased and loafing flocks no longer had a reason to gather in the Heathcote Loop. Numbers subsequently fell to between 30 and 60 birds, amounting to only 10-20% of the numbers present previously. In recent years however, since the creation of the riverbank walkway between the Heathcote River and shops along Ferry Road, numbers have begun to rise again as a response to people offering food and peak numbers of up to 200 were recorded in the early 1990's, with up to 80 present in more recent times.

Through the late 1980's and 1990's wetland and riparian habitats along the Heathcote River continued to be lost - both through reclamation and through the die back of vegetation in saltmarshes (see 3.2 above). The nesting populations of several species dependent on these habitats (i.e.; Pukeko, Harrier, NZ Kingfisher, Pied Stilt and White-faced Heron) suffered declines, although in the early 2000's, Pukeko numbers have begun to increase again – more so in Heathcote Valley farmland than in the riparian wetlands where they remain very scarce (for example, Pukeko continue to be absent from saltmarshes on the true left bank of the Heathcote, including Heathcote Loop Saltmarsh.)

In contrast to the declines noted above, the gradual improvement in water and sediment quality since the installation of the Woolston Industrial Sewer has seen a steady increase in the numbers of certain typically estuarine birds using the Heathcote Loop and the Lower Heathcote River. Several species have begun to regularly occur that were seldom if ever recorded before, while the populations of a number of formerly uncommon species have increased.

The changes are most obvious at the guild level, particularly amongst waders (polychaete worm and mollusc eaters) and cormorants/shags (piscivores - fish eaters): For example, in the mid 1980's only one species of wader was common (Pied Stilt) with smaller numbers of two others (Spur-winged Plover and South Island Pied Oystercatcher) occasionally visiting the Heathcote Loop. Numbers of all waders combined seldom exceeded 20-60 birds. In the late 1990's – early 2000's, four wader species commonly occur (Pied Stilt, South Island Pied Oystercatcher, Spur-winged Plover and Bar-tailed Godwit) with combined numbers reaching up to 120 birds. Cormorant/Shag numbers have increased in a similar way: In the mid 1980's three species (Black Cormorant, Little Cormorant, and Spotted Shag) occurred in very small numbers (usually <5 in total for all three species). Now in the late 1990's – early 2000's four species occur (the three above plus Pied Cormorant, which has become the commonest species) and total numbers range between 8 and 30 birds. This large increase in cormorant/shag numbers almost certainly indicates an increase in fish abundance in the Lower Heathcote.

The most recent development has been the return of native waterfowl to the Lower Heathcote River. Paradise Shelduck numbers have increased slowly over recent years, while New Zealand Scaup began to appear in 1999 after this species had recolonised upstream parts of the river. However, the most remarkable return has been that of Grey Teal. Not recorded in daylight on the Lower Heathcote River until 2 March 2003, when a flock of 116 were observed feeding over Gracilaria beds opposite Ferrymead, this species was first discovered as a night visitor (up to 50) in the Heathcote Loop in 1993. Flocks of this species have remained over March 2003 and if they become regular day time visitors to the Lower Heathcote River (as they did to McCormacks Bay and the Lower Avon in the 1990's), they will greatly boost total bird numbers using the river and adjacent wetlands.

Table 2. Changes in wetland bird species using Lower Heathcote River tidal habitats 1850-2003

(1850 list based on historical accounts and educated guess work; 1985 & 1998 data based on field observations by A. Crossland)

1850	1985	2003
abundant species		
Grey Duck	Mallard/Hybrid	
Brown Teal	Black-backed Gull	
NZ Shoveler		
Marsh Crake		
Pukeko		
South Island Pied Oystercatcher		
Bar-tailed Godwit		
White-fronted Tern		
NZ Kingfisher		
Fernbird		
common species		
Black Cormorant	White-faced Heron	White-faced Heron
Pied Cormorant	Pukeko	Mallard/Hybrid
Little Cormorant	Pied Stilt	SI Pied Oystercatcher
Australasian Bittern	Red-billed Gull	Pied Stilt
Harrier	NZ Kingfisher	Black-backed Gull
Banded Rail		Red-billed Gull
Pied Stilt		NZ Kingfisher
Black Stilt		Grey Teal (usually night only)
Black-backed Gull		Pied Cormorant
less common species		
Spotted Shag	Black Cormorant	Black Cormorant
Reef Heron	Little Cormorant	Little Cormorant
Paradise Shelduck	Spotted Shag	Welcome Swallow
NZ Scaup	Australasian Bittern	Spotted Shag
NZ Falcon	Feral Goose	White Heron
Buff Weka	Paradise Shelduck	Australasian Bittern
Variable Oystercatcher	Grey Duck	Royal Spoonbill
NZ Dotterel	Harrier	Paradise Shelduck
Banded Dotterel	Spur-winged Plover	Grey Duck
Red-necked Avocet	Welcome Swallow	NZ Shoveler
Lesser Knot		NZ Scaup
other migrant waders		Harrier
Black-billed Gull		Pukeko
Caspian Tern		Variable Oystercatcher
Black-fronted Tern		Spur-winged Plover
Fairy Tern		Bar-tailed Godwit
		Black-billed Gull
		Caspian Tern
		White-fronted Tern

Figure 28. Gulls and Mallards congregate opposite Devil's Elbow at a spot where they are fed each day by workers and passers-by. (A Crossland)

Figure 29. November 1994 aerial photograph (NZ Aerial Mapping)

Compare with figs. 13, 16, 22, 24 & 27. Note: Erosion in all saltmarshes has advanced with the most rapid losses being along the northern margin of Heathcote Loop Saltmarsh where vegetation in the northeast corner has disappeared (1). The pond and saltmeadow in the Settlers Crescent area have now disappeared and are replaced by an industrial subdivision (2). Both Heathcote County Council landfills are now retired and grassed over (3,4). Almost all trace of the original course of Avoca Valley Stream and associated tidal creeks in this area have been lost. A few remnant channels, now largely ephemeral, remain (5). The course of Avoca valley Stream below Tunnel Road has been realigned and now flows in a more or less canalised straight line (6) from west to east. Ferrymead Historic Park occupies a sizeable block along Truscotts Road (7) and is still expanding with several areas of earthworks and construction being obvious. Urban development has occurred between Tunnel Road and the Christchurch-Lyttelton Railway line (8) but has not encroached into low-lying areas further down the valley.

Reclamation of Ferry Road Saltmarsh (9) has continued but has almost reached the line at which it ceased in 1995/96. No changes have occurred in Tunnel Road (10), but the saltmarsh remnant on the upstream side of the bridge has been lost to reclamation (just outside of the photograph). Riparian enhancement plantings along both banks of the lower Heathcote River are now apparent (11).

Figure 30. 2001 aerial photograph (Geodata Services)

Note: Continued sea rush dieback in Heathcote Loop Saltmarsh, particularly along the northern edge (1), on the western side (2) and the substantial increase of bare batches in the central area (3). Sea rush dieback is also evident at Devil's Elbow Saltmarsh (4) where vegetation cover on the downstream side has become increasingly sparse.

While Tunnel Road Saltmarsh (5) and Ferrymead Saltmarsh (6) remain relatively intact, Ferrymead Esplanade Saltmarsh is fragmented into two parts (7,8) and threatened by proposed widening of Ferrymead Bridge; Ferrymead Saltmeadow (9) is likely to be partially excavated to accommodate the proposed Tamaki Maori Village development; and Ferry Road Saltmarsh (10) has decreased through reclamation to less than 1/10th its 1926 size. The latter habitat is also now undergoing significant sea rush dieback as ponding tidal water has drowned rushes growing in the lowest-lying part of the remaining basin (11).

The 2001 aerial photo reveals progress to date with CCC enhancement work along the Lower Heathcote River – note the now well-developed coastal bush revegetation programme along both riverbanks (12, 13) immediately downstream of Tunnel Road Bridge. Note also, the healthy state of coastal bush revegetation at Ferrymead Esplanade Reserve (14) (site of an old bottle dump). These patches of coastal bush have greatly approved the aesthetics of the Lower Heathcote River, as well as provided a screen for the river and potential feeding/nesting opportunities for native birds such as Kingfisher, Fantail, Grey Warbler, Silvereye, Shining Cuckoo, Bellbird and Pukeko.

Three small-scale wetland restoration projects have been implemented by CCC and Friends of the Estuary - all are visible on the aerial photo. The riverbank at Ferry Road Saltmarsh (bare for decades after toxic mud was dumped there from river dredging) has been planted with salt-tolerant plants which are slowly spreading. Cuttings (10) made through the bank now link the remaining patch of saltmarsh to the main flow of the river. The rehabilitation of this site has been slow, but a natural vegetation cover (and birdlife) is slowly returning. More rapid progress is evident in the small riparian marsh (15) created in the mid 1990's near the bird hide, opposite the Devil's Elbow. Plantings here have grown vigorously and are beginning to spread to adjacent areas, including a third restoration site (16) – a patch of recovering *Sarcornia*-dominated saltmeadow (freed from a smothering of driftwood) immediately east of the bird hide. No wetland restoration work has yet been undertaken on the true right bank of the Heathcote, although tremendous potential exists for large-scale habitat development there.

3.5 Recent Valley Changes: mid 1980's onwards

Presently the birdlife occurring within the lower Heathcote Valley is impoverished and it has been this way for well over 100 years. There are few native species (either wetland or dryland) on the paddocks or waterways and those which do occur have low populations with most declining. Numbers of Pukeko, a species once synonymous with the Heathcote Valley, have declined greatly in the last few decades

and its long-term status in the valley is tenuous. Concern was first expressed about a decline in numbers during the 1960's (W. Harris, The Star 20/4/94). For some years a "Pukeko Protection Committee" was in existence and its members made regular surveys of Pukeko numbers in the Heathcote Valley area. I have not been able to track these surveys down but my own data shows a decline through the 1980's and 90's.

In the mid 1980's Pukeko numbers in the Heathcote Valley, including the river wetlands, probably exceeded 100 birds. A survey of the valley only on 29/6/90 found a total of only 54 Pukeko. Subsequent survey results were 48 on 7/7/92; 24 on 17/6/95; 19 on 2/4/98; and 20 on 15/5/98. By 1998, the birds had almost completely disappeared from the river saltmarshes now (except near Tunnel Road) and persisted in small groups on Heathcote Valley paddocks and along Avoca Valley Stream. A population recovery was detected in 2000 with a census total of 56 counted on 20/8/00 (Ferrymead paddocks = 25, Heathcote Valley paddocks = 10, Mary Duncan Pond area = 11, Tunnel Road Saltmarsh = 4, Kennaway Farm area = 6, with none in the saltmarshes near the Heathcote River mouth). If Pukeko and other wetland birds are to be maintained as resident birds in the valley, good quality wetland and wet grassland habitat needs to be maintained for them. Paradise Shelduck numbers have been declining also: In the 1980's up to 40 regularly occurred on the Heathcote Valley paddocks. A survey on 29/6/90 found a total of 13. Subsequent surveys found 8 on 7/7/92; 10 on 17/6/95; 6 on 1/5/98 and 6 on 15/5/98. Numbers have increased across Christchurch in the early 2000's and it is expected that a planned census in May/June 2003 will show higher numbers than found in the late 1990's.

Spur-winged Plovers appear to have slightly increased with totals of 6 on 29/6/90; 4 on 23/9/91; 16 on 7/7/92 and 12 on 15/5/98. This species is a relatively recent colonist from Australia, specifically adapted to short grasslands, and can be expected to increase for some time as its regional and national populations continue to grow. A flock of 21 birds in the Heathcote Loop at high tide on 20/1/03 was a good indication of increasing numbers.

As outlined in section 3.4, the end of malt and barley dumping in Lower Heathcote Valley paddocks saw a major drop off in duck numbers. Up to 680 Mallard had been recorded feeding over malt and barley, and this number dropped to <30 Mallard in the valley once the food bonanza ceased. Numbers are now on the rise again with concentrations occurring on ponds at Mary Duncan Park and Ferrymead Heritage Park "township". Occasionally NZ Shoveler and NZ Scaup also occur.

Figure 31. April 1988 panoramic view of Heathcote Valley (A. Crossland)

Figure 32. May 1998 panoramic view of Heathcote Valley (A. Crossland)

Figure 33. Feb 2003 panoramic view of Heathcote Valley (A Crossland)

Figures 31, 32 & 33 reveal landscape/habitat changes in the Heathcote Valley between 1988 and 2003. While little habitat loss occurred between 1988 and 1998, the pace of change is now accelerating with renewed housing development around the edges of Heathcote Valley township and plans for considerable recreational and environmental development in the lower valley.

The Heathcote County Council tip (1) was still open in the 1988 photo but has now been closed for some time and is grassed over with a few cabbage trees and flaxes surviving from an unsuccessful 1990 planting project (2). A proposal to develop a golf course on the old land fill is currently before the Christchurch City Council.

Surface water ponds in the lower Truscotts Road paddocks (3) are evident in the 1988 photograph. These paddocks act as a ponding area during winter or after heavy rain at other times of the year. The obvious potential for these paddocks to be developed into a stormwater retention basin system has been recognised and is proposed as part of this report. The 2003 aerial photograph indicates increasing development in the Truscotts Road Paddocks, including a new road (Ferrymead Park Drive) (4) curving across the northern margin and a housing subdivision (5) at the early construction stage on the southern margin. Saltmeadow habitat still survives in depressions along Avoca Valley Stream (6) and at Ferrymead Saltmeadow (7).

Table 3. Changes in wetland bird species using Heathcote Valley freshwater habitats and grassland: 1850-2003

1850	1985	2003
abundant species		
Bittern	Mallard/Hybrid	
Grey Duck		
Brown Teal		
NZ Shoveler		
NZ Scaup		
Buff Weka		
Marsh Crake		
Pukeko		
NZ Kingfisher		
Fernbird		
common species		
Black Cormorant	Paradise Shelduck	Mallard/Hybrid
Little Cormorant	Pukeko	Pukeko
Paradise Shelduck	Spur-winged Plover	Spur-winged Plover
Harrier	Black-backed Gull	NZ Kingfisher
Black Stilt	NZ Kingfisher	Welcome Swallow
Pied Stilt	Welcome Swallow	
less common species		
Pied Cormorant	Black Cormorant	Black Cormorant
White Heron	Little Cormorant	Little Cormorant
NZ Falcon	White-faced Heron	White-faced Heron
Banded Rail	Feral Goose	Royal Spoonbill
Spotless Crake	Grey Duck	Feral Goose
Black-backed Gull	NZ Shoveler	Paradise Shelduck
Black-billed Gull	Harrier	Grey Duck
Black-fronted Tern	Pied Stilt	Harrier
Southern Crested Grebe	Red-billed Gull	Pied Stilt
New Zealand Dabchick	Black-billed Gull	Black-backed Gull

4.0 Current State of Habitat within the Lower Heathcote Valley Floodplain and its ability to sustainably support wetland birdlife

Although the Lower Heathcote Valley Floodplain still contains a reasonable extent of wetland habitat (i.e.; river channel, mudflats, saltmarshes, saltmeadows, wet grassland, ephemeral ponds, ditches and streams), much of this is under-utilised by birdlife, and in comparison with other parts of the Avon-Heathcote Estuary, the area currently supports relatively few species and relatively low bird densities.

4.1 River channels and mudflats

River channels and mudflats seem to be recovering from decades of pollution and a more diverse bird assemblage has begun to utilise them (refer to Appendix 1 for bird census data gathered between 1985 and 2003). An increase in piscivores (fish eaters) such as cormorants and terns probably indicates a real increase in fish abundance in the river (especially key prey species such as eels, yellow-eyed mullet and flounder sp.).

Birds which take food from mudflats such as waders, herons and Grey Teal have also increased, probably indicating an increased abundance of marine organisms living within mud and in *Gracilaria* beds. It is assumed that the construction of the Woolston Industrial Sewer in 1971 and closure of the Gas Works in 1982, (events which ended the discharge of industrial pollution into the Heathcote River), were the trigger events for a recovery. Large pockets of anaerobic mud have disappeared and the mudflats have now become much firmer. The extent of mudflat area has also increased, largely due to vegetation dieback in saltmarshes (see 4.2).

4.2 Saltmarshes

The habitat values of saltmarshes are currently undermined by the combination of patch fragmentation, dieback of vegetation (particularly sea rush), “drowning” under spring tides, and smothering by driftwood. The historical survey of habitat changes given in section 3.0 shows that habitat patch fragmentation has occurred incrementally over 150+ years as saltmarshes were drained and infilled for land reclamation or rubbish dumping.
This has continued into the present day with the last 10% of Ferry Road Saltmarsh narrowly saved from reclamation in the late 1990’s (see figs. 34 - 43) and destruction of part of Ferrymead Esplanade Saltmarsh currently proposed as part of the planned widening of Ferrymead Bridge.

Figures 34 - 42
Progressive infilling of Ferry Road Saltmarsh c. 1988 to 2003
(Photos: A. Crossland)

Figure 43. Revegetation of riverbank at Ferrymead Saltmarsh

In the mid 1990's cuttings were made into the riverbank to facilitate the recolonisation of saltmarsh plants. The photograph shows *Sarcocornia* recolonising a scraped hollow.

The second major threat to saltmarshes is vegetation dieback. Sea rush communities in Ferry Road, Devil's Elbow, Stilt Island, Heathcote Loop and Ferrymead Esplanade saltmarshes are all disappearing. This die back is evident in aerial photos and its recent acceleration at Heathcote Loop Saltmarsh is shown in a series of oblique elevated photographs in figs 44- 47. Causes are poorly understood and an urgent investigation is required to assess if the process can be halted and/or reversed.

Figure 44 April 1988 view of Heathcote Loop (A. Crossland)

Figure 45. April 1998 view of Heathcote Loop (A. Crossland)

Figure 46. Winter 2001 view of Heathcote Loop in moderate flood (A. Crossland)

Figure 47. February 2003 view of Heathcote Loop (A. Crossland)

Note: This series of photos shows progressive erosion and vegetation loss around the river-side edges of Heathcote Loop Saltmarsh (1), and through the bare area on the northern side (2). A process of conversion from saltmarsh to mudflat appears to be occurring. On spring tides (3-4 days/month) and during high river flows, much of the saltmarsh habitat within the lower Heathcote River is fully or partially inundated with tidal water.

A third major threat - the "drowning" of saltmarshes which are not protected by bank works - is possibly related to vegetation dieback. Close examination of 19th and early 20th Century paintings and photographs indicate that most saltmarshes were then once drier – i.e.; located on parts of the shoreline that were apparently less frequently inundated and/or less deeply flooded than currently. The saltmarshes appear to be sinking – in other words they are no longer occupying an ideal position on the shoreline with an ideal level of tidal inundation. They are now occupying a position which is essentially river bottom and mudflat. Consequently, tidal flooding is frequent and relatively deep. Because of this, most saltmarshes within the Lower Heathcote are no longer suitable as nesting sites for wetland birds – nests are simply flooded by spring tides and in flooding events, such as shown in fig. 46. Hence, species such as Pukeko, Harrier, Bittern, Marsh Crake, and waterfowl no longer nest in the rushes, except at protected sites like Tunnel Road Saltmarsh.

Figure 48. Sea Rush dieback at NW corner of Heathcote Loop Saltmarsh
(A. Crossland)

Note: retreating edge of main marsh (1); pockets of sea rush now isolated from the main marsh (2); eroding root systems (3); new mudflats behind old line of vegetation (4); remnant saltmeadow patch (5).

Figure 49. Driftwood smothering part of Heathcote Loop Saltmarsh (A. Crossland)

A third threat to saltmarsh vegetation is smothering by driftwood. This involves the formation of large accumulations of wood and other debris over top of saltmarsh vegetation and is a particular problem at Devil's Elbow and Heathcote Loop Saltmarshes. Large areas covered by driftwood are clearly evident (coloured yellow) in Figure 25. Much of this accumulated debris was removed by CCC and Friends of the Estuary in the mid 1990's, freeing up some areas of saltmarsh and saltmeadow vegetation. A repeat of this exercise every 3-5 years is recommended.

Figure 50. Area cleared of driftwood accumulation in Heathcote Loop Saltmarsh
(A. Crossland)

Clearance of driftwood, habitat restoration work and the construction wildlife observation hide took place in the NW corner of Heathcote Loop Saltmarsh in the mid 1990's. The cleared areas of saltmarsh, saltmeadow and mudflat are now utilised as a roosting site waders and herons.

4.3 Saltmeadows

For the purposes of this report, "saltmeadow habitats" are defined as patches of low-growing salt-tolerant vegetation, generally dominated by one or more of *Sarcocornia quinqueflora*, *Cotula coronopifolia*, *Mimulus repens*, *Samolus repens*, *Selliera radicans* and *Plantago coronopus*. Saltmeadow remnants are found throughout the study area, including the "islands" at Stilt Island Saltmarsh; adjacent to the bird hide at Heathcote Loop Saltmarsh; at the southern end of Tunnel Road Saltmarsh: on the southern side of Ferrymead Saltmarsh; at Ferrymead Saltmeadow; and in the hollows of old tidal creeks throughout the floodplain. Most of these sites are very small and threatened by unsympathetic landuses, infilling and loss of salinity.

Bird use of these areas is currently low but would potentially be much higher if patch size was increased and if waterbodies such as tidal creeks or ephemeral ponds were located within, or adjacent to saltmeadows. Under such circumstances they would support roosting and nesting waders as well as waterfowl.

Figure 51 Ferrymead Saltmeadow (photo: A. Crossland)

This is the largest saltmeadow remnant within the Lower Heathcote Valley Floodplain. The proposed Tamaki Maori Cultural Village and adjacent waterway will destroy part of this site, although opportunity exists to create replacement saltmeadow habitat further inland in the Truscotts Road paddocks.

4.4 Wet Grasslands

Much of the undeveloped land between Tunnel Road, Bridle Path Road and the Heathcote River comprises lowland wet grassland. The Black maps show that this largely comprised rushes, grass, raupo, flax and toe toe in pre-European times. Some pockets (such as the paddocks alongside Truscotts Road) remain reasonably wet, particularly in winter, but an extensive drainage network throughout the lower Heathcote Valley limits habitat potential. Consequently (as outlined in 3.5), only small numbers of wetland birds occur on the grasslands and compared to other areas such as the Linwood Paddocks, Travis Wetland, Styx Mill Basin, Lower Styx Ponding Area, etc, they are currently under utilised by birdlife.

4.5 Ephemeral ponds

Ephemeral ponding occurs in hollows and along former tidal creek swales. Wetland birds such as Paradise Shelduck, Pukeko, Pied Stilt, Spur-winged Plover and White-faced Heron are attracted to these for feeding and nesting. Habitat values of existing sites are limited by small size and quick evaporation.

4.6 Permanent Ponds

Two small permanent ponds are located within the Ferrymead Heritage Park village. This support up to 50 Mallard, but have low water quality and are of little value to other waterbird species.

Mary Duncan Park Pond, located adjacent to the study area in the middle reaches of Avoca Valley Stream was created as part of a waterway enhancement project by CCC. It supports up to 40 Mallard as well as Pukeko, Welcome Swallow and occasional NZ Shoveler, Scaup, Grey Duck and White-faced Heron. The pond has good riparian cover and an island, but habitat values are limited by small size, steep sides and vulnerability to bank disturbance. The remains of a decapitated Pukeko and several predated ducks found during early 2003 indicates a predation problem, probably from mustelids.

4.7 Ditches, Drains and Streams

Historic and aerial photographs reveal that the Lower Heathcote Valley Floodplain was formerly covered in an intricate network of tidal and freshwater creeks. Most have long since disappeared or have been realigned, and the current landscape is criss-crossed by ditches and drains. Several waterways are tidal in their lower reaches and support low numbers of wetland birds. Avoca Valley Stream is the largest of these and although highly modified, its lower reaches supports a good assemblage of wetland birds including Paradise Shelduck, Mallard, Grey Duck, NZ Shoveler, White-faced Heron, Pukeko, Welcome Swallow and NZ Kingfisher. Ditches further inland support low numbers of Pukeko and ducks where they have riparian cover and reliable base flows.

Figure 52. Tidal swale near Ferrymead Saltmarsh (photo: A. Crossland)

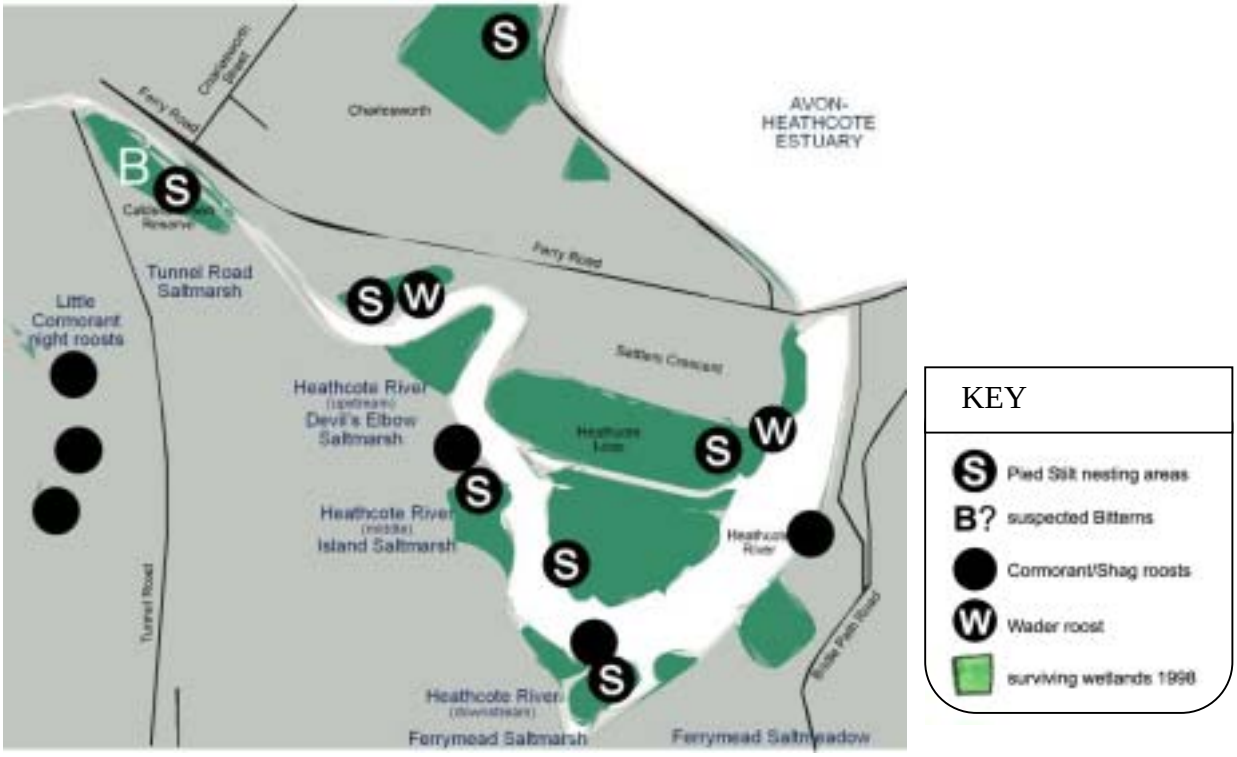
Figure 53. Ephemeral ditch in the Lower Heathcote Valley (R. Barker)

Note: salt-tolerant vegetation along banks and taller grasses, etc along margins. Ditches, drains and streams throughout the Lower Heathcote Valley Floodplain offer habitat for nesting, feeding and roosting Pukeko and waterfowl.

5.0 Current sites of importance to birdlife

Birdlife within the Lower Heathcote Valley Floodplain is mainly focused on the mudflats, saltmarshes and waterway of the lower Heathcote River, as well as scattered across adjacent farmland. Bird distribution varies with the tides: at low tide wetland birds are well dispersed, while at high tide or at night (depending on species) they congregate at a small number of key roosting/rafting sites. These are shown in figure 54.

Figure 54. Key high tide areas for birdlife in the Heathcote Loop and Lower Heathcote River



6.0 Potential Ecological Values

As outlined in section 1.2, the Lower Heathcote Valley Floodplain currently has a lower species richness and lower bird/hectare density than most other parts of the Avon-Heathcote Estuary. However, the study area retains important swampbird habitat and is a core breeding and roosting location for wetland birds. Considerable potential exists to enhance and develop natural habitats within the Lower Heathcote to increase wildlife usage and to enhance ecological values generally. There are few other sites along the Christchurch/Canterbury coastline where such potential exists. The Heathcote is one of only a handful of tidal rivers in the Canterbury Region and one of the few that is not surrounded by constraints to habitat development such as built up areas, roadways or flood protection stopbanks. Because of its close proximity to the Avon-Heathcote Estuary and Bromley Oxidation Ponds (two very rich wetland wildlife areas), and to the Port Hills (source area of bush and grassland birds), any habitat restoration/development is likely to be quickly utilised by a wide range of birds.

6.1 Wetland restoration and creation

Given that much of the Lower Heathcote Valley Floodplain was originally covered in wetland of one type or another, the restoration of existing wetland habitat patches or the creation of new wetland habitat is appropriate. The consequences for wildlife and ecology would be very positive: An expansion of freshwater and tidal wetland habitats will promote greater biodiversity and contribute toward the long-term sustainability of plant, bird and animal communities. Indeed, provision of new wetlands is likely to compensate for the progressive loss of existing saltmarshes due to dieback of vegetation. Away from the immediate environs of the Heathcote River, enhancement of tributary waterways and saltmeadows, as well as creation of freshwater and brackish ponds can be expected to attract and support a wide range of wetland birds.

Figure 55. Salt-tolerant vegetation will recolonise suitable sites by itself

Salt-tolerant vegetation such as the *Sarcocornia* shown here recolonising the edge of a tidal waterway at Bexley Wetland, will colonise new sites by itself once environmental conditions (such as inflow of tidal water or concentrations of salts in soils). Weed problems and large-scale revegetation plantings are not generally required with saltmarsh and saltmeadow re-establishment.

6.2 Safeguarding and improving roosting sites

High tide and night roosting sites around the periphery of the Avon-Heathcote Estuary are limited to a few areas which are prone to increasing disturbance as human recreational and other activity increases. The most secure sites are located in the lower rivers (Heathcote & Avon) and on islands in McCormacks Bay and the Bromley Oxidation Ponds. Safeguarding and improving roosting sites within the Lower Heathcote Valley Floodplain is crucial to the long-term sustainability of bird populations using the lower river and south-western parts of the estuary.

6.3 Safeguarding and improving breeding areas

Over recent decades, breeding populations of most wetland bird species within the Lower Heathcote have declined. Most notable have been reductions in numbers of breeding Pied Stilt, Pukeko and Black-backed Gull. Habitat restoration/creation, predator control and careful mitigation of disturbance effects is likely o reverse this trend and is also likely to attract new species as breeders in the area.

6.4 Coastal bush development

Enormous potential exists to link the Estuary fringes and the Bromley Oxidation Ponds with the Port Hills via establishment of coastal bush patches or corridors within the Lower Heathcote Valley Floodplain. Plantings of coastal bush are already well–established along parts of both Heathcote riverbanks and in small patches on St Andrews Hill, near the Road Tunnel entrance and in private gardens in Heathcote Valley. Coastal bush development will increase numbers of native bush birds, particularly Silvereye, Fantail, Grey Warbler, Shining Cuckoo and Bellbird.

6.5 Target bird species

a) Waders

Pied Stilt – Breed from Sept to Dec at three sites (Stilt Island Saltmarsh, Ferrymead Saltmarsh and Tunnel Road Saltmarsh). Recommended aim to restore these colonies and encourage establishment of two new colonies at safe locations. Protect roosting sites near Bird Hide at Heathcote Loop Saltmarsh, and a Ferry Road Saltmarsh. Encourage new roosting sites.

South Island Pied Oystercatcher & Bar-tailed Godwit - Protect roosting sites near Bird Hide at Heathcote Loop Saltmarsh. Encourage new roosting sites.

Spur-winged Plover – Breed from August to Dec at scattered locations. Encourage breeding on grassland and adjacent to waterways and wetlands. Protect roosting sites near Bird Hide at Heathcote Loop Saltmarsh and at Ferry Road Saltmarsh.

b) Waterfowl

Native waterfowl – The Lower Heathcote Valley Floodplain has potential as a core breeding ground for five species of native duck - Paradise Shelduck, Grey Duck, Grey Teal, New Zealand Shoveler and New Zealand Scaup. Recommended aim to develop and manage habitat to facilitate an increase in breeding populations of these species.

c) Swampbirds

Australasian Bittern – This globally endangered species is known to occur in Tunnel Road Saltmarsh. It was once a common resident of Heathcote Valley wetlands but is now locally very rare. Recommended aim to restore habitat to attract Bittern back as a winter visitor (this has happened at Travis wetland) and possibly to recolonise as a breeder.

Marsh Crake – Another formerly common species, now absent. Wetland restoration for Bittern and waterfowl may attract this species. Predator control is required to limit predation by rats, mustelids and feral cats.

Pukeko - Breed from August to March. Once a characteristic bird of the Lower Heathcote Valley, this species is no longer common locally and has disappeared from the true left bank of the Heathcote. Recommended aim to increase Pukeko numbers by wetland and wet grassland restoration.

d) Herons

White-faced Heron – Breed from September to December in trees. The Lower Heathcote is a core breeding/roosting/feeding area for them. Recommended aim to retain and protect suitable nesting trees and to facilitate an increase in the local breeding population of this species by creating wetland and wet grassland habitats.

e) Cormorants

Three species, Black Cormorant, Pied Cormorant and Little Cormorant commonly roost and feed in the lower Heathcote. Important roost (and potential future nesting) sites exist in Eucalypts and pines at Kennaway Farm (mainly Little Cormorant) and in pines between Stilt Island and Devil's Elbow Saltmarshes (mainly Black Cormorant). Recommended aim to protect these sites from tree-felling, disturbance and predation.

f) Kingfishers

New Zealand Kingfisher – Breed from September to January in holes in trees and banks. An important local breeding population is centered on the Lower Heathcote River. Recommended aim to develop and manage habitat to facilitate an increase in the breeding population of this species.

7.0 Mitigation of Disturbance and Edge Effects

Because most wetland birds occurring along the Lower Heathcote River, in tributary waterways, on ponds and on grassland habitats are ground-dwelling birds (i.e.; they nest, feed, roost on the ground), they are vulnerable to disturbance and predation. Effective mitigation measures are essential to ensure that bird populations are sustained long-term and that the ecological values of the area (already reduced due to historical habitat loss and pollution) do not suffer further in the face of urban development. Several mitigation options are discussed below:

7.1 Buffer zones

Buffer zones between ecologically sensitive areas and new developments are recommended along the Heathcote Riverbank, around ponding areas and wetlands and along tributary streams. A minimum buffer width of 100 m is recommended along the Heathcote true right bank, and a 50 m buffer is recommended elsewhere.

7.2 Moats

Moating has proved effective at sites like Bexley and Travis Wetland, and would be a potentially useful mitigation measure against predation and disturbance on the landward edge of saltmarshes and around wetlands. A form of moating is already in place at Ferry Road Saltmarsh, Ferrymead Saltmarsh, and along two sides of Tunnel Road Saltmarsh.

7.3 Fencing

Non-electric fencing can be an effective barrier to stock, dogs and humans, as well as a barrier to cats and other mammals if mesh sizes are fine enough and fence posts are guarded so that animals cannot jump over them. Such fences reduce predatory impacts and disturbance levels within an ecologically sensitive area.

7.4 Dense Vegetation Barriers

Dense vegetation (coastal bush, shrubland, flax, toe toe, etc) is a useful screen and a buffer around ecologically sensitive areas. It hinders access by people, cats and dogs, and also reduces the effects of noise and visual intrusion.

7.5 Location and Screening of walkways, cycleways, etc

Public access through the Lower Heathcote Valley Floodplain is likely to increase substantially with development of recreational and parkland facilities in the area.

Tracks and paths should be carefully located to minimise disturbance to wildlife or degradation of other ecological values. Use of vegetation screening around the edges of wetlands and riverbanks is recommended and this should be well-established before the tracks are opened.

8.0 Specific Opportunities for Ecological Enhancement and Habitat Restoration

8.1 Restoration of existing saltmarshes

Causes of sea rush dieback in Ferry Road, Devil's Elbow, Heathcote Loop, Stilt Island and Ferrymead Esplanade Saltmarshes require investigation and options for reversing the decline should be explored. For example, will low protective bunding around saltmarsh edges or a restoration planting programme work?

8.2 Potential locations for new wetland habitats

Nine locations within the Lower Heathcote Valley Floodplain lend themselves to wetland restoration/creation. These are (a) the low-lying paddocks east of Truscotts Road and south of Ferrymead Park Drive; (b) Ferrymead Saltmeadow and environs; (c) the low-lying area surrounding Avoca Valley Stream between the old H.C.C landfills and the railway line; (d) the low-lying area straddling old tidal swales north of the H.C.C landfill site; (e) the paddock immediately south of Devil's Elbow Saltmarsh; (f) Paddocks between Tunnel Road Saltmarsh and the Motorway; (g) the area on the TR bank of the Heathcote between Tunnel Road Bridge and the Woolston Cut; (h) the TR bank of the Heathcote adjacent to Kennaway Farm and (i) Mary Duncan Park Pond;

(a) The low-lying paddocks east of Truscotts Road and south of Ferrymead Park Drive

These low-lying paddocks are presently used for horse grazing. Small numbers of Pukeko, Paradise Shelduck, Mallard, Spur-winged Plover, White-faced Heron and Kingfisher regularly occur. In winter, these paddocks are saturated and localised ephemeral ponding occurs. Potential for creation of more permanent pond/waterway/wetland habitat comes from this seasonal wetness and from inflow of both stormwater and tidal water via drains. A wetland created at this site could incorporate a pond basin or saltmarsh core with a wider margin of salt meadow, ephemeral marsh, ephemeral fresh/brackish/tidal pools and wet grassland. Current design plans for the site show a stormwater treatment basin and a waterway link through site (b) to the Heathcote River. This linkage and the relatively large site of the proposed basin are likely to attract a range of wading birds, waterfowl and swampbirds.

Figure 56. Truscotts Road paddocks with surface water ponding during a storm event.

(b) Ferrymead Saltmeadow and environs

This block, including Ferrymead Saltmeadow and surrounding horse-grazing paddocks, occupies a low-lying area on the north-east margin of the old Ferrymead landfill. A small degree of surface ponding occurs in winter and a tidal drain connects with the Heathcote Loop. Current plans are to develop the Tamaki Maori Cultural Village over part of this site, but to also develop a tidal/brackish waterway. There should be room to utilise as much of the exiting saltmeadow vegetation as possible and to naturalise the waterway banks with plantings.

Although small and likely to have a significant human presence, this site is strategically located opposite the eastern Heathcote Loop mudflats (where many wetland birds feed) and habitat development here can be expected to attract a range of wetland birds.

Figure 57. Ferrymead Saltmeadow and environs

Note: Ferrymead saltmeadow (1) in the foreground and surrounding horse paddocks. The tidal ditch (2) linking the Heathcote River with the saltmeadow follows the edge of the old landfill (3). This is the proposed site for a new waterway and the Tamaki Maori Cultural Village. Ferrymead Saltmarsh (4) and the low-lying paddocks around lower Avoca Valley Stream (5) are evident in the background.

(c) The low-lying area surrounding Avoca Valley Stream between the old H.C.C landfills and the railway line

The habitat-development potential of this area has already been explored in previous reports by The Water Services Unit and Lucas Associates (referral should be made to site investigation and other formation contained within these reports). Much of the underlying topography and soil types reflects a former tidal wetland landscape. Hollows and old swales still contain pockets of salt-tolerant vegetation, particularly *Sarcocorina* and *Cotula*. Despite separation from the Heathcote River by the H.C.C landfills, this site would lend itself well to wetland restoration and partial tidal flooding in a basin or along an expanded Avoca Valley Stream. Up to 25 species of wetland bird could be expected to occur, either as residents or as non-breeding visitors.

The site does contain one constraint however – the double set of high-tension powerlines which spans the paddocks from south to north. Collision with utility wires is a major cause of bird fatality. The visibility of wires would need to be enhanced in some way (just as by affixing disks or balls to the wires), and new waterways and wetland habitat should be orientated so that bird movement parallel to the wires is encouraged and movement across the wires is minimised.

(d) the low-lying area straddling old tidal swales north of the H.C.C landfill

This site includes part of the old Avoca Valley Stream channel which skirts the northern perimeter of the old H.C.C landfill. It also includes a number of smaller swales which are remnants of 19th Century saltmarsh channels. The swales are currently isolated from direct tidal inflow by a low-lying bank. This bank should be breached and a core area of tidal saltmarsh/saltmeadow permitted to naturally re-establish. A range of wetland birds could be expected to colonise this site including Pied Stilt, Spur-winged Plover, Paradise Shelduck, Grey Duck, NZ Shoveler, Black-backed Gull and Kingfisher..

Figure 58. Earth bund between Stilt Island Saltmarsh and former Avoca Valley Stream mouth

The low-lying earth bund (1) requires breaching to allow tidal inflow into the low-lying area at the toe of the old H.C.C landfill (2). Stilt Island Saltmarsh is located immediately adjacent – note dieback of sea rush cover (3).

(e) the paddock immediately south of Devil's Elbow Saltmarsh

This site appears to have a higher elevation above sea level than sites a, b, c & d. However, aerial photos show up former tidal channels and the site offers a number of key advantages that lend itself to wetland creation: 1) it occupies a strategic position between Devil's Elbow and Stilt Island saltmarshes and can be connected to those sites to create one large continuous wetland; 2) it lies within 800m of the Avon-Heathcote Estuary shoreline and is in a prime location to attract roosting, feeding and breeding birds; 3) it has links to other habitats along the TR riverbank and across the river to wetland habitats on the TL; 4) Flow from the Heathcote River could be partially diverted around the southern side of Devil's Elbow Saltmarsh to form moating and to provide tidal inflow into site (e) paddocks.

(f) Paddocks between Tunnel Road Saltmarsh and the Motorway

Tunnel Road Saltmarsh is the most diverse saltmarsh remnant on the Lower Heathcote and the least affected by sea rush dieback. It is a remnant of a much larger saltmarsh that occupied the whole bend in the river on either side of what is now Tunnel Road Motorway.

It is the only site in the Heathcote Catchment where the globally endangered Australasian Bittern is known to occur. It also supports a diverse range of breeding birds including Pukeko, Paradise Shelduck, Grey Duck, NZ Shoveler, Pied Stilt, Spur-winged Plover, NZ Kingfisher and Welcome Swallow. Expansion of this site downstream along the riverbank and out into the Tunnel Road paddocks (former Port Company land, now owned by CCC) is highly desirable. Re-created wetlands in this area would compensate for the progressive loss of tidal saltmarshes along the lower Heathcote River. The existing bund could be breached or piped in several places to allow inflow and outflow of tidal water. These paddocks lie under the Estuary-Lake Ellesmere Flyway (a bird movement corridor linking the Estuary and Pegasus Bay shoreline with points south of Banks Peninsula. Any habitat wetland habitat created here is likely to attract high bird usage and a wide range of species.

(g) The area on the TR bank of the Heathcote between Tunnel Road Bridge and The Woolston Cut

Like site (f), this area formerly comprised tidal wetlands and native grasslands. Unlike site (f), which was cleared and drained only, parts of this site have also been filled. In fact, reclamation of saltmarsh on the northern side of the bridge approach continued to the late 1980's. Because of its close proximity to the Heathcote River and the Woolston Cut (both of which have narrow mudflat margins which attract many wetland birds), and because of its proximity to the Kennway Farm cormorant roosts, this site has good strategic value and would be another good candidate for wetland restoration.

(h) The TR bank of the Heathcote adjacent to Kennaway Farm.

The TR bank along this stretch of river contains remnants of original wetland vegetation with an overstory of old Eucalypts and pines. The TL bank comprises recent enhancement plantings. Taller trees along the TR bank host a large cormorant night roost, containing mainly Little Cormorant (it is the principal roost site in eastern Christchurch for this species), and smaller numbers of Pied Cormorant and Black Cormorant. These trees should be protected from felling and the immediate environs of the roost trees should be fenced off to limit disturbance.

(i) Mary Duncan Park Pond

This permanent pond has potential as an important core site for native and introduced waterfowl. It is recommended that the size of the pond be expanded, with creation of further islands and densely vegetated margins on at least two sides.

8.3 Recommended sites for coastal bush establishment

A number of sites are suitable for coastal bush establishment. These include areas that require screening, such as along tracks, roadways and the edges of housing subdivisions. Another key area is under the high tension power lines that span the lower valley. Low-canopy bush could be used to guide wetland birds (the group most at risk from collision) away from a collision course with the wires. Narrow corridors of bush are already established along both banks of the Heathcote River. These can be continued further along the banks and linked to new bush patches within the valley and around the edges of wetlands and waterways. Further opportunities for coastal bush establishment exist around Ferrymead Heritage Park and within the Tamaki Maori Cultural Village complex. Finally, it may be possible over time to replace existing exotic trees along the riverbanks and in shelter belts with native species.

8.4 Retention of ecologically and historically important exotic trees

A number of stands or individual exotic trees within the Lower Heathcote Valley Floodplain are important as nesting/roosting sites for birds – particularly herons, cormorants, kingfisher and owls. Other trees are of historical interest due to age, associations with people or buildings, etc. These trees should be identified and kept safe from felling, etc.

Appendix 1:

Species	25/8/85	5/12/86	13/12/86	15/1/87	8/2/87*	29/3/87	26/10/87	6/3/88*
	H Tide	L Tide	H Tide	L Tide	H Tide	H Tide	L Tide	M Tide
Black Cormorant	3	1	3	1	n.c.	3	n.c.	n.c.
Pied Cormorant	-	-	-	-	-	-	-	-
Little Cormorant	1	-	1	2	n.c.	2	n.c.	n.c.
Spotted Shag	-	-	-	-	-	1	-	-
White-faced Heron	1	3	9	14	23	-	4	44
White Heron	-	-	-	-	-	-	-	-
Bittern	-	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	-	-	-	-	-
Feral Goose	4	n.c.	n.c.	n.c.	-	-	-	-
Paradise Shelduck	1	-	-	14	-	-	-	2
Mallard/Grey/Hybrid	248	56	387	210	n.c.	270	n.c.	n.c.
Grey Duck	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
NZ Shoveler	-	-	-	-	-	-	-	-
Harrier	3	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	1
Pukeko	28	5	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
SI Pied Oystercatcher	-	1	6	14	13	-	-	63
V. Oystercatcher	-	-	-	-	-	-	-	-
Pied Stilt	58	24	18	18	59	n.c.	4	54
Spur-winged Plover	2	2	2	6	3	-	-	8
Bar-tailed Godwit	-	2	-	-	-	-	-	-
Siberian Tattler	-	-	-	-	-	-	-	-
S Black-backed Gull	500+	many	400	790	n.c.	n.c.	880	1220
Red-billed Gull	n.c.	30	40	30	n.c.	n.c.	n.c.	n.c.
Black-billed Gull	-	-	-	-	-	-	-	-
Caspian Tern	-	-	-	-	-	-	-	-
White-fronted Tern	-	-	-	-	-	-	-	-
NZ Kingfisher	4+	n.c.	n.c.	n.c.	n.c.	n.c.	1+	n.c.
Welcome Swallow	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Grey Teal	-	-	-	-	-	-	-	-
NZ Scaup	-	-	-	-	-	-	-	-

Species	12/4/88	22/8/88	15/11/88	18/12/88	17/1/89	29/1/90	9/2/90	29/6/90
	L Tide	H Tide	L Tide	M Tide	H Tide	H Tide	H Tide	H Tide
Black Cormorant	n.c.	-	n.c.	2	-	1	n.c.	2
Pied Cormorant	-	-	-	-	-	-	-	-
Little Cormorant	n.c.	2	n.c.	-	3	-	n.c.	2
Spotted Shag	-	-	-	-	-	-	-	-
White-faced Heron	n.c.	8	n.c.	16	28	20	33	n.c.
White Heron	-	-	-	-	-	-	-	-
Bittern	-	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	-	-	-	-	-
Feral Goose	-	-	-	-	-	-	-	-
Paradise Shelduck	n.c.	-	-	-	-	-	4	-
Mallard/Hybrid	n.c.	n.c.	n.c.	18	60	44	n.c.	50
Grey Duck	n.c.	n.c.	n.c.	-	-	-	n.c.	n.c.
NZ Shoveler	-	-	-	-	-	-	-	-
Harrier	n.c.	n.c.	n.c.	n.c.	n.c.	1	n.c.	n.c.
Pukeko	n.c.	n.c.	n.c.	n.c.	2	n.c.	n.c.	n.c.
SI Pied Oystercatcher	52	2	2	12	12	28	43	-
V. Oystercatcher	-	-	1	-	-	-	-	-
Pied Stilt	-	6	14	18	4	10	2	-
Spur-winged Plover	-	6	-	-	-	-	3	-
Bar-tailed Godwit	-	-	-	-	-	-	-	-
Siberian Tattler	-	-	-	-	-	-	-	-
S Black-backed Gull	1530	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Red-billed Gull	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Black-billed Gull	-	-	-	-	-	-	-	-
Caspian Tern	-	1	-	-	-	-	-	-
White-fronted Tern	-	-	-	-	-	-	-	-
NZ Kingfisher	n.c.	n.c.	n.c.	n.c.	1+	n.c.	n.c.	n.c.
Welcome Swallow	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Grey Teal	-	-	-	-	-	-	-	-
NZ Scaup	-	-	-	-	-	-	-	-

Species	14/11/90	28/11/90	27/2/91*	3/4/91*	4/4/91	10/6/91	1/7/91	23/9/91
	H Tide	M Tide	L Tide	H Tide	H Tide	H Tide	L Tide	H Tide
Black Cormorant	n.c.	n.c.	27	9	-	n.c.	n.c.	-
Pied Cormorant	-	-	2	-	-	n.c.	n.c.	-
Little Cormorant	n.c.	n.c.	6	7	-	n.c.	n.c.	-
Spotted Shag	-	-	1	-	-	-	-	-
White-faced Heron	26	n.c.	15	22	n.c.	1	n.c.	2
White Heron	-	-	-	-	-	-	-	-
Bittern	-	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	-	-	-	-	-
Feral Goose	-	-	-	-	-	-	-	-
Paradise Shelduck	9	-	-	-	-	-	-	-
Mallard/Hybrid	n.c.	n.c.	51	10	n.c.	n.c.	80	14
Grey Duck	n.c.	n.c.	n.c.	-	n.c.	n.c.	n.c.	n.c.
NZ Shoveler	-	-	2	-	n.c.	n.c.	-	-
Harrier	n.c.	n.c.	1	1	n.c.	n.c.	n.c.	1
Pukeko	n.c.	n.c.	7	-	n.c.	n.c.	n.c.	-
SI Pied Oystercatcher	-	-	24	49	74	2	n.c.	-
V. Oystercatcher	-	-	-	-	-	-	-	-
Pied Stilt	19	14	6	2	60	60	n.c.	7
Spur-winged Plover	2	-	2	4	5	4	n.c.	-
Bar-tailed Godwit	-	8	-	-	-	-	-	-
Siberian Tattler	1	-	-	-	1	-	-	-
S Black-backed Gull	n.c.	n.c.	14	6	n.c.	n.c.	n.c.	16
Red-billed Gull	n.c.	n.c.	9	-	n.c.	n.c.	n.c.	n.c.
Black-billed Gull	-	-	-	-	-	-	-	-
Caspian Tern	-	-	-	1	-	-	-	1
White-fronted Tern	-	-	1	-	-	-	-	-
NZ Kingfisher	n.c.	n.c.	6+	3+	n.c.	n.c.	c.	n.c.
Welcome Swallow	n.c.	n.c.	2	n.c.	n.c.	n.c.	n.c.	2
Grey Teal	-	-	-	-	-	-	-	-
NZ Scaup	-	-	-	-	-	-	-	-

Species	15/10/91*	22/10/91	5/11/91	24/11/91	14/1/92	16/1/92	22/1/92	7/7/92
	L Tide	M Tide	L Tide	L Tide	H Tide	M Tide	H Tide	H Tide
Black Cormorant	n.c.	n.c.	1	2	8	6	n.c.	-
Pied Cormorant	-	-	1	-	-	-	n.c.	1
Little Cormorant	n.c.	n.c.	-	2	1	1	n.c.	2
Spotted Shag	-	-	-	-	-	-	-	-
White-faced Heron	4	4	2	11	n.c.	1	20	2
White Heron	-	-	-	-	-	-	-	-
Bittern	1	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	-	-	-	-	-
Feral Goose	-	-	-	-	-	-	-	-
Paradise Shelduck	2	-	2	-	-	-	-	2
Mallard/Hybrid	6	4	2	8	n.c.	n.c.	n.c.	84
Grey Duck	n.c.	n.c.	n.c.	6	n.c.	n.c.	n.c.	n.c.
NZ Shoveler	2	-	-	-	-	-	-	-
Harrier	-	-	1	-	n.c.	n.c.	n.c.	-
Pukeko	2	n.c.	-	-	n.c.	n.c.	n.c.	-
SI Pied Oystercatcher	-	4	4	1	19	20	93	-
V. Oystercatcher	-	-	-	-	-	-	-	-
Pied Stilt	27	20	-	12	48	4	34	13
Spur-winged Plover	-	-	-	2	-	2	4	-
Bar-tailed Godwit	-	-	-	-	-	-	-	-
Siberian Tattler	-	-	-	-	-	-	-	-
S Black-backed Gull	28	6	20	24	n.c.	n.c.	n.c.	6
Red-billed Gull	-	4	15	-	-	n.c.	n.c.	-
Black-billed Gull	-	-	-	-	1	n.c.	n.c.	-
Caspian Tern	-	-	2	-	-	-	-	-
White-fronted Tern	-	-	-	-	-	-	-	-
NZ Kingfisher	2+	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
Welcome Swallow	2	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	-
Grey Teal	-	-	-	-	-	-	-	-
NZ Scaup	-	-	-	-	-	-	-	-

Species	17/9/92	17/10/92	6/11/92	24/12/92	8/7/93*	13/8/93	1/9/93	9/9/93
	L Tide	H Tide	L Tide	L Tide	L Tide	H Tide	L Tide	H Tide
Black Cormorant	2	2	-	2	-	-	-	-
Pied Cormorant	1	1	1	-	3	-	-	-
Little Cormorant	-	-	-	2	4	2	1	-
Spotted Shag	-	-	-	-	1	1	-	1
White-faced Heron	3	1	2	1	7	3	-	2
White Heron	-	-	-	-	-	-	-	-
Bittern	-	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	-	-	-	-	-
Feral Goose	-	-	-	-	-	-	-	-
Paradise Shelduck	-	-	4	-	2	-	2	-
Mallard/Hybrid	16	2	n.c.	4	105	n.c.	18	30
Grey Duck	2	n.c.	n.c.	-	n.c.	n.c.	n.c.	n.c.
NZ Shoveler	-	-	2	-	2	-	-	-
Harrier	-	-	2	n.c.	2	2	2	n.c.
Pukeko	2	-	-	1	12	n.c.	-	-
SI Pied Oystercatcher	-	-	-	3	-	-	-	-
V. Oystercatcher	-	-	-	-	-	-	-	-
Pied Stilt	-	3	14	2	-	34	-	8
Spur-winged Plover	-	-	4	4	-	2	2	-
Bar-tailed Godwit	-	-	-	-	-	-	-	-
Siberian Tattler	-	-	-	-	-	-	-	-
S Black-backed Gull	26	6	n.c.	24	42	n.c.	n.c.	12
Red-billed Gull	-	-	n.c.	-	-	n.c.	n.c.	-
Black-billed Gull	-	-	-	-	-	-	-	-
Caspian Tern	-	-	-	-	-	-	-	-
White-fronted Tern	-	-	-	-	-	-	-	-
NZ Kingfisher	2+	1+	n.c.	1+	16+	1+	n.c.	n.c.
Welcome Swallow	2	n.c.	n.c.	n.c.	2	n.c.	n.c.	n.c.
Grey Teal	-	-	-	-	-	-	-	-
NZ Scaup	-	-	-	-	-	-	-	-

Species	11/9/93	20/11/93*	21/2/94*	23/3/94	13/4/94	31/1/95	9/3/95	17/6/95
	M Tide	L Tide	L Tide	M Tide	L Tide	L Tide	H Tide	H Tide
Black Cormorant	-	2	7	2	7	2	5	n.c.
Pied Cormorant	-	1	-	5	4	-	2	n.c.
Little Cormorant	-	3	4	14	4	4	5	n.c.
Spotted Shag	1	-	-	-	-	-	-	-
White-faced Heron	12	10	14	-	4	10	10	n.c.
White Heron	-	-	-	-	-	-	-	-
Bittern	-	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	-	-	-	-	1
Feral Goose	-	-	-	-	-	-	-	-
Paradise Shelduck	2	-	-	-	2	n.c.	n.c.	n.c.
Mallard/Hybrid	-	38	55	n.c.	n.c.	n.c.	n.c.	190
Grey Duck	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.
NZ Shoveler	-	2	-	-	-	-	-	n.c.
Harrier	1	2	n.c.	n.c.	n.c.	n.c.	-	n.c.
Pukeko	n.c.	6	4	n.c.	-	n.c.	-	-
SI Pied Oystercatcher	-	-	18	-	-	9	14	n.c.
V. Oystercatcher	-	-	-	-	-	-	-	-
Pied Stilt	10	10	6	8	3	18	39	n.c.
Spur-winged Plover	4	-	12	-	4	7	7	n.c.
Bar-tailed Godwit	-	-	-	-	-	-	-	-
Siberian Tattler	-	-	-	-	-	-	-	-
S Black-backed Gull	n.c.	24	9	n.c.	8	n.c.	18	n.c.
Red-billed Gull	n.c.	-	12	n.c.	1	n.c.	-	n.c.
Black-billed Gull	-	-	-	-	-	-	-	n.c.
Caspian Tern	1	-	-	-	1	-	1	-
White-fronted Tern	-	-	-	-	-	-	-	-
NZ Kingfisher	2+	8	6+	n.c.	1+	n.c.	3+	n.c.
Welcome Swallow	n.c.	4	2	n.c.	-	n.c.	-	n.c.
Grey Teal	-	-	-	-	-	-	-	-
NZ Scaup	-	-	-	-	-	-	-	-

Species	12/2/96	9/4/96	29/4/96*	15/7/96	9/8/96	21/12/96*	29/8/97	2/4/98
	H Tide	H Tide	H Tide	H Tide	H Tide	H Tide	H Tide	M Tide
Black Cormorant	n.c.	n.c.	-	n.c.	n.c.	n.c.	n.c.	2
Pied Cormorant	n.c.	6	3	n.c.	n.c.	n.c.	n.c.	6
Little Cormorant	n.c.	n.c.	1	n.c.	n.c.	n.c.	n.c.	2
Spotted Shag	-	-	-	-	1	-	-	-
White-faced Heron	n.c.	n.c.	6	n.c.	n.c.	-	2	26
White Heron	-	-	-	-	-	-	-	-
Bittern	-	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	2	-	-	-	-
Feral Goose	-	-	-	-	-	-	-	-
Paradise Shelduck	n.c.	n.c.	-	n.c.	n.c.	n.c.	-	-
Mallard/Hybrid	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	44
Grey Duck	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	2
NZ Shoveler	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	2	-
Harrier	n.c.	1	n.c.	n.c.	n.c.	-	-	1
Pukeko	n.c.	-	3	n.c.	n.c.	-	-	-
SI Pied Oystercatcher	23	16	10	n.c.	-	54	-	11
V. Oystercatcher	-	-	-	-	-	-	-	-
Pied Stilt	38	58	19	n.c.	11	15	2	26
Spur-winged Plover	20	-	2	n.c.	-	3	-	8
Bar-tailed Godwit	33	-	-	-	-	10	-	-
Siberian Tattler	-	-	-	-	-	-	-	-
S Black-backed Gull	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	11
Red-billed Gull	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	n.c.	14
Black-billed Gull	n.c.	-	-	n.c.	n.c.	-	-	-
Caspian Tern	-	-	1	-	2	-	-	-
White-fronted Tern	-	-	-	-	-	2	-	-
NZ Kingfisher	n.c.	n.c.	12	n.c.	n.c.	n.c.	n.c.	n.c.
Welcome Swallow	n.c.	n.c.	-	n.c.	n.c.	n.c.	n.c.	-
Grey Teal	-	-	-	-	-	-	-	-
NZ Scaup	-	-	-	-	-	-	-	-

Species	1/5/98* Low Tide	5/5/98 Mid Tide	15/5/98* Low Tide	27/7/98* H Tide	19/11/98* L Tide	12/10/99 Mid Tide	30/10/99 H Tide	26/1/00 L Tide
Black Cormorant	2	-	2	-	-	-	-	2
Pied Cormorant	2	2	3	3	1	1	1	5
Little Cormorant	4	-	7	4	-	-	-	20+
Spotted Shag	1	-	-	-	-	-	-	-
White-faced Heron	10	5	8	12	3	6	2	-
White Heron	-	-	-	-	-	-	-	-
Bittern	-	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	-	-	-	-	-
Feral Goose	-	-	-	-	-	-	-	-
Paradise Shelduck	2	-	1	2	-	-	-	-
Mallard/Hybrid	63	49	77	60	17	15	n.c.	n.c.
Grey Duck	2	n.c.	n.c.	n.c.	-	-	-	-
NZ Shoveler	-	-	n.c.	-	-	2	-	-
Harrier	1	1	n.c.	1	-	-	-	-
Pukeko	-	-	1	2	-	-	-	-
SI Pied Oystercatcher	12	11	3	5	3	-	-	1
V. Oystercatcher	-	-	-	-	-	-	6	-
Pied Stilt	-	-	5	11	16	4	-	2
Spur-winged Plover	2	4	2	2	12	-	1	2
Bar-tailed Godwit	-	-	-	-	-	-	-	-
Siberian Tattler	-	-	-	-	-	-	-	-
S Black-backed Gull	8	22	23	34	27	13	6	n.c.
Red-billed Gull	9	14	32	15	14	9	n.c.	n.c.
Black-billed Gull	-	-	-	-	-	-	-	-
Caspian Tern	-	-	-	2	-	-	-	-
White-fronted Tern	-	-	-	-	-	-	-	-
NZ Kingfisher	22	n.c.	14+	8	5+	2+	n.c.	1+
Welcome Swallow	7	n.c.	2	-	-	2	-	-
Grey Teal	-	-	-	-	-	-	-	-
NZ Scaup	-	-	-	-	-	4	-	-

Species	23/4/00*	7/5/00	26/10/02*	6/1/03	19/1/03	20/1/03	12/2/03	2/3/03*
	L Tide	H Tide	L Tide	H Tide	L Tide	H Tide	H Tide	L Tide
Black Cormorant	-	-	-	1	-	3	3	10
Pied Cormorant	3	-	2	3	1	-	2	5
Little Cormorant	2	-	1	7	-	-	5	5
Spotted Shag	-	-	-	-	-	-	-	1
White-faced Heron	2	6	11	11	14	8	14	10
White Heron	-	-	-	-	-	-	-	-
Bittern	-	-	-	-	-	-	-	-
Royal Spoonbill	-	-	-	-	-	-	-	-
Feral Goose	-	-	-	-	-	-	-	-
Paradise Shelduck	6	-	4	2	-	-	4	2
Mallard/Hybrid	31	n.c.	26	41	44	38	42	76
Grey Duck	1	-	-	. -	-	n.c.	n.c.	n.c.
NZ Shoveler	-	-	4	2	-	-	2	2
Harrier	2	-	1	2	-	-	-	-
Pukeko	2	-	1	-	-	-	-	-
SI Pied Oystercatcher	5	6	-	1	8	16	33	24
V. Oystercatcher	-	-	-	-	-	-	-	-
Pied Stilt	4	3	6	2	4	27	57	19
Spur-winged Plover	4	-	8	2	6	21	14	8
Bar-tailed Godwit	-	-	-	-	-	-	12	3
Siberian Tattler	-	-	-	-	-	-	-	-
S Black-backed Gull	9	n.c.	20	6	10	-	14	10
Red-billed Gull	5	n.c.	4	14	104	20	16	95
Black-billed Gull	-	-	-	-	-	-	-	-
Caspian Tern	1	-	-	1	-	-	2	1
White-fronted Tern	-	-	-	-	-	-	-	-
NZ Kingfisher	9	4+	n.c.	2+	n.c.	n.c.	n.c.	4+
Welcome Swallow	5	-	1	-	-	-	-	2
Grey Teal	-	-	-	-	-	-	-	116
Scaup	-	-	-	-	-	-	-	-

Species	10/3/03* L Tide	11/3/03* H Tide	15/3/03* L Tide
Black Cormorant	13	17	16
Pied Cormorant	3	5	4
Little Cormorant	5	8	5
Spotted Shag	-	-	-
White-faced Heron	9	6	9
White Heron	-	-	-
Bittern	-	-	-
Royal Spoonbill	-	-	-
Feral Goose	-	-	-
Paradise Shelduck	3	3	-
Mallard/Hybrid	69	41	56
Grey Duck	n.c.	-	-
NZ Shoveler	-	-	-
Harrier	1	-	-
Pukeko	2	-	-
SI Pied Oystercatcher	18	42	9
V. Oystercatcher	-	-	-
Pied Stilt	8	-	2
Spur-winged Plover	5	19	17
Bar-tailed Godwit	4	-	-
Siberian Tattler	-	-	-
S Black-backed Gull	10	8	11
Red-billed Gull	25	43	14
Black-billed Gull	-	-	-
Caspian Tern	2	-	-
White-fronted Tern	-	-	-
NZ Kingfisher	6+	n.c.	n.c.
Welcome Swallow	2	-	-
Grey Teal	74	82	129
Scaup	-	-	-

Appendix 2:

Other Wildlife Found Within the Lower Heathcote Valley Floodplain

Wildlife other than birds observed in the Heathcote Valley and along the Lower Heathcote River and Heathcote Loop include the following:

a) Land Mammals

Brushtail Possum (*Trichosurus vulpecula*) - small numbers present, mainly in stands of trees including Eucalypts along the Heathcote River.

Hedgehog (*Erinaceus europaeus*) - common in most dryland rural/garden habitats.

Rabbit (*Oryctolagus cuniculus)* - moderately common on farmland.

Brown Hare *(Lepus europaeus)* - small numbers on farmland.

House Mouse *(Mus musculus)* - common in most dryland habitats.

Ship Rat *(Rattus rattus)* – probably common around buildings.

Norway Rat *(Rattus norvegicus)* - common along waterways and saltmarsh edges. Population probably much reduced after closure of landfills.

Weasel *(Mustela nivalis)* - not recorded, but may be overlooked as occurs elsewhere around the estuary.

Stoat *(Mustela erminea*) - common in most rural habitats including the edges of streams and saltmarshes.

Ferret *(Mustela furo)* - common in farmland and around the edges of streams and saltmarshes.

Feral/Domestic Cat *(Felis catus)* - both occur in rural habitats and around the edge of saltmarshes.

b) Lizards and Amphibians

Common Skink *(Oligosoma nigriplantare)* - the only lizard known to occur in the study area; moderately common in riverbank and dry rural habitats.

Golden Bell Frog *(Litoria raniformis)* - occurs along freshwater ditches and streams.

Whistling Frog *(Litoria ewingii)* - not recorded, but may occur as it is present in other rural/open space areas around the Estuary.

c) Marine Mammals

Hookers Sea Lion *(Phocarctos hookeri)* - a very rare visitor to the Heathcote Loop; animals (usually immatures) occasionally spend short periods a few days to a few months) in the estuary and may venture into the lower rivers.

New Zealand Fur Seal *(Arctocephalus forsteri)* - individuals commonly enter the estuary and occasionally venture into the Heathcote Loop and lower river (probably several times a year).

Southern Sea Elephant *(Mirounga leonina*) - a rare visitor to the Heathcote Loop and River. From time to time Sea Elephants take up temporary residence on the Christchurch coastline (e.g.; Elizabeth, Phillip, Dumbo) and occasionally venture up the Heathcote and Avon rivers.

Hector's Dolphin (Cephalorhynchus hectori) – a rare visitor to the Estuary and lower rivers, most recently recorded on the Avon River in 2001. May potentially venture into the lower Heathcote.

d) Fish

Both Long-finned and Short-finned Eels occur in the Heathcote Loop and the Lower Heathcote R. eels also occur in riparian wetlands (such as Tunnel Road and Ferry Road saltmarshes) and in tributary streams and drains. Shoals of young Inanga are seasonally common in the Heathcote River (although few people white-bait in this area). Other fish observed in tidal reaches of the Heathcote River include Smelt, Yellow-eyed Mullet, Kahawai and Sand Flounder.

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