Ōruapaeroa/Travis Wetland

Biodiversity management guidelines

October 2025

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Christchurch City Council

Forward

The Travis Wetland Trust formed in 1992. Under the leadership of the late Mrs Anne Flanagan the Travis Wetland Trust successfully lobbied the Christchurch City Council to purchase, protect, preserve and develop the swamp as a Nature Heritage Park for the education and enjoyment of all.

In 1999, in consultation with the Travis Wetland Trust a Landscape Development Plan was finalised. The management of Ōruapaeroa/Travis Wetland is managed as a partnership between the Travis Wetland Trust and the Christchurch City Council.

In the thirty-three years since the Travis Wetland Trust vision for the future Ōruapaeroa/ Travis has become a biodiversity hot spot a haven for native birds, fish, insects, plants and skinks. It now attracts visitors from across Aotearoa-New Zealand and the world.

These Biodiversity Management Guidelines are intended to help manage Ōruapaeroa as a biodiversity sanctuary for the future.

Thanks to the trust members for being the kaitiaki and for the mahi which is making the restoration successful.

John Skilton,

Travis Wetland Ranger/Project Manager, 2000 - present

Introduction

Purpose

These guidelines were created to help manage the Ōruapaeroa-Travis Wetland as a biodiversity sanctuary for its local and regional biodiversity values. They are intended to be used internally by regional park rangers, council staff, and the Travis Wetland Trust and volunteers to guide both day-to-day and long-term management of the wetland. The guidelines reflect current management practices, identify areas for improvement, and provide opportunities to enhance the ecological value of the wetland and develop new management strategies for the future.

Our primary driver for Ōruapaeroa-Travis Wetland is:

"…to enable the restoration and maintenance of the wetland habitat, and to help sustain a living city that integrates our cultural activities and our natural heritage…"

Background & context

Wetlands are nationally threatened ecosystems. We have seen them undergo extreme levels of loss and degradation nationwide. Lowland wetlands, in particular, are especially scarce and have typically been reduced to less than 10% of their former extent. Ōruapaeroa-Travis Wetland therefore represents an ecosystem that is becoming increasingly scarce not just in Canterbury, but across Aotearoa-New Zealand. It was identified early on as being nationally important for its soil and vegetation systems, and regionally important for its pūkeko population. In 1999, of all the remaining lowland freshwater wetlands in the Ōtautahi-Christchurch area, we identified Ōruapaeroa-Travis Wetland as offering the greatest potential for restoration.

From LIDAR imagery[1], we can clearly see the low-lying nature of Ōruapaeroa-Travis Wetland, and particularly its historic connection with the Ihutai-Avon/Heathcote Estuary. This close association becomes even more apparent when we overlay the LIDAR on the 1851 'Black Map' of Ōtautahi-Christchurch (Figure 1) which describes the vegetation that surveyors encountered at the time of European settlement. Combined, this information reinforces our need to take a landscape-level approach to managing Ōruapaeroa-Travis Wetland and the wider area into the future, especially in regard to its connections via the Ōtākaro-Avon River Corridor.

In 1999, in consultation with the Travis Wetland Trust, we finalised a landscape development plan for the Travis Wetland Nature Heritage Park (Figure 2). The plan was written to provide direction for the coordinated restoration and enhancement of the wetland over at least the following ten-year period. Although we designed it as a comprehensive guide, it did not necessarily claim to have all the answers to all the technical questions on how the sensitive - and often unique - ecological components of the wetland should be best managed. We anticipated we would need to take an experimental 'research-by-management' approach in answering some of these unknowns.

[1] LIDAR (laser imaging, detection, and ranging) is a technology used to construct 3-dimensional representations of the earth's surface.

Also, the last twenty years has seen a significantly greater public awareness and appreciation of the ecological crisis facing not just us in Aotearoa/New Zealand, but the entire planet. However, in the Low Canterbury Plains Ecological District, where less than 0.5% of the original indigenous vegetation cover now remains, our situation is particularly dire. As a result, in 2019, the Christchurch City Council and Environment Canterbury independently declared both a Climate Emergency and an Ecological Emergency.

Canterbury earthquakes

The 2010 - 2012 Canterbury earthquakes caused widespread damage to our city. The earthquakes also impacted significantly on Ōruapaeroa-Travis Wetland by bringing about some of the sudden changes in hydrology and plant & animal distributions that we witnessed. However, we found that very few of these changes were actually detrimental from an ecological perspective. Instead, we found that the vast majority of the earthquake effects actually improved habitat recovery trajectories within the wetland: it became wetter; the re-establishment of indigenous wetland vegetation accelerated; and it helped a range of wetland bird species to either colonise or re-colonise the wetland. Notable species that returned and expanded included marsh crake, spotless crake, Australasian bittern, royal spoonbill and little black cormorant.

On a broader scale, the earthquakes resulted in large tracts of our city's eastern suburbs - including land immediately adjacent to Ōruapaeroa-Travis Wetland - being deemed no longer suitable for residential land use. These areas became known to us as the Residential Red Zones. Central Government made offers to purchase insured properties in these areas, and soon owned the vast majority (5442) of Red Zoned properties.

Figure 1: Lidar map of eastern Christchurch overlain with the 1851 Black Maps showing historic indigenous vegetation patterns and contiguous wetland habitat linking the Avon-Heathcote Estuary (bottom right) to Travis Wetland (top centre).

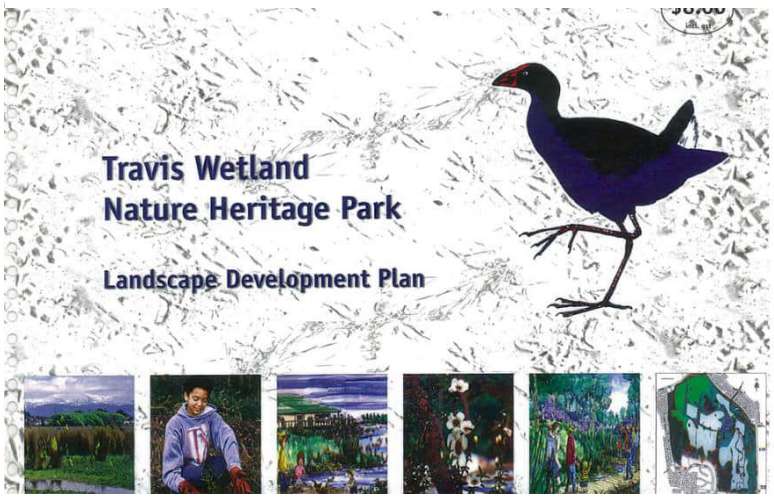


Figure 2: Christchurch City Council's 1999 Travis Wetland Heritage Park Landscape Development Plan cover.

A Regeneration Plan for the Red Zoned 'Otakaro-Avon River Corridor' (OARC) was adopted by Council in 2019. The OARC Regeneration Plan connected Ōruapaeroa-Travis Wetland with more than 600 hectares of former residential land, of which at least 350 hectares we have set aside specifically for ecological restoration. Throughout the entire OARC area, one of our primary focuses is on regenerating nature through *"creating a restored native habitat with good water quality so there is an abundant source of mahinga kai, birdlife and native species"*.

We anticipate that the ongoing management of Ōruapaeroa-Travis Wetland needs to take into account both the opportunities and potential pressures arising from a heightened interest in planning and managing not just the wetland itself, but it's linkages to - and throughout - the OARC. We now have a unique and timely opportunity to expand the scope of the Ōruapaeroa-Travis Wetland management area by considering the red zone land immediately to the south of Travis Road to link with the Ōtākaro-Avon River (Figure 3).

Figure 3: *Location of Ōruapaeroa-Travis Wetland in the context of the Ōtākaro-Avon River and the Residential Red Zone.*

Ecological values

Botanical values

Ōruapaeroa-Travis Wetland protects the largest remaining example of a freshwater wetland ecosystem that used to cover a significant proportion of our city, up to 70% in the past. While the wetland mainly contains native species that are still relatively common, such as harakeke/lowland flax *(Phormium tenax)*, pukio sedge *(Carex secta)* and raupo *(Typha orientalis)*, the wetland harbours exceptionally rare plant communities. Among them are baumea *(Machaerina rubiginosa)* and manuka *(Leptospermum scoparium)* associations that occur on peat soils.

Several rare species that have extremely localised occurrences across the wider Canterbury Region are present as the only known natural occurrences in the Christchurch City environs. Most remarkably is the diminutive spider orchid (*Corybas rivularis*, At Risk–Naturally Uncommon), forked sun dew (*Drosera binata*), and baumea. The manuka stands in the wetland are also significant as they represent the last substantial stands remaining on the Canterbury Plains. Interestingly, there is a small population of spider orchids with an unusual pigmentation-, which poses a taxonomic mystery. It is possible that this genotype represents a new unnamed species closely related to another unnamed spider orchid species known as C. "Bridal Veil," and it may be unique to Ōruapaeroa-Travis Wetland. If confirmed, this discovery would make it one of the rarest and most threatened plant species in New Zealand.

Other notable native species we find in Ōruapaeroa-Travis Wetland include Celmisia graminifolia, woodrush (Luzula picta), yellow sedge (Carex. flaviformis), silverweed (Argentina anserinifoli*a* – formerly *Potentilla)*, broad-leaved rush *(Juncus planifolius*), and *Hypericum pusillum*. These species are naturally sparse among wetlands, and as such they are now especially rare across the Christchurch District and lowland Canterbury.

Management

Ensuring we maintain the viability of the rare plant communities and species associated with peat soils is of paramount concern to the management of Ōruapaeroa-Travis Wetland. Owing to the larger stature of baumea and manuka, and that we find that these species appear to be naturally expanding through recruitment of juveniles (incl. manuka), suggests that very little management is required other than the control of large woody weeds to prevent shading. This includes removing adjoining willow stands to that currently prevent the expansion of manuka and baumea and associated habitats for rare plants. In the unlikely situation that we find raupo invasion is adversely affecting (smothering) peat plant communities, then we may need to consider the control of raupo in the future.

We find that smaller native species are vulnerable to smothering by exotic species such as creeping buttercup *(Ranunculus repens)*, jointed rush *(Juncus articulatus)* and others that are common throughout Ōruapaeroa-Travis Wetland. This threat is possibly exacerbated when occurring in combination with dense baumea and fern (*Blechnum minus*), although to what extent we are somewhat uncertain. We also presume that some disturbance may be required for us to maintain high light habitats for rare species, and to provide opportunities for seedling recruitment, but the type or extent is not well understood. Consequently, it is probably necessary for us to continue doing ongoing localised weeding - including thinning of dense baumea and fern in order for us to maintain the natural diversity of the wetland ecosystem generally, and to prevent smothering of the smaller rare species.

Monitoring: For us to better understand optimal habitat requirements for rare species and the effects of competitive interactions, we need to do formal monitoring. Our key objective of this monitoring should be to understand if weeding (thinning) causes a competitive release that is beneficial (or not) to rare species. An appropriate monitoring protocol requires us establishing a sufficient number of permanent plots of identical parameters that give us an adequate sample, that monitoring is repeatable, and that the data we collect is reliable. We provide guiding parameters for this monitoring in Appendix 1.

For the other rare species present that are not necessarily confined to peat soil associations (e.g., *Celmisia graminifolia*, woodrush, yellow sedge, silverweed, broad-leaved rush, and *Hypericum pusillum*), we need to better understand the extent of their populations, as well as habitat favourability and appropriate management (such as grazing). We can best achieve this through establishing a series of permanent vegetation plots (or transects) stratified by key habitat types (including peat associations). We would systematically monitor these plots over time for species composition and abundance, providing us with and additional understanding of ecological change into the future.

Plant species reintroductions

Species reintroductions are important conservation tools because they can help restore ecosystem functions and promote biodiversity. When a species is lost from an area, it can have cascading effects on other species and the overall health of the ecosystem. Reintroducing a species can help restore natural processes and interactions, which can lead to benefits for other species and the ecosystem as a whole. Additionally, plant species reintroduction can help prevent the extinction of a species and is important for maintaining the genetic diversity of plant communities and the evolutionary potential of ecosystems. Reintroducing plants can also have cultural and aesthetic value and may provide economic benefits such as promoting ecotourism. However, species reintroduction should be done carefully and based on scientific evidence, to ensure that it is effective and does not cause unintended harm to the ecosystem or other species.

Potential opportunities that exist for us to re-introduce and/or translocate threatened plant species appropriate for Ōruapaeroa-Travis Wetland are outlined below in Table 2. We also include a separate threatened species list that could possibly be introduced to the remnant dunelands on the northern perimeter of Ōruapaeroa-Travis Wetland in Table 1.

Table 1: *Potential threatened plant species reintroductions for the remnant dune-lands along the northern perimeter of Travis Wetland.*

Species Name	Treat Rank	Notes
Carmichaelia kirkii	Nationally Vulnerable	Records from Brighton dunes closet extant source Banks Peninsula or Mt Cass.
Clematis quadribracteolata	Naturally Uncommon	Present in dune scrub at Kaitorete and on Plains.
Coprosma acerosa	Declining	Once very common on dunes, now only at Leithfield and Okains Bay.
Discaria toumatou	Declining	Was a common dune species.
Muehlenbeckia astonii	Nationally endangered	Occasionally on dunes, still present at Leithfield.
Parsonsia capsularis var. rosea	Data Deficient	In dry coastal scrub Birdlings flat.
Pimelea villosa subsp villosa	Declining	Was common on dunes, now extinct in Canterbury. Unsure closest source?

Table 2: *Potential threatened plant species reintroductions for wetland areas within the park*

Species Name	Treat Rank	Notes
Coprosma obconica	Nationally Vulnerable	Seasonally wet forest margin species. Dubious record from Travis (Burrows). Otherwise, closest source in Canterbury foothills.
Coprosma pedicelata	Declining	Damp margins of hollows under kahikatea forest. Closest source Lords Bush upper Plains ED.
Carex strictisima	Nationally Endangered	Presumed extinct in Canterbury. Lowland swamps. Closest source Otago?
Deschampsia cespitosa	Declining	Was common throughout but now presumed extinct in lowland Canterbury. Closest source Mackenzie Basin?
Gunnera densiflora	Nationally Endangered	Stream margins. Historic records on Banks Pen, otherwise in montane Canterbury. Closest source Waimakariri Basin.
Juncus holoschoenus var holoschoenus	Nationally Critical	Lowland wetlands in shallow water. Was known from Chaney's but presumed extinct in Canterbury. Closest source?
Mazus novaezeelandiae subsp. impolitus f. impolitus	Nationally Endangered	Damp hollows, ephemeral wetlands. Closest source Spencer Park.
Melicytus flexuosus	Nationally Vulnerable	Wet margins of kahikatea forest. No know records from CHCH District, but still extant at Peel Forest and in Nth Canterbury.
Spiranthes novae-zelandiae	Declining	Ephemerally wet hollows and peat bogs. Recorded at Styx, Ōtukaikino and Te Waihora.
Triglochin palustri	Nationally Critical	Swamps and wet riparian margins. Presumed extinct in lowland Canterbury. No records in Nth Canterbury (closest source likely Mackenzie Basin)
Urtica perconfusa	Declining	Swampland typically with *Carex secta*, still extant at Styx as possibly the national stronghold for the species.

Avifauna values

Bird surveys carried out in the late 1980s/early 1990s identified Ōruapaeroa-Travis Wetland as the most important freshwater wetland for birds in Ōtautahi-Christchurch. Our need to conserve enough habitat to support the population of 700 Pūkeko and 27 other indigenous bird species occurring at the time was a key reason for protecting the full 119 hectares in public ownership – a very large reserve footprint for a New Zealand urban wetland at the time, and still-so today. Habitat development to support and enhance the site's birdlife commenced in 1997, and involved:

- Creation of ponds and waterways to attract and support wetland bird populations,
- Management of lowland wet grasslands (grazing marsh) to maximise feeding, roosting and nesting opportunities for wetland and grassland birds. This included the facilitation of ephemeral ponding both seasonally and after prolonged rainfall events,
- Removal of willows and invasive weeds to allow the recovery and spread of indigenous vegetation,
- Planting of substantial areas of woodland and shrubland vegetation to start the long process of creating future habitat for our forest birds.

The initial birdlife response to these measures was a decline in the native species that favoured grassland habitats such as gulls, herons and pūkeko. However, this decline was countered by a rapid increase in both species richness and numbers of birds that favoured waterway and swampland habitats. As a result, between 1989 and 2022, the total number of bird species recorded at Ōruapaeroa-Travis Wetland has almost doubled from 41 to 79 (Refer Appendix 2). Of these, 50 species (63%) are associated in some way with wetland habitat while the remainder are woodland or dry grassland birds.

The primary focuses for bird management at Ōruapaeroa-Travis Wetland since 1998 have been to:

- Contribute in a substantial way to the need to support the city's pūkeko population,
- Repopulate the site with a wide and authentic assemblage of wetland bird species, and
- Attract some of the more common native bush birds to the reserve.

These key objectives have been achieved, and at the time of writing these guidelines the wetland is now an expansive and diverse mosaic of open water and swampland habitat that supports richly diverse populations of waterfowl, waders and swamp birds. In peak seasons the site typically supports upwards of 1000 wetland birds made up of more than 25 species, including up to 250 pūkeko (down from 700 in the late 1980s/early 1990s).

Forty-seven species (60%) occurring at Travis Wetland are New Zealand natives; eight species (10%) are visitors from Australia or the Northern Hemisphere, and 24 (30%) are introduced species. Currently, 24 bird species categorised as "Threatened" or "At Risk" under New Zealand's threat classification system occur at Ōruapaeroa-Travis Wetland, with an increasing number of these now confirmed as 'breeding-residents' (Table 3).

To-date, 19 woodland bird species have been recorded at Ōruapaeroa-Travis Wetland, including six native and 13 introduced species. As the monitoring programme progresses into the future, it is expected that changes in bird abundance, species richness and patterns of seasonal occurrence will be revealed.

The obvious next stage is to further refine the role of Ōruapaeroa-Travis Wetland as an important bird habitat. To achieve this, it will be important to match the site's key attributes (size, extensive habitats, low predator presence and a low disturbance environment) with a species assemblage that more closely matches the pre-European avifauna of the site. Achieving this will further reinforce the role of Ōruapaeroa-Travis Wetland as a hub for authentic biodiversity in Ōtautahi-Christchurch.

Table 1: *Threatened and At Risk Bird Species currently resident or regularly visiting Ōruapaeroa-Travis Wetland (Based on 2021 DoC threat status)*

Species Name	Threat Rank	Notes
White heron	Threatened – Nationally Critical	Occasional visitor
Australasian bittern	Threatened – Nationally Critical	Occurring year round and probably regularly breeding
Black stilt	Threatened – Nationally Critical	Rare visitor
Black-fronted tern	Threatened – Nationally Endangered	Occasional visitor
Grey duck	Threatened – Nationally Vulnerable	Formerly resident, now seasonal visitor
Eastern falcon	Threatened – Nationally Vulnerable	Rare visitor
Caspian tern	Threatened – Nationally Vulnerable	Seasonal visitor
Australasian crested grebe	Threatened – Nationally Vulnerable	Occasional visitor
Brown teal	Threatened – Nationally Increasing	Unsuccessful past reintroduction but a good candidate for future reintroductions
New Zealand pipit	At Risk - declining	Seasonal visitor
Banded dotterel	At Risk - declining	Seasonal visitor
South Island pied oystercatcher	At Risk - declining	Seasonal visitor
Black-billed gull	At Risk - declining	Seasonal visitor
Red-billed gull	At Risk - declining	Seasonal visitor
Marsh crake	At Risk - declining	Occurring year round and probably regularly breeding
Spotless crake	At Risk - declining	Occurring year round and probably regularly breeding
Variable oystercatcher	At Risk - recovering	Occasional visitor
Pied cormorant (shag)	At Risk - recovering	Seasonal visitor
Black cormorant (shag)	At Risk - relict	Occurring year round
Little cormorant (shag)	At Risk - relict	Occurring year round
Black-fronted dotterel	At Risk – naturally uncommon	Occasional visitor
Australasian coot	At Risk – naturally uncommon	Seasonal visitor
Little black cormorant (shag)	At Risk – naturally uncommon	Occurring year round
Royal spoonbill	At Risk – naturally uncommon	Occurring year round and recently commenced breeding

In terms of its contribution to the city's biodiversity conservation initiatives, the restored habitats at Ōruapaeroa-Travis Wetland have already triggered the self-colonisation of more than a dozen wetland bird species. These include locally and regionally important populations of pūkeko, little black cormorant, Australasian bittern, royal spoonbill, paradise shelduck, grey teal, New Zealand shoveler, New Zealand scaup, marsh crake, spotless crake, South Island pied oystercatcher and pied stilt.

Management and habitat development to support bird populations

Maintenance and enhancement of bird populations at Ōruapaeroa-Travis Wetland require a combination of extensive and carefully refined habitat provision, good habitat condition, a low disturbance environment, and low levels of predation. Key wetland habitats (such as lowland wet grassland, permanent and ephemeral ponds, tall swampland, native bush and shrubland) are well provided for and should continue to be enhanced and managed for the key plant and wildlife species they support.

Recommendations for new habitat include further waterbody development - particularly deeper channels, wider moating, and provision of more permanent and ephemeral ponding. Installation of a small number of weirs and boards to control water levels would be useful in enabling a sequence of alternate flooding and drying cycles that coincides with the key life stages of birds across the year (e.g., high water levels in winter and during the breeding season, and low levels in the post-breeding period).

Optimal management of a transition zone between the southern end of Lake Kate Sheppard and the Otakaro-Avon River that allows for natural estuarine expansion to occur in-step with sea level rise also needs to be considered. Here the ecotone between saline tidal water from the river and freshwater from upstream will create a rich transition zone that progresses from saltmarsh to freshwater swampland, to shrubland and eventually to native forest. This will be a rich area for birdlife. It will likely attract many species to feed and roost and also attract water birds that nest in large colonies such as Royal Spoonbill, Black Cormorant, Pied Cormorant, Little Cormorant, Little Black Cormorant, Pied Stilt and Black-billed Gull.

Another key factor in ensuring Ōruapaeroa-Travis Wetland's integrity as a core site for authentic biodiversity in Christchurch is the need to manage the movement of people within the reserve. Providing good opportunities for nature observation and recreation within the site needs to also minimise wildlife disturbance. This would ideally be achieved by delineating and maintaining activity zones that include undisturbed refuge areas (e.g., in the centre of the wetland) that are not accessible to the public.

Predators occurring at Ōruapaeroa-Travis Wetland are not limited to just introduced wild and domestic mammals but also include a range of avian predators (Swamp Harrier, Magpie, Pūkeko, gulls, kingfishers and herons), and fish - especially eels. Indeed, the avian predators listed above are likely an equal, if not *greater* predation threat to nests and young of birds breeding within the reserve than mammalian predators. For example, the predatory behaviour of a night roost of up to ten Swamp Harrier within the site was likely one of the key reasons that the first attempt at reintroducing Brown Teal failed.

Future assisted or natural reintroductions of avian predators like New Zealand Falcon, morepork and buff weka may increase this level of predation. Therefore, although providing the extensive high-quality habitat that supports high breeding productivity is likely an ecologically optimum outcome for Ōruapaeroa-Travis Wetland, predator control also remains a significant consideration.

Bird species reintroductions

As highlighted earlier in this report, following the red-zoning of large parts of the Ōtākaro-Avon River corridor, there is now a unique opportunity to expand the scope of the management area by encompassing the red zone land immediately to the south of Travis Road to link with the Ōtākaro-Avon River. With this increased size, age and level of pest control in established nearby habitats, the site will soon be ready to receive and support reintroductions of native bird species that are unable to naturally recolonise on their own.

Only species considered appropriate to the site should selected as candidates for reintroduction. Such species may be recommended from multiple perspectives, including their ecological authenticity to the site, chance of successful establishment, likelihood establishing as a viable population in the long-term, or as an authentic contribution to the city's biodiversity. Any wildlife reintroductions would be subject to population viability analysis and Department of Conservation (DoC) permitting and would unlikely extend to high conservation value species that have more stringent habitat requirements (e.g., kiwi, Takahe, Kakapo, Stitchbird etc.).

The initial focus between now and 2030 should therefore be on wetland birds, as the attributes of the receiving habitats are largely ready for these reintroductions to take place immediately. Following this, bush birds released as either focused reintroductions to Ōruapaeroa-Travis Wetland, or as part of a wider Red Zone and/or citywide programme could be considered. Species could include various native bush birds that could likely survive in relatively small and relatively young habitat patches such as South Island Tomtit, Brown Creeper and Rifleman. Species considered suited for future reintroduction are listed in Table 4 below. Others, such as Tui and Kereru will likely self-colonise from populations elsewhere in the city and Port Hills as they build up and disperse across the landscape.

Table 2: *Native bird species identified as candidates for reintroduction to Ōruapaeroa-Travis Wetland.*

Species Name	Threat Rank	Notes
New Zealand Dabchick	Threatened – Nationally Increasing	
Brown Teal	Threatened – Nationally Increasing	
Buff Weka[2]	At Risk – Relict	
Banded Rail	At Risk – Declining	
South Island Fernbird	At Risk – Declining	
Morepork	Not Threatened	
South Island Rifleman	Not Threatened	
Brown Creeper	Not Threatened	
South Island Tomtit	Not Threatened	
South Island Robin	At Risk – Declining	
Tui	Not Threatened	

[2] Although buff weka is an authentic reintroduction candidate for Travis Wetland (and other sites in Canterbury), it may be problematic due to its potential predatory impacts on other indigenous wildlife.

By 2040, these reintroductions and self-colonisations should be well advanced, and the site's total bird list could have reached over 50 indigenous species with a total avifauna of close to 90 species. Therefore, in terms of eco-tourism potential, we consider that these species, along with other already established rare birds (E.g., Australasian Bittern and Marsh Crake) are likely to be key drawcards for the city. These species are often extraordinarily difficult to see elsewhere in Aotearoa-New Zealand, and Ōruapaeroa-Travis Wetland has the potential to become a *'must visit'* site for visitors with an interest in seeing them.

Monitoring

Bird surveys are a key method by which the ecological well-being of natural and human-created habitats within the greater Ōtautahi-Christchurch area can be monitored. Systematic monitoring of bird populations in Ōtautahi-Christchurch commenced in the mid-late 1980s, although the focus has been on wetland bird species. However, at Ōruapaeroa-Travis Wetland, both wetland birds and woodland birds have been and continue to be regularly monitored. Wetland bird and woodland bird monitoring protocols are included in Appendix 2.

Invertebrate values

Research carried out in 1998 by Macfarlane *et al.*[3] showed the diversity of invertebrate species found in Travis Marsh, compares well comparisons to other lowland herb to shrub communities investigated throughout the country. A total of 467 insect species have been documented in Travis Marsh, with 81% of these species being endemic and only 3% identified as clear vagrants. Among these species, approximately 40-70% are likely to be characteristic of marshes and wet pastures. The decline in manuka and raupo vegetation, as well as the disappearance of toetoe, has likely resulted in the loss of at least 10 insect species, with beetles being notable examples. Additionally, Travis Marsh is home to 55 other larger invertebrate species, including spiders, centipedes, millipedes, land-hoppers, slaters, snails, slugs, earthworms, and flatworms. Travis Wetland is also an important location for the Canterbury endemic Flightless Crane Fly *Gynoplistia pedestris* . For a full account of invertebrates at Ōruapaeroa-Travis Wetland, refer to Macfarlane *et al.* (1998).

[3] Macfarlane, R. P., Patrick, B. H., Johns, P. M., and Vink, C. J. (1998) *Travis marsh: invertebrate inventory & analysis.* Unpublished.

Aquatic ecology values

We have found that the aquatic invertebrate communities have improved since they were first surveyed in 1996 and 1998. Invertebrate biodiversity is now higher and is similar to what we would find in areas that have not undergone urban development.

A fish survey in 2008 revealed only two species of fish: shortfin eel and rudd (a pest fish often referred to as 'possums of the waterways'), while others had previously recorded inanga, common bully and smelt, and we also believe giant kokopu are probably present. During subsequent pest fish monitoring surveys, nine species of native fish have so far been recorded from Ōruapaeroa-Travis Wetland (Table 5). In 2008 we found seasonally low dissolved oxygen levels and high nitrate concentrations which may have prevented large populations of the other native fish establishing and thriving. It was thought that poor water circulation throughout the wetland may have been a cause of the low dissolved oxygen, which may also increase the likelihood of toxic cyanobacterial blooms[4]. However, we believe that water circulation has improved since the 2010/2011 earthquakes, and these issues may no longer be as significant.

The removal of the weir and flap valve connecting Lake Kate Sheppard to Ōruapaeroa-Travis Wetland at Hard Rush Corner likely played an important role in improving tidal flushing and water circulation in the wetland. This has also likely helped restore the important fish passage between the Otakaro-Avon River at the wetland via Lake Kate Sheppard.

Table 3: *Nine native fish species recorded at Ōruapaeroa-Travis Wetland since 2008.*

Species	Threat status
Tuna/ long finned eel (Anguilla dieffenbachia)	At Risk – Declining
Shortfin eel *(Anguilla australis)*	Not threatened -Not Threatened
Inanga *(Galaxias maculatus)*	At Risk – Declining
Upland bully -East Coast South Island *(Gobiomorphus breviceps)*	Not threatened - Not Threatened
Common bully *(Gobiomorphus cotidianus)*	Not threatened - Not Threatened
Giant bully *(Gobiomorphus gobioides)*	Not threatened - Not Threatened
Stokell's smelt *(Stokellia anisodon)*	At Risk - Naturally Uncommon
Black flounder *(Rhombosolea retiarii)*	Not threatened -Not Threatened
Lamprey *(Geotria australis)*	Threatened – Nationally Vulnerable

[4] Main, M., and Taylor, M. (2010) Aquatic Ecology of the Travis Wetland. Aquatic Ecology Ltd.

Threats to biodiversity

Pest plants

The Christchurch City Council prepares site-led pest plant programmes that detail the control of pest plant species for specified areas. The purpose of these programmes is to aid in the management of pest plant species within areas of high ecological value such as Ōruapaeroa-Travis Wetland. Site-led programmes are intended to be used alongside species-led pest plant programmes that are produced annually for high priority species within Christchurch City.

Pest plant problems have played a major role at the site. These have comprised many that were part of the farming period, and others that have arrived or expanded since the change from farming to conservation. Many of these pest plants have threatened to deflect the desired outcomes of the native plantings, so control is of great importance. A list of 20 high, medium and low priority pest plants is provided in Appendix 3, along with comments on their past and future approach to their management.

Any new pest plant incursions or unknown plant species within the site should be reported to the Christchurch City Council Parks Biodiversity team for identification and advice. Detailed species identification information on pest plants can be found either within species-led programmes or from Environment Canterbury's 'weed of the month' guides. http://ecan.govt.nz/publications/Pages/weed-month-common.aspx

Spray-free area

Prior to 2016, the Ōruapaeroa-Travis Wetland Trust and the Christchurch City Council jointly determined to designate four specific zones within the reserve as 'spray-free' areas. This decision aimed to safeguard delicate biodiversity values that were considered too vulnerable to the potential risks associated with herbicide spraying. However, due to the maturing and thinning of the vegetation canopy in three of these areas, exotic grasses began to invade, necessitating the use of herbicide for weed control. The fourth site, which remains herbicide-free, encompasses the manuka and fen area (Figure 4) and contains remnants of the original plant species and their ecological associations.

Figure 4: *Designated spray free area at Travis Wetland to protect sensitive plant species from herbicide effects.*

Beggar's ticks

Beggar's ticks, a common weed found in along water bodies and wetlands, poses a threat to areas with native vegetation of low stature. While it used to be actively controlled throughout Travis Wetland, previous efforts proved ineffective, resulting in a change of approach. Currently, active control is limited to the Manuka area, where hand pulling is employed. However, in suitable areas where managers aim to maintain short sward grassland, sheep grazing has been implemented as a method to control beggar's ticks. To aid in the eradication of beggar's ticks from specific sites, three key areas (Figure 5) spanning over 11 hectares have been identified for mass plantings of *Carex secta*, serving as a tool to combat the weed and promote native species.

Figure 5: *Areas of Ōruapaeroa-Travis Wetland suitable for mass planting of Carex secta as a tool to control beggar's ticks.*

Additionally, in other areas, Rangers are working to encourage the reduction of low-growing weedy wetland vegetation, primarily consisting of exotic sedges such as *Carex flacca* and *C. leporina*. The goal is to subsequently replace these species with taller native species like *Carex secta*, with the expectation that these plants will outcompete exotic species, including beggar's ticks.

Note: This method could also be applied to other invasive wetland weeds that are too widespread to be controlled by conventional methods, like using herbicide.

Pest animals

Halting the on-going decline of indigenous biodiversity is a matter of national importance. The Te Mana o Te Taiao - Aotearoa New Zealand Biodiversity Strategy 2020 sets the statutory imperative to achieve this with the key objective of maintaining and restoring a full range of remaining natural habitats, ecosystems and viable populations of indigenous species. It identifies that invasive pests pose the greatest single threat to indigenous biodiversity, and includes goals, objectives and actions intended to address this threat.

Councils have a core statutory obligation under the Resource Management Act 1991 (RMA) to protect and maintain indigenous biodiversity on Council land. Managing pests is also important to maintain the operational integrity of core council assets and infrastructure. The Biosecurity Act 1993 requires councils to control organisms declared as pests in Regional Pest Management Strategies on land that they occupy and to meet the costs of doing so. Managing pest animals is also important to maintain the operational integrity of core park assets and infrastructure, and managing these pest animals is an essential part of the ongoing work required to maintain and enhance Ōruapaeroa-Travis Wetland as a core habitat for flora and fauna.

Figure 6: *Norway rat (Rattus norvegicus)*

Council's Operational Pest Animal Management Plan sets the priority levels described in Table 6 for control of pest animals in key ecosystems across the city. Ōruapaeroa-Travis wetland comprises three key ecosystems: 1) indigenous forest & shrubland, 2) freshwater waterways and wetlands, and 3) wet grasslands with significant bird values. Levels for pest animal control in these three ecosystem types are shown in Table 7 (below). In order for Ōruapaeroa-Travis Wetland to maintain and exceed its role as a top tier site for breeding/wintering birdlife and other biodiversity, it is recommended that pest animal control levels are set higher than the general level for the relevant habitat types.

Figure 7: Weasel (Mustelo nivalis)

Table 4: *Priority levels and descriptions for control of pest animals as set out in Councils Pest Animal Management Plan (Parks).*

Control level	Action required
Total Control - all sites	Eradicate all individuals of a pest animal species at all sites as soon as possible
Total Control - selected sites	Eradicate all individuals of a pest animal species at selected sites as soon as possible
Progressive Control - all sites	Control all individuals of a pest animal species at all sites, aim for eradication over medium term
Progressive Control - selected sites	Control individuals of a pest animal species at selected sites, aim for eradication over medium term
Containment Control - all sites	Control all individuals of a pest animal species at all sites, aim to contain spread immediately and reduce population over long term
Containment Control - selected sites	Control all individuals of a pest animal species at selected sites, aim to contain spread immediately and reduce population over long term
Restricted	Do not release or allow to escape. Observe establishment and spread. Control if necessary.
No control	Control not currently required

Table 5: *Proposed levels of control for pest animals in three key ecosystem types at Ōruapaeroa-Travis Wetland.*

Common name	Control levels recommended for Ōruapaeroa Travis Wetland
Feral rabbit	Progressive control
Possum	Containment control
Hedgehog	Progressive control
Feral cat	Restricted
Ferret	Containment Control
Stoat	Containment Control
Weasel	Containment Control
Norway rat	Containment Control
Ship rat	Containment Control
House mouse	No Control
Brown hare	Restricted

An intensive pest animal control programme has been in place at Ōruapaeroa-Travis Wetland for more than a decade. This is managed by the park rangers and involves deployment of 164 DoC 200 box traps, as well as 220 bait stations. Between October 2012 and May 2023, some 1562 pest animals were caught, including:

- 1302 Norway/ship rats (83.3%)
- 200 hedgehogs (12.8%)
- 47 weasels (3.0%)
- 11 stoats (0.70%)
- 2 ferrets (0.13%)

Rats (Figure 8) - and to a lesser extent hedgehogs (refer Figures 9 & 10) - are the primary mammalian predators on site. It is notable that mustelids (see also Figure 9), that are such tenacious predators of birds and other wildlife in many habitats across New Zealand, comprise such a small proportion of the mammalian predator community at Ōruapaeroa-Travis wetland. A total of just 60 mustelids were caught over 10+ years, comprising just 3.8% of total mammals caught. The only two ferrets ever encountered in the wetland were both caught in traps in March 2021, which was an especially dry season. Otherwise, the site seems to be generally too wet to be attractive habitat for ferrets. Consequently, rabbits (important prey for mustelids) are also rarely seen in Ōruapaeroa-Travis Wetland and hares have not yet been recorded.

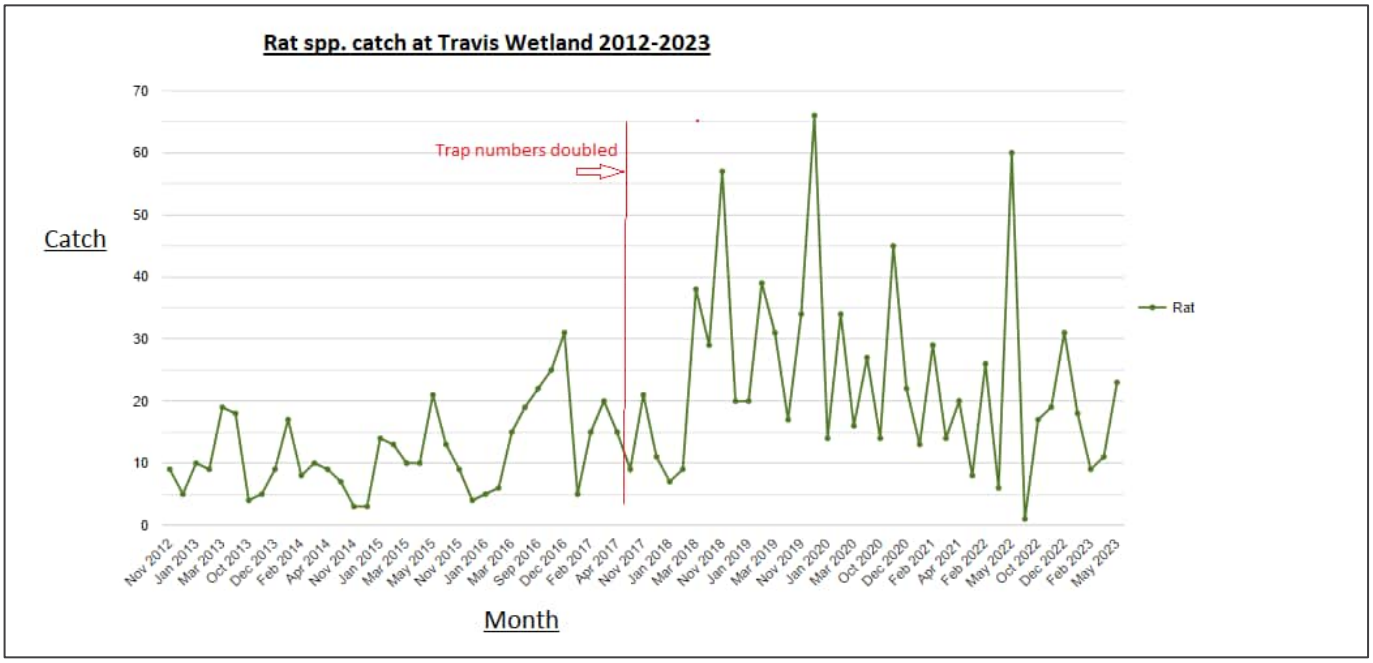


Figure 8: *Trap catch data (21012 – 2023) for rats at Travis wetland.*

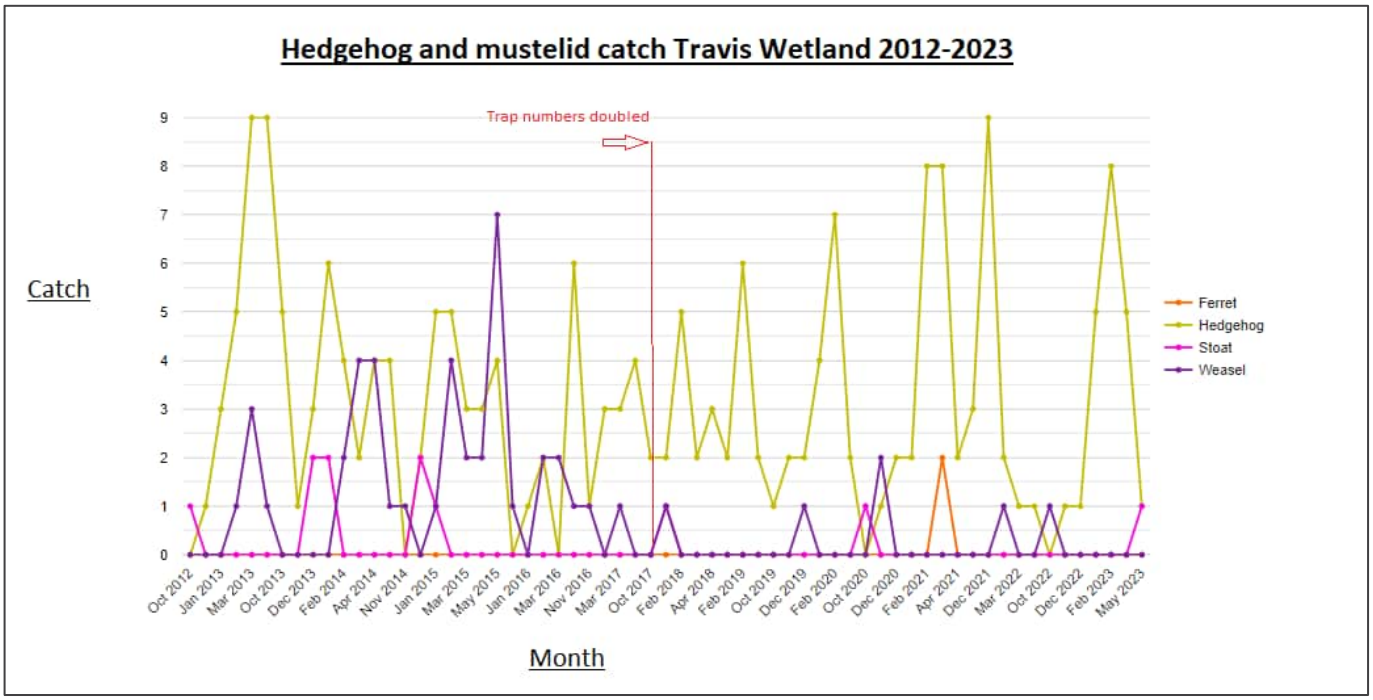


Figure 9: *Trap catch data (2012 – 2023) for hedgehogs and mustelids at Travis Wetland.*

Hedgehogs have shown to be the second highest species in the trap catch numbers. They represent a threat to the ground nesting birds of Travis Wetland, however, are largely limited to the dryer areas of the site as shown by the 'heat map' of catches shown in Figure 10.

Figure 10: *Heat map of hedgehog trap catch data (2012 – 2023) fir Travis Wetland showing catches largely limited to the drier areas of the site.*

Possums are present throughout the wetland and were the target of focused control efforts in 2018 and 2019. Densities now appear to low and are suppressed by maintenance trapping during winter.

Cats are not targeted by kill traps at Ōruapaeroa-Travis Wetland so their omission within the trap data set is problematic. General observations and focused research (including transmitter tagging and monitoring with trail cameras) indicate that cats commonly occur within a wide zone around the wetland periphery, as well as at locations deep inside the interior. Waterways, ponded areas and seepages do not seem to be delivering the moating deterrent to roaming domestic cats that their design hoped for, and some new initiatives are therefore required.

Pest Fish

Council rangers have worked with the Department of Conservation to monitor and control pest fish at Travis Wetland for over a decade. There have been no recent confirmed sightings of rudd, a species once present in the central pond areas at Travis (See Figure 11).

Despite this success, ongoing vigilance is crucial. Rudd are a significant threat to our waterways and are prolific breeders that outcompete native fish and can destroy entire aquatic ecosystems. As they mature, they prefer to graze on native aquatic plants, which are critical habitats and spawning grounds for indigenous species. This heavy grazing can lead to severe habitat loss, bank erosion, and overall environmental degradation.

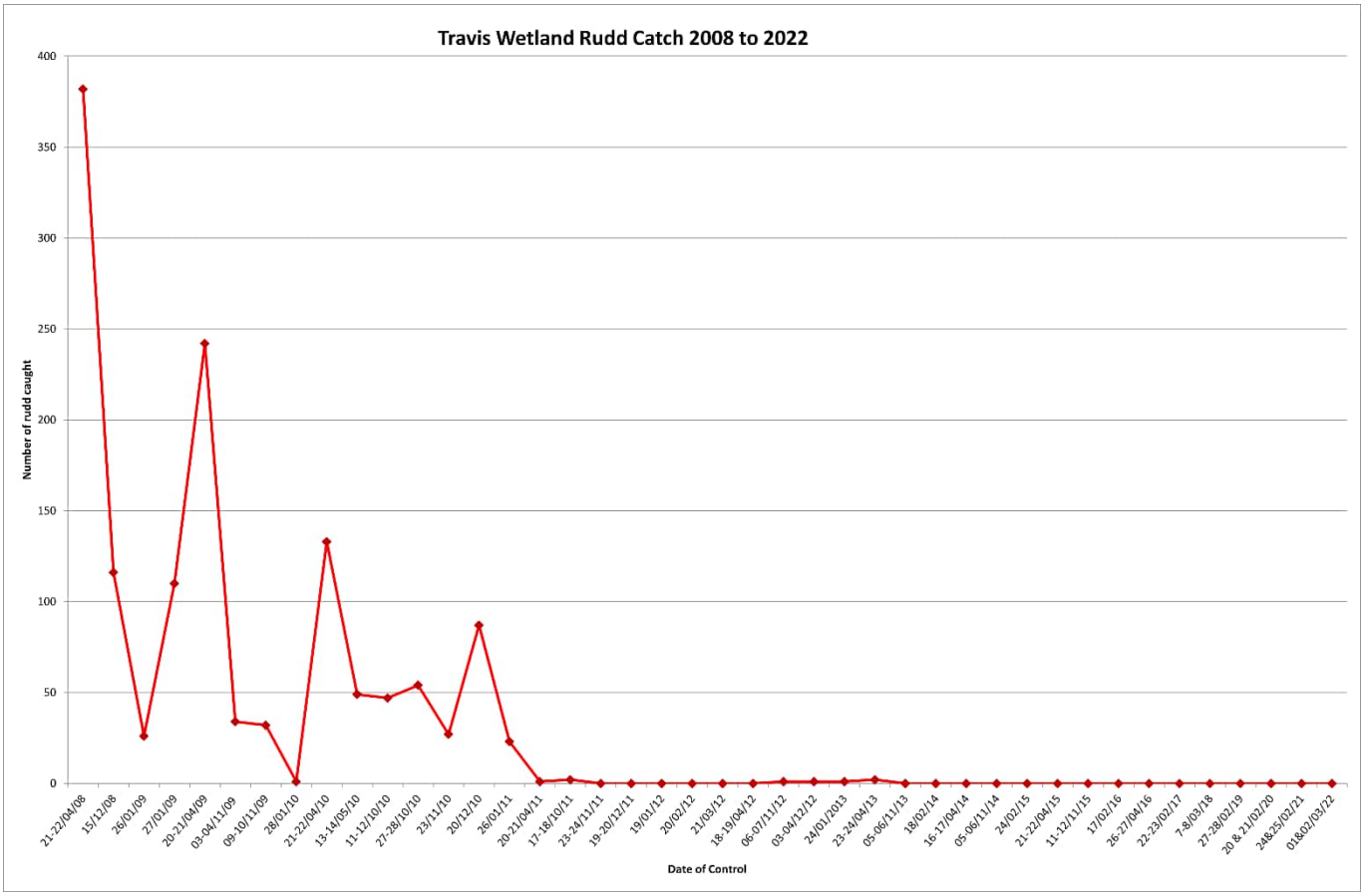


Figure 11: *Rudd catches at Ōruapaeroa-Travis Wetland, 2008 – 2022.*

Continued surveillance[5]

The feeding habits of Rudd also directly impact water quality. They stir up sediment from the bottom of waterways, increasing turbidity and making the water murky. This not only hinders the growth of native plants by blocking sunlight but also creates an environment where invasive species can thrive.

To prevent the re-establishment of Rudd and other potentially invasive aquatic fish species, annual surveillance of the main ponding areas at Travis Wetland is essential. The preferred approach to monitoring is to carry out EDNA sampling of waterway areas within Travis every two years. If the presence of pest fish is detected, then follow up surveillance using nets should be undertaken. Rangers can detect any new presence of these pest fish early, ensuring a rapid and effective response to protect the health of the wetland.

[5] **Note:** Christchurch City Council holds further information on pest fish surveillance at Ōruapaeroa-Travis Wetland which can be made available on-request (Internal filing references TRIM16/963549, and TRIM23/302674).

Wildlife Disturbance

Many bird species occurring at Ōruapaeroa-Travis Wetland are susceptible to disturbance. This may be both direct physical disturbance and also more subtle disturbance like noise, dust, smoke, vibrations, etc. Disturbance can lead to cascading effects from simple activity cessation and vigilance behaviour, to becoming alarmed, moving away, flying a short distance, flying a longer distance, leaving a site and even to permanent avoidance where disturbance-sensitive species do not return and become permanently displaced. In order to allow people to enjoy a diverse wildlife spectacle at Ōruapaeroa-Travis Wetland we need to find ways to convey the movement of people and offer excellent wildlife viewing opportunities, without making the birds aware that people are there, or at least making them expect that people will not break out of the network of tracks and viewing locations where almost all human activity is confined. To this end, pathways and viewing points at Ōruapaeroa-Travis Wetland can generally be screened by lines of vegetation (E.g., dense shrubs, flax, pukio sedge) or through the use of installations such as hides, lookout towers, and viewing walls.

People (pedestrians, cyclists & dog-walkers)

The proximity of people, visibility, activity, predictability and the direction in which human disturbance is projected, are all factors in how birds will react. Generally, the closer, the more energetic and the less predictable the human activity, the more alarming it is to birds. While the more distant, less visible, and more predictable activities (such as people walking slowly along a partially screened path) the more relaxed and less prone to a flight response the birds will be.

A key component in attracting a rich and diverse bird population to Ōruapaeroa-Travis Wetland and to provide an opportunity for people to view this wildlife is to minimise the "disturbance footprint" of humans. It is relatively easy to achieve this for people walking, standing and sitting, but extremely difficult for people moving at a faster pace on bicycles, scooters or motorbikes, and almost impossible when dogs are present. For these reasons, all bikes, scooters and motorbikes have been prohibited, as are dogs on or off the lead. Because of the disturbance to wildlife and possible inadvertent damage to vegetation, public access at Ōruapaeroa-Travis Wetland is limited to formed pathways and public grassed areas. Permission is required from the park rangers for individuals to venture beyond these areas.

Dogs

Dogs cause disturbance to birdlife, both from their behaviour (E.g., running, chasing, barking, attacking wildlife), as well as their simple presence on the edge of a wildlife habitat. Birds perceive dogs as predators and will react fearfully even if a dog does not take notice of them. Also, dogs react to a surge of irresistible stimuli when in a wild environment including visual, sounds and scents. They eagerly follow scent trails of birds, cats and wild mammals through habitats and can catch and kill wildlife as well as seize nests/chicks/ducklings or cause parent birds to desert their young. For these reasons, dogs have always been prohibited from Ōruapaeroa-Travis Wetland.

Drones

Drones have potential to disturb birdlife and livestock and are generally prohibited by the CCC Drone Bylaw from operating over Ōruapaeroa-Travis Wetland. Permission can be granted for special purposes such as survey work.

Motor Vehicles

Only authorised vehicles are permitted within Ōruapaeroa-Travis Wetland outside of the carparks and access road. Vehicles damage vegetation and soft ground and also disturb wildlife.

Construction & Maintenance Activity

During the bird breeding season, construction, maintenance and planting activities should use best practise to avoid disturbing the nests and young of protected bird species. Decisions on how to best proceed will usually be based on a brief pre-works assessment by Ōruapaeroa-Travis Wetland ranger staff, but in the case of major projects, especially those requiring a resource consent, may require a Bird Management Plan (BMP) and a formal ornithological survey.

Mowing or other drain maintenance activity over the breeding season disturbs breeding. It can:

- Cause adult birds to panic and desert their nests or young,
- Lead to inadvertent nest destruction, or
- Cause incubating birds to stay away from nests for too long whereby eggs either overheat or chill – and unbeknown to the parent birds, they waste a season incubating a clutch of dead eggs.

Under the Wildlife Act such disturbance is unlawful with heavy potential penalties.

Restoration zoning

To effectively manage the unique biodiversity and ecological values of Ōruapaeroa-Travis Wetland, it is beneficial to identify discrete management units within the site, even though the natural systems are interconnected (e.g., see Figure 11). In the original landscape development plan, various vegetation types were listed, including grazing marsh, tussock/reed swamp, sedge-rush marsh, kahikatea swamp forest, totara-matai hardwood forest, coastal bush, broadleaved swamp forest, and manuka tall shrub swamp. These guidelines use these vegetation types as a foundation but also give importance to the aquatic aspects of the wetland, such as lakes, ponds, waterbodies, ephemeral ponding areas, natural waterways, constructed moats, and drains. Consequently, the vegetation types mentioned above will be considered within three main groups:

1. **Ponds and waterbodies,**
2. **Wetlands, and**
3. **Forest & shrubland.**

Figure 12: *Aerial oblique view of Ōruapaeroa-Travis Wetland illustrating the interconnectedness of waterbodies, wetlands and forest (Source: Christchurch City Council 2021).*

Ponds and waterbodies

Ponds and waterways (E.g., Figure 12) form the framework around which many of the plant communities have developed, and also around which birds, fish and invertebrates find favoured and specialist niche habitats.

Six important waterbodies or waterbodies within Ōruapaeroa-Travis Wetland (see Figure 13) will be discussed separately in this section. They include:

1. **Central ponding area,**
2. **Backwater Lagoon,**
3. **Hard Rush Corner,**
4. **ANZAC Drive Wetland,**
5. **Lake Kate Sheppard, and**
6. **Natural waterways & moats.**

Figure 13: *Central ponding area at Ōruapaeroa-Travis Wetland (Photograph, A. Crossland 2021)*

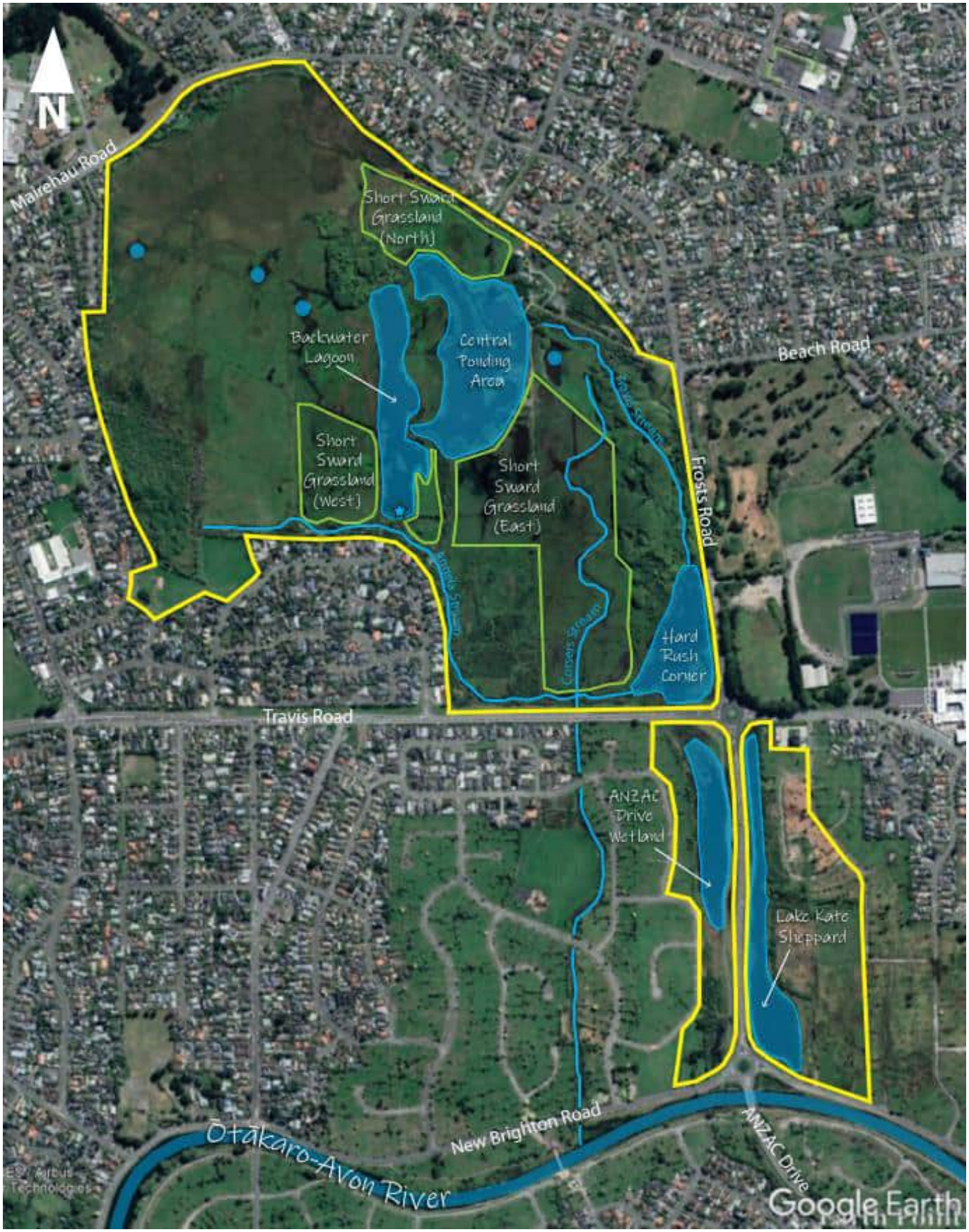


Figure 14: *Aerial photograph of Ōruapaeroa-Travis Wetland showing key waterbody types (Blue stars indicate locations of significant pools & seepages). Note that the two areas of grazing marsh within the Otakaro-Avon River Corridor (OARC) at the southern end of the site are out of scope of this report but have been included for context.*

Central ponding area

The central ponding area covers approximately eight hectares, including more than four hectares of open water. The central ponding area is perhaps the most significant landscape feature of the park in terms of its visibility and accessibility to the public. The main waterbody is flanked on all sides by extensive stands of pukio sedge, raupo and planted lowland podocarp forest. It is therefore relatively well screened from the public and supports healthy populations of water birds that are easily viewable from a well-designed and integrated bird hide and interpretation feature (Figure 14). From here, black swan, grey teal, paradise shelduck, Australasian shoveler, NZ scaup, kingfisher, Australasian harrier and little pied cormorant are just some of the indigenous water birds that can be regularly seen feeding, roosting or loafing on the water.

Figure 15: *Aerial oblique view of the main central ponding looking north towards the bird observation hide (left) and the interpretation shelter (top right).*

Actions

Maintain & enhance screening: Planting between the public walkway and the pond is some of the most mature planting in the park. Throughout most of its length the planting provides a good buffer that effectively reduces disturbance to wildlife from human activity. However, in places the forest understorey has become clear as trees have matured, and this has resulted in clear views through to the lake which has the potential to result in disturbance of wildlife. To mitigate this situation, reserve managers shall ensure new understorey planting is composed of species capable of quickly re-establishing screening, and any future enhancement work must avoid opening up large areas of understorey.

Replace roosting features: Large diameter hardwood logs and woody material has been incorporated in and around the pond margins to provide fine-scale habitat features for water bird roosting – most notably grey teal (Figure 15) and little pied cormorants. Rangers shall work with the Council's ornithologist to install additional roosting (and nesting) features, and also ensure that any existing features are replaced once they decay to the point that they are no longer being used. Consideration needs to be given to how sites for new roosting features (and replacement features) can be accessed, and opportunity should be taken to take advantage of recently cleared areas through the existing screening vegetation while they still remain relatively clear (refer above).

Figure 16: *Grey Teal on roosting features around the margins of the central ponding area. These features are to be replaced over time as they begin to decay.*

Foster natural regeneration: Due to the age of the plantings surrounding the ponds, natural regeneration of a range of tree and shrub species – including totara - is beginning to occur in the understorey of older plantings. Park manages will now need to modify their forest management practices in these areas to support this natural regeneration. These practices are likely to begin to entail lower levels of management that will be limited to treatment of selected weed species that are known to hinder natural regeneration. With this approach, the public are likely to notice a drop in maintenance standard, and therefore the reasons for this change in management approach should be clearly communicated through novel on-site interpretation.

Introduce secondary planting: Within the mature vegetation around the pond margins, work with Council's botanist to develop a staged plan for establishing appropriate indigenous plant species that require frost, wind and/or sun protection, or require established vegetation as a support structure (e.g., vines such as native clematis, bush lawyer, jasmine).

Manage pest fish: Continue to monitor for and strive to eradicate pest fish from the central ponding area.

Item	Staging	Funding
Manage water levels	Short term	Capital
Maintain & enhance screening	Ongoing	Operational
Replace roosting features	Medium term	Capital
Foster natural regeneration	Ongoing	Operational
Introduce secondary planting	Ongoing	Capital
Manage pest fish	Ongoing	Operational
Control aquatic weed (if any)	Ongoing	Operational
Weed control	Ongoing	Operational

Backwater Lagoon

Backwater Lagoon (Figure 16) spans an area of roughly six hectares, with approximately three hectares consisting of open water. This lagoon is effectively concealed and typically not accessible to the public, providing an excellent undisturbed habitat for a diverse array of waterbirds.

Figure 17: *Backwater lagoon looing northwest.*

Actions

Manage water levels: An improved ability to raise and lower water levels will enable a sequence of alternate flooding and drying cycles that coincides with the key life stages of birds across the year (E.g., high water levels in winter and during the breeding season, and low levels in the post-breeding period). Although this may be able to be achieved with a simple weir structure, determining how best to achieve these desired water levels will entail engaging a water-environmental engineer.

Replace roosting features: As described for the central ponding area above, large diameter hardwood logs and woody material shall be incorporated into the waterbody and its margins and replaced once they decay to the point that they are no longer being used by waterbirds.

Item	Staging	Funding
Manage water levels	Short term	Capital
Replace roosting features	Medium term	Capital

Hard Rush Corner

Hard Rush corner on the corner of Travis Road and Frosts Road consists of a two-hectare open waterbody flanked by sedges, rushes and stands of inundated crack willow trees the support a roosting and nesting colony of Royal Spoonbills (Figure 17). This waterbody is a significant landscape feature of Ōruapaeroa-Travis Wetland, as it is highly visible from the busy Travis Road intersection.

Figure 18: *Royal Spoonbill colony in dying willows at Hard Rush Corner*

Actions

Maintain views from Travis Road: The large ponding area at Hard Rush Corner is viewable from Travis Road near the Frosts Road/ANZAC Drive intersection and provides a significant 'shop window' to Ōruapaeroa-Travis Wetland. This view is enhanced further by the presence of a Royal Spoonbill nesting colony in dead willow trees near the centre of the lake. Vegetation along the Travis Road interface shall be managed in such a way that this view is maintained.

Willow management: Collaborate closely with the Council ornithologist to ensure the proper management of willows, maintaining their role as roosting and nesting sites for wildlife while also contributing to the aesthetic appeal of the wetland. The long-term goal is to eliminate willows from Ōruapaeroa-Travis Wetland. However, where they offer valuable benefits to wildlife, they will be preserved until native species can fulfil the same ecological functions.

Interpretation: Design and installation of interpretation panel on Travis Road frontage to highlight the significance of Royal Spoonbills in the context of Ōruapaeroa-Travis Wetland. Information could include life history, breeding biology, worldwide distribution and habitat requirements etc.

Item	Staging	Funding
Maintain views from Travis Road	Ongoing	Operational
Willow management	Medium term	Capital
Interpretation	Short term	Capital

ANZAC Drive wetland

This wetland area (Figure 18) runs the length of the western side of ANZAC Drive between Travis Road and New Brighton Road. Originally planned as an area of kahikatea dominated forest, the site has become increasingly wet. It is now dominated by an approximately two-hectare open waterbody towards its northern end, and in the south, it transitions through reeds & rushes and into planted indigenous shrubland and coastal forest habitat. At the extreme north of the site, a stand of large crack willow trees amongst dense stands of raupō and rushes has been poisoned but continues to provide important water bird roosting and an aesthetic 'sculptural' value.

Figure 18: *ANZAC Drive wetland looking towards the Travis Road/Frosts Road intersection (Photograph A. Crossland 2007).*

Actions

Management agreement: Management of this area requires coordination between the Parks Residential Red Zone (RRZ), Regional Parks, and Parks Ecology teams. The RRZ team handles daily operations, while the Regional Parks team provides technical assistance with things like weed management, pest control, wildlife monitoring, and habitat management.

Enhance screening: Increase planting between ANZAC Drive cycleway and wetland to minimise wildlife disturbance whilst allowing strategic viewing points for the public. Screening should also be managed to minimise the effects of artificial light on sensitive wildlife.

Manage willows: Work closely with Council ornithologist to ensure willows are appropriately managed so that they continue to provide roosting and opportunities for wildlife and provide a 'sculptural' aesthetic whilst taking into account any public safety considerations.

Integration with OARC: Council ecologists to work closely with OARC team to ensure habitat restoration within the former Red Zone provides optimal outcomes for biodiversity and complements those values being managed for across the wider Ōruapaeroa-Travis Wetland area covered in this document.

Transition to tidal wetland: Investigate a range of opportunities for the gradual transition of the wetland from freshwater to a tidally inundated coastal wetland with increasing levels of salinity. This will necessitate reviewing the operation of the existing culvert beneath New Brighton Road, and ensuring expansion of the tidal wetland to the west into the former Red Zoned land is able to be planned for and facilitated.

Predator proof fence: Ensure that any design, habitat enhancement or other site developments takes into account a possible alignment for a section of predator proof fence along the western edge of the ANZAC Drive shared cycleway as part of the proposed Waitakiri Eco-sanctuary initiative.

Item	Staging	Funding
Management agreement	Short term	Operational
Enhance screening	Short term	Capital
Manage willows	Ongoing	Operational
Integration with OARC	Ongoing	Operational
Transition to tidal wetland	Medium term	Capital
Predator proof fence (planning)	Short term	Operational

Lake Kate Sheppard

Located on the eastern side of ANZAC Drive, Lake Kate Sheppard (see Figure 13) consists of almost 2.5 hectares of open water flanked by dense stands of harakeke, sedges, rushes, cabbage trees and a mix of native trees and shrubs to form a narrow band of coastal forest and shrubland. These plantings provide excellent screening along ANZAC Drive, and wide gaps in the plantings along the less-busy New Brighton Road provide views to the lake. Near the centre of the southern part of Lake Kate Sheppard, a stand of submerged willows provides an important and undisturbed roost for cormorants, herons and other waterbirds (Figure 19).

Figure 19: *Lake Kate Sheppard viewed from New Brighton Road. Note dense planting along ANZAC Drive (rear left) and semi-submerged willow roost tree at centre of lake.*

Where Lake Kate Sheppard meets the Ōtākaro-Avon River, the freshwater wetland ecosystems begin to interface with the tidal reach of the river. Here, sea level rise will continue to influence the inland/upstream migration and ecotone between tidal saltmarshes and freshwater wetlands. However, unless the Ōtākaro-Avon River Corridor Regeneration Plan option of relocating ANZAC Drive further to the east is implemented, the transition zone is likely to be confined to the current area of Lake Kate Sheppard and some of the immediately adjacent Red Zone land. Although very unlikely in the short to medium term, should Council and NZTA one day decide to relocate ANZAC Drive, this could create a contiguous tidal wetland exceeding 25 hectares and which merges seamlessly with extensive restored native forest and shrubland ecosystems. From a wildlife perspective, this would present opportunities for fish (including Inaka spawning and flounder) and birds as a location for feeding and roosting, and also as a breeding location, particularly for species that nest in colonies. However, currently areas east of Lake Kate Sheppard are designated for restoration as native coastal forest, alongside compatible nature-based recreation, as part of the OARC regeneration programme

Actions

Management agreement: Management of this area requires coordination between the Parks RRZ, Regional Parks, and Parks Ecology teams. The RRZ team handles daily operations, while the Regional Parks team provides technical assistance in areas of (e.g.) weed management, pest control, wildlife monitoring, and habitat management.

Transition to tidal wetland: Investigate a range of opportunities for the gradual transition of Lake Kate Sheppard from a freshwater lake to a tidally inundated coastal wetland with increasing levels of salinity. This will necessitate reviewing the operation of the existing culvert beneath New Brighton Road and ensuring that State Highway 74 (ANZAC Drive) is not compromised.

Fine-scale habitat and roosting features: Design and install roosting features in main lake area so that roosting opportunities continue to be provided if and when the existing semi-submerged willows die and collapse. Incorporate logs and stumps around the periphery of the lake for water bird roosting, nesting, hunting, courting and territorial defence.

Pest plant control: Monitor for and control biodiversity pest plants throughout the site – particularly yellow flag iris and grey willow.

Item	Staging	Funding
Management agreement	Short term	Operational
Transition to tidal wetland	Medium term	Capital
Fine scale habitat & roosting features	Medium term	Capital
Plant pest control	Ongoing	Operational

Natural waterways and moats

Ōruapaeroa-Travis Wetland consists of a complex network of natural waterways, drains, and constructed moats (E.g., Figure 20). Towards the southern and south-eastern parts of the wetland, Angela Stream, Corsers Stream, and Travis Stream converge at Travis Road and southward through the downstream reach of Corsers Stream to join the Otakaro-Avon River. Elsewhere, a series of former farm drains have been transformed into natural linear waterbodies that are now flanked by sedge-rush marsh plant communities and are an ecologically valuable environment.

Figure 20: *Waterbodies at Ōruapaeroa-Travis Wetland provide moats to prevent/restrict people, dogs and cats from accessing high value ecological areas (Photograph A. Crossland 2006)*

Actions

Assess how moats are functioning: A series of moats were installed as a means to prevent people, cats and dogs from accessing the interiors parts of the wetland. For various reasons it is thought that these moats no longer function to their full potential, and it is timely that they are assessed and where possible remediated and/or extended. This may include removal of any 'bridges' created by fallen trees and branches.

Establish authentic riparian ecosystems: Work with freshwater ecologist to assess natural waterways & moats and develop strategies to restore authentic riparian vegetation sequences.

Assess and remediate any fish barriers: Work with freshwater ecologist to assess natural waterways & moats for potential barriers to fish passage and remediate.

Item	Staging	Funding
Assess and remediate moats to offer better levels of protection	Short term	Capital
Authentic riparian restoration	Medium term	Capital
Assess and remediate any fish barriers	Short term	Capital

Wetlands

For the purpose of these biodiversity management guidelines, we define five types of wetlands at Ōruapaeroa-Travis Wetland, but noting that they are in a constant state of transition as (e.g.) sedges move into the rank wet grasslands and harakeke moves into sedge-rush marshes where sedges are also displacing rushes. These five wetland types are listed below (and see Figure 22), and noting that some other areas (E.g., the tussock-red swamp surrounding the central ponding area and backwater lagoon) have been discussed earlier in the ponds and waterbodies section of the report.

1) **Short sward grassland,**
2) **Sedge-rush marsh,**
3) **Rushland,**
4) **Raupo, and**
5) **Rank wet grassland.**

Figure 21: *Raupo expanding into Carex secta sedge-rush marsh at Ōruapaeroa-Travis Wetland.*

Figure 22: *Aerial photograph of Ōruapaeroa-Travis Wetland showing key wetland areas.*

Short sward grassland

Ephemerally flooded wet paddocks at the southern end of Ōruapaeroa-Travis Wetland (Figure 23) and also in the northeast corner are characterised by low grazed pasture with scattered tussocks and rushes. These areas provide important habitat for (e.g.) pūkeko, stilts, Australasian harrier, gulls and paradise shelduck. This habitat once covered a significantly greater proportion of the park than it does today, however it has been significantly reduced as a result of native forest planting, natural expansion of raupo, tall rushes & sedges, and permanent inundation of areas following the 2010/2011 earthquake-induced land subsidence. As a result, the ability to provide this valuable wildlife habitat – particularly for pūkeko – is increasingly threatened.

In a habitat dominated by exotic short sword grass, vegetation control methods such as mowing and grazing can promote the spread of other invasive herbaceous weeds. Therefore, a careful review of these management techniques is needed to ensure they are not inadvertently encouraging the growth of invasive weeds.

Figure23: *Aerial oblique view of the wet paddocks looking southeast towards the Frosts Road/Travis Road intersection (top right), with the Frosts Road willow corridor forming the backdrop.*

Actions

Maintain winter pūkeko population: Maintain pūkeko population by retaining larger areas of grazing marsh and preventing these from reverting to taller vegetation through grazing and/or mowing as directed by Council's ornithologist.

Ecotones: Establish ecologically authentic ecotones between short sward wet grassland and planted native forest areas. Note that in establishing these eco-tone areas, we mustn't significantly reduce the area of short sward wet grassland.

Bird monitoring platform: Bird monitoring (refer Appendix 2) plays a crucial role in tracking wildlife populations over time, the results of which are used to inform management decisions. However, parts of Ōruapaeroa-Travis Wetland have become difficult to monitor due to vegetation growth, and a simple elevated bird monitoring platform that is not accessible nor used by the public is proposed in this this area.

Item	Staging	Funding
Maintain winter pūkeko population	Ongoing	Operational
Ecotones	Medium term	Capital
Bird monitoring platform	Medium term	Capital

Sedge-rush marsh

Sedge-rush marshes (Figure 24) cover extensive parts of Ōruapaeroa-Travis Wetland, particularly in the northern half of the reserve. These ecosystems are relatively self-sustaining, however grey willow is likely to be the main threat to these areas. Recently harakeke *(Phormium tenax)* has begun to spontaneously appear throughout this area and can be expected to continue to transform the site into a mosaic of harakeke, pukio sedge and raupo.

Figure 24 *Aerial oblique view of a typical sedge-rush wetland with scattered pools and harakeke that grade into tall manuka shrubland around the margins.*

Actions

Grey willow and woody weeds: Continue to carry out surveillance for grey willow and other woody weeds and carry out timely control. Additionally, it is imperative to control the extensive stands of grey willow within and on the periphery of Travis wetland (on council land), as these stands serve as a local seed source that contributes to the invasion of these dense sedge wetland areas.

In-fill unvegetated areas to control for beggar's ticks: Beggar's ticks can quickly invade bare ground, however by establishing dense sedges this weed can be prevented from invading. Therefore, the existing areas of sedge-rush wetland should be assessed by ranger staff and Council ecologists to assess if planting of dense *Carex secta* should be initiated.

Item	Staging	Funding
Ongoing grey willow and woody weed control	Ongoing	Operational
Carex planting to displace beggar's ticks	Short term	Capital

Rushland

Almost nine hectares of rushland immediately west of Backwater Lagoon (Figure 25) has developed from seasonally grazed marsh following the removal of grazing. This ephemerally flooded area is now dominated by sporadic rush species *(Juncus spp.).* These expanding rushland areas, which are no longer grazed, provide a model for the potential outcomes of further grazing retirement and reduced mowing.

Figure 25: *Rushland west of Backwater Lagoon in the rear ground. Photograph, Christchurch City Council 2021)*

Actions

Grey willow and woody weeds: Continue to carry out surveillance for grey willow and other woody weeds and carry out timely control.

Bird monitoring platform: Bird monitoring (refer Appendix 2) plays a crucial role in tracking wildlife populations over time, the results of which are used to inform management decisions. However large parts of Ōruapaeroa-Travis Wetland have become difficult to monitor due to vegetation growth, and a simple elevated bird monitoring platform (E.g., Figure 26) that is not accessible nor used by the public is proposed in this this area.

Item	Staging	Funding
Ongoing grey willow and woody weed control	Ongoing	Operational
Bird monitoring platform	Medium term	Capital

Raupo

In addition to the original remnant raupo stand at the at the northern end of the central ponding area (formerly Travis Drain), mot than 2.5 hectares of raupo has established in the north-eastern corner of Ōruapaeroa-Travis Wetland (Figure 26). This patch appears to be increasing in area as it spreads into the *Carex secta* dominated wetland immediately to the west.

Figure 26: *Raupo (Typha orientalis) wetland at the northeast end of Ōruapaeroa-Travis Wetland.*

Raupo wetlands are known for their high biodiversity, supporting a range of plant species, invertebrates, and microorganisms, contributing to the overall health and resilience of Ōruapaeroa-Travis Wetland. They provide habitat for a variety of native bird species, including the endangered Australasian Bittern and South Island Fernbird which rely on raupo for nesting, shelter, and foraging opportunities within wetland areas. Raupo wetlands also offers nesting sites, protection from predators, and a food source for waterfowl such as New Zealand Scaup, Grey Teal, and Paradise Shelduck.

Actions

Grey willow and woody weeds: Continue to carry out surveillance for grey willow and other woody weeds and carry out timely control.

Item	Staging	Funding
Ongoing grey willow and woody weed control	Ongoing	Operational

Rank wet grassland

An approximately ten-hectare area of rank wet exotic grassland is located towards the western side of the reserve (Figure 27). As discussed earlier in this report, this area is being invaded by the pest plant beggar's ticks, and to aid in the eradication of this species, the mass plantings of *Carex secta* across the site has been considered, serving as a tool out-compete the weed and promote native species. Currently the area has limited biodiversity value.

Figure 27 *Looking west across the ten-hectare rank wet grassland area on the western side of Ōruapaeroa-Travis Wetland.*

Actions

Grey willow and woody weeds: Continue to carry out surveillance for grey willow and other woody weeds and carry out timely control.

Carex planting: Plant extensive dense area of Carex secta across all areas of rank wet grassland as a means of outcompeting the weed beggar's ticks.

Item	Staging	Funding
Ongoing grey willow and woody weed control	Ongoing	Operational
Carex planting to control beggar's ticks	Short	Capital

Forest & shrubland

The forest and shrubland areas (E.g., Figure 28) within Ōruapaeroa-Travis Wetland are not as extensive as the wetlands and waterbodies in terms of overall area. Nevertheless, they are an important ecological feature of the reserve great importance within the reserve. These areas predominantly exist on the drier peripheries surrounding the wetland's core, making them the primary zones that visitors interact with. They serve as a picturesque backdrop for the reserve and provide valuable habitats for various wildlife, including bush birds and some waterbirds also.

Six forest & shrubland types within Ōruapaeroa-Travis Wetland (see Figure 28) will be discussed separately in this section. They include:

1) **Manuka tall swamp,**
2) **Frosts Road willow woodland,**
3) **Lowland podocarp forest,**
4) **Coastal bush,**
5) **Central willows area, and**
6) **Eco Action Nursery plantings.**

Figure 28: *Waterbodies, wetlands and shrubland flanked by planted native forest plant communities at Ōruapaeroa-Travis Wetland (Photograph, A. Crossland 2020)*

Figure 29: *Forest & shrubland types in Ōruapaeroa-Travis Wetland.*

Manuka tall shrub swamp

On the western side of Ōruapaeroa-Travis Wetland, one of only two naturally occurring manuka shrublands (Figure 30) in the Christchurch area has established on the fringes of the four-hectare crack willow and grey willow stand on the saturated peat and gley soil. The manuka, along with cabbage trees, toetoe mikimiki. Harakeke and Baumea reeds are gradually forming denser stands slowly expanding out from the edge of the shrubland/woodland.

As described earlier, outside of the willow area and amongst the wider manuka woodland area, several rare species are present as the only known natural occurrences in the Christchurch City environs. Some are naturally sparse among wetlands and are now especially rare across the Christchurch District and lowland Canterbury and often vulnerable to smothering by exotic species. Therefore, it is probably necessary for us to continue doing ongoing localised weeding - including thinning of dense baumea and fern in order for us to maintain the natural diversity of the wetland ecosystem generally, and to prevent smothering of the smaller rare species.

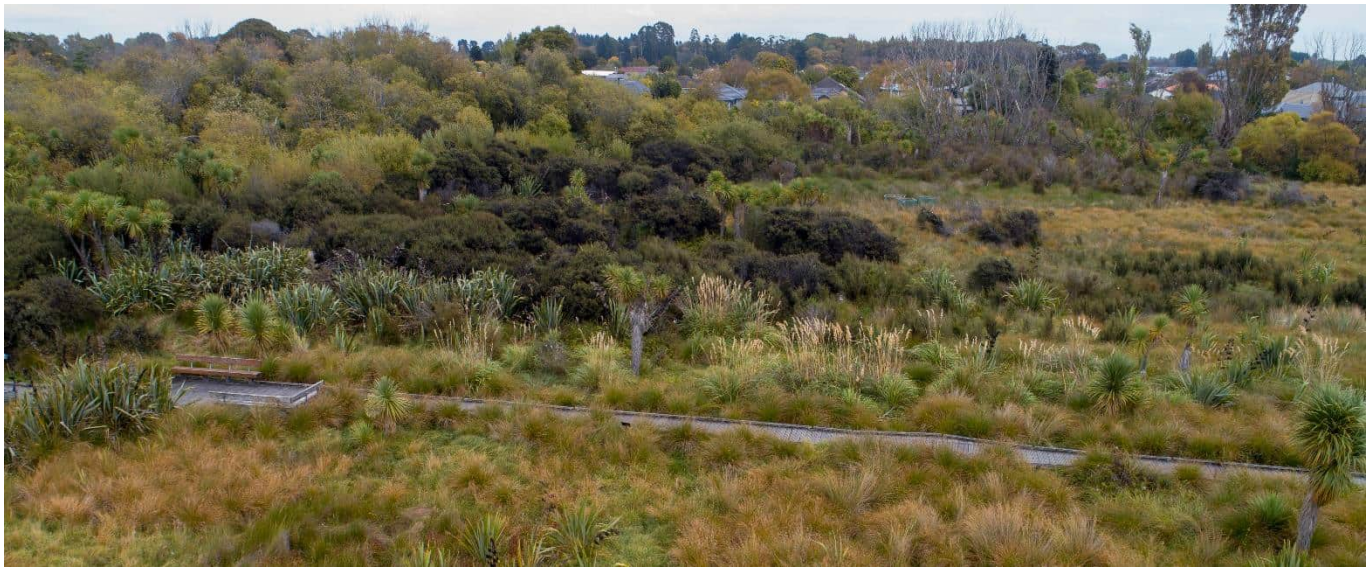


Figure 30: *Aerial oblique view of the Ōruapaeroa-Travis Wetland Manuka tall shrub swamp on west side of the park*

Actions

Crack & grey willow control: Progressively drill and poison crack and grey willow to chieve total eradication and continue to carry out surveillance and follow up control of grey willow and other woody weeds.

Establish authentic planting: The fine scale topography of the area will provide the basis for a mosaic of vegetation patterns that may include sedges, harakeke and kiokio fern that grade into mikimiki and manuka dominated shrubland and kahikatea dominated forest on areas of slightly higher ground.

Plant species reintroductions: Potential opportunities exist for us to re-introduce and/or translocate threatened plant species appropriate for Ōruapaeroa-Travis Wetland and have been outlined in Table 1.

Localised weeding: Localised weeding - including thinning of dense baumea and fern in order for us to maintain the natural diversity of the wetland ecosystem, and to prevent smothering of the smaller rare species.

Item	Staging	Funding
Crack & grey willow control	Medium term	Capital
Establish authentic plantings	Medium term	Capital
Plant species reintroductions	Ongoing	Capital
Localised weeding & thinning to maintain natural plant species diversity	Ongoing	Operational

Coastal bush

Along the Mairehau Road interface with Ōruapaeroa-Travis Wetland, a narrow strip of coastal bush on a high a relic sand ridge (Figure 31) has been stablished and provides an effective buffer between the busy road and the wider wetland area. Although planted, is a unique and representative plant community within the reserve.

Figure 31: *Aerial oblique view looking north to Mairehau Rd of the coastal forest and stable dune restoration plantings.*

Actions

Ongoing weed control: As with the lowland podocarp forest, as the canopy begins to close, herbaceous broad leafed and grass weeds will become less of a problem, however woody weeds and vines will likely persist. Regular surveillance for these weeds (E.g., old man's beard, blackberry, sycamore) shall be carried out and control operations undertaken in a timely fashion.

Secondary plantings: As microclimates establish within maturing plantings, species diversity shall be increased by planting frost/wind/sun intolerant species, native climbers such as native clematis, Parsonsia spp., and bush lawyers, and shall include the reintroduction of at risk/threatened species listed earlier in this report.

Review of species assemblages: The plant species within the Mairehau dune area should be carefully reviewed to ensure an authentic vegetation composition. Species that are over-represented or fall outside of their natural range should be gradually phased out as the plantings reach maturity.

Invertebrate & lizard reintroductions: Although relatively small, the coastal bush area lends itself well to the reintroduction of both native invertebrates and possibly lizard species. Therefore, a list of candidate species shall be determined, and a plan for reintroducing these species be developed in partnership with suitably qualified/experienced ecologists.

Introduce large diameter woody debris: As with the lowland podocarp forest discussed earlier, large diameter downed woody debris is a core element of natural forest ecosystems and shall be sourced and incorporated into the coastal bush area, taking care to cause minimal damage to existing plantings.

Item	Staging	Funding
Ongoing weed control	Ongoing	Operational
Secondary planting	Medium term	Capital
Review of species assemblages	Ongoing	Operational
Large diameter downed woody debris	Short term	Capital
Invertebrate and lizard reintroductions	Medium term	Capital

Lowland podocarp forest

In the extreme southwest corner of Ōruapaeroa-Travis Wetland, approximately six hectares of kahikatea dominated swamp forest (Figure 32) has been progressively established over the past 15 years.

Figure 32: *Aerial oblique view of the southern kahikatea swamp forest looking southeast towards the Frosts Road/Travis Road intersection (top left).*

Actions

Ongoing weed control: As the canopy begins to close, herbaceous broad leafed and grass weeds will become less of a problem, however woody weeds and vines will likely persist. Regular surveillance for these weeds (E.g., old man's beard, grey willow, ivy, sycamore) shall be carried out and control operations undertaken.

Secondary plantings: As microclimates establish and canopy shade is provided from maturing trees, species diversity shall be increased by planting frost/wind/sun intolerant understorey species, and native climbers such as native clematis, Parsonsia spp., and bush lawyers.

Establish dense edge buffer planting: Creating dense buffer plantings will help reduce edge effects on the forest interior, soften straight lines, and also help screen less densely planted interior areas for improved aesthetics. Edge plantings should consist of densely planted harakeke, small-leafed coprosma and manuka and provide a natural transition to adjacent short sward wet grassland areas.

Introduce large diameter woody debris: Large diameter downed woody debris is a core element of natural forest ecosystems that is important for habitat, nutrient cycling, carbon storage, building soil structure, forest regeneration and even aesthetics. Wherever possible, large woody debris shall be sourced and incorporated into all forest areas, taking care to cause minimal damage to existing plantings.

Invertebrate reintroductions: Given its size, and also the relatively small area requirements for many native invertebrates, the planted forest sites at Travis wetland may be particularly valuable for the reintroduction of native invertebrates. Therefore, a list of candidate species shall be determined, and a plan for reintroducing these species be developed in partnership with suitably qualified/experienced ecologists.

Item	Staging	Funding
Ongoing weed control	Ongoing	Operational
Secondary planting	Medium term	Capital
Buffer planting	Short term	Capital
Large diameter downed woody debris	Short term	Capital
Invertebrate reintroductions	Medium term	Capital

Frosts Road willow woodland

Throughout the length of Frosts Road corridor, the eastern edge of Ōruapaeroa-Travis Wetland is characterized by dense stands of crack willow *(Salix fragilis),* with grey willow *(S. cinerea)* also being abundant (Figure 33). Towards the southern end of the corridor at Hard Rush Corner (refer to ponds and waterbodies section of report), the willow has succumbed to permanent water ponding. This has created a novel habitat of open water with emergent dead willow trees that now support a breeding colony of royal spoonbill and an array of other native water birds. This area serves as a *'shopwindow'* interface for passing motorists, pedestrians and cyclists near the Travis Road intersection. Here, they offer spectacular framed views of an area of high natural character, and of the wildlife it supports.

North of the ponding area, the healthy willow woodland extends almost as far as the park entrance driveway and covers approximately 5.5 hectares. This willow woodland offers significant potential for restoration, and also a high probability of restoration planting success due to its sheltered, nutrient rich and damp nature. However, it will also mean that the area will likely be impacted by vigorous growth of weeds and pest plants that will hold restoration back if not adequately addressed early in the restoration process.

Figure 33: *Aerial oblique view of the willow-dominated section of the Frosts Road corridor looking southeast towards the Frosts Road/Travis Road intersection (top right).*

Actions

Determine values & restoration potential: As with many relatively unmodified wetlands, often they may still support remnants of original vegetation. Therefore, before any restoration work commences – particularly site preparation for planting – the sites should be surveyed by an ecologist to identify any vegetation (or other features) to be protected. Also, within the corridor there is likely to be a range of micro-scale topographic features (E.g., ponds, up-turned root plates, decay cavities, dry mounds etc.) that could form the basis for authentic restoration. These features should be identified and mapped as accurately as practically possible to enable them to be incorporated into further planning for this part of the park.

Control crack willow: Progressively drill-and-poison crack willow *(Salix fragilis)* throughout the length of the Frosts Road corridor over an extended period to achieve eradication in the long term. Where crack willow is controlled in this manner, dying/dead trees shall be left in-situ where they will not present a health and safety risk to the public - particularly on Frost Road - from falling debris. If left in-situ, the dead trees will gradually fall apart, and because the falling debris is dead, it will not take root and form new trees. Furthermore, the falling dead woody debris will be lighter than live wood and will therefore be less inclined to damage understorey plantings.

Where poisoned trees may present a risk to the public, as soon as the tree is completely dead it should be carefully felled in such a manner that causes minimum disturbance to the understorey. It is important that the tree is completely dead before felling, as any live debris that comes into contact with the ground has the potential to form roots and form new trees, thereby exacerbating the willow issue within and downstream along the corridor. Once felled, smaller diameter branches can be chipped for use as mulch on drier sites that will not be subject to waterlogging, while larger diameter woody material can be left in-situ for habitat complexity and as a carbon sink.

Eradicate grey willow: Unlike crack willow, grey willow *(Salix cinerea)* does not easily reproduce vegetatively, however, it does regenerate prolifically from seed produced by female trees. Grey willow has significant adverse effects on waterway and wetland ecosystems through direct competition with indigenous species. It also 1) alters the natural hydrology, and 2) increases nutrient levels of wetlands, and in doing so can displace indigenous plant species that have adapted to low-nutrient wetland habitats.

Historically, throughout the park and elsewhere in Christchurch's natural areas, reserve managers have only targeted female grey willow trees for control. However, more recently environmental managers have begun to target both male and female trees in order to achieve complete eradication. This complete eradication approach should be adopted at Travis Wetland using similar methods to crack willow (refer above).

In most instances, grey willow is a smaller stature tree than crack willow and is unlikely to present the same degree of public safety issue from falling debris. Furthermore, because if does not regenerate vegetatively from live fallen debris, it can be felled while still alive (i.e., without pre-treatment with herbicide), as long as the stump is painted with herbicide immediately - within minutes - after felling trees or cutting smaller saplings.

Establish authentic planting: The fine scale topography of the area will provide the basis for a mosaic of vegetation patterns that may include pukio sedge, harakeke and kiokio fern *(Blechnum minus)* flanked waterbodies and wetlands, that grade into mikimiki *(Coprosma propinqua)* and manuka *(Leptospermum scoparium)* dominated shrubland towards less saturated soils. On areas of slightly higher ground, kahikatea *(Dacrycarpus dacrydioides)* and pokaka *(Elaeocarpus hookerianum)* dominated swamp forest will extend back from Frosts Road, and grade back through shrubland to flank the wet grazing paddocks on the western edge of the corridor.

Plant mown grassed areas: An area of approximately 4500 m2 at the Beach Road entrance to Travis Wetland is currently maintained under a mowing contract. This area should be planted as additional wet shrubland and forest habitat to increase habitat and provide buffering to waterbodies beyond. Planting this area will also help reduce mowing-related greenhouse gas emissions and provide carbon sequestration.

Item	Staging	Funding
Determine values and restoration potential	Short term	Operational
Control crack willow	Medium term	Capital
Eradicate grey willow	Short term	Capital
Establish authentic planting	Medium term	Capital
Plant mown grassed areas	Short term	Capital

Central willow area

A relatively small (two hectare) isolated patch of crack and grey willow swampland (Figure 34) immediately to the north of Backwater Lagoon provides important and undisturbed wildlife habitat. Here the water table has been artificially raised and controlled by control structures at the outlet to support and enhance these values. these values. Restoration and management of this area will largely follow the actions identified for the Frosts Road willow corridor and consist of willow control and the establishment of authentic indigenous plant communities consisting of kahikatea swamp forest and manuka tall shrub swamp associations. A recent camera trapping study in Ōruapaeroa-Travis Wetland has revealed a sizable feral cat population in this area despite its remote setting.

Figure 34: *The two-hectare central willow area immediately north of Backwater Lagoon shown in the top right. (Source: Christchurch City Council 2021)*

Actions

Control crack willow: Progressively drill-and-poison crack willow *(Salix fragilis)*. Where crack willow is controlled in this manner, dying/dead trees shall be left in-situ.

Eradicate grey willow: Complete eradication approach should be adopted at the Travis Wetland.

Establish authentic planting: establishment of authentic indigenous plant communities consisting of kahikatea swamp forest and manuka tall shrub swamp associations.

Item	Staging	Funding
Control crack willow	Medium term	Capital
Eradicate grey willow	Short term	Capital
Establish authentic planting	Medium term	Capital

Eco Action Nursery plantings

Approximately 1.5 hectares of native forest planting has been established by various schools and volunteers as on Red Zone land as part of the Eco Action Nursery initiative (Figure 35). While the focus of these plantings has been on community and youth engagement rather than the establishment of an authentic indigenous plant community, it is nevertheless a significant planted area that is contiguous with the area currently managed by regional park rangers as part of Ōruapaeroa-Travis Wetland.

Figure 35: *Eco Action Nursery planting east of Frosts Road (Photograph David Newton, 2021)*

Actions

Management agreement: Work closely with the councils Red Zone team and provide input into the management of this site.

Weed control: Undertake ongoing weed control within planted area and ensure woody weeds do not establish.

Manage non-eco-sourced plants: Actively manage the site to remove any non-local or cultivar species that are deemed by the Council botanist to post a threat to biodiversity/restoration values within or adjacent to the planted area.

Introduce secondary planting: Within the mature vegetation with Council ecologists to develop a staged plan for establishing appropriate indigenous plant species that require frost, wind and/or sun protection, or require established vegetation as a support structure (e.g., vines such as native clematis, bush lawyer, jasmine).

Item	Staging	Funding
Management agreement	Short term	Operational
Weed control	Ongoing	Operational
Manage non-eco-sourced plants	Short term	Operational
Introduce secondary planting	Medium term	Capital

Appendices

Appendix 1: Rare plant monitoring

Suggested monitoring protocols for understanding optimal habitat requirements of rare plant species occurring at Travis Wetland.

Monitoring Protocols
Minimum 15 permanent plots (~1 x 1m) that are comparable (similar parameters), including: • Five entirely weeded (weed out all exotic species), • Five half-weeded (maintain a consistent sparse/open cover of (e.g.) no greater than ~40% cover of 'unwanted' rushes (=60% open/low stature vegetation/mosses) as a consistent measure to compare against. If 40% is considered too high consider a lower percentage), • Five control plots (no weeding or other interventions.

In each plot record:
• The number of individual target species (*Corybas, Celmisia, Drosera, Luzula, Hypericum*),
• Size class, e.g.:
  ○ 1 = seedling <1cm,
  ○ 2 = mature (fruiting) small/single plant/rosette,
  ○ 3 = mature large plant (multi rosette),
• Height and numbers of flower stems per plant.

Supplementary planting of 'target' species raised in nursery maybe necessary to get a comparative sample. Note that if doing this, establishing additional plots in sites with no rarities present would be preferable rather than to interfere and disturb existing plots and sites where the rarities naturally exist.
Monitoring should be repeated probably annually although the weeding may require more visits.
In addition to the counts of individual target species, in each plot assess the total vegetation composition and cover (and average height) to the nearest percentage.
An estimate of plot shadiness any surrounding canopy cover would be useful, (E.g., willows or the like hanging over).
Consider including some fenced plots to exclude pūkeko in order to assess their impacts.

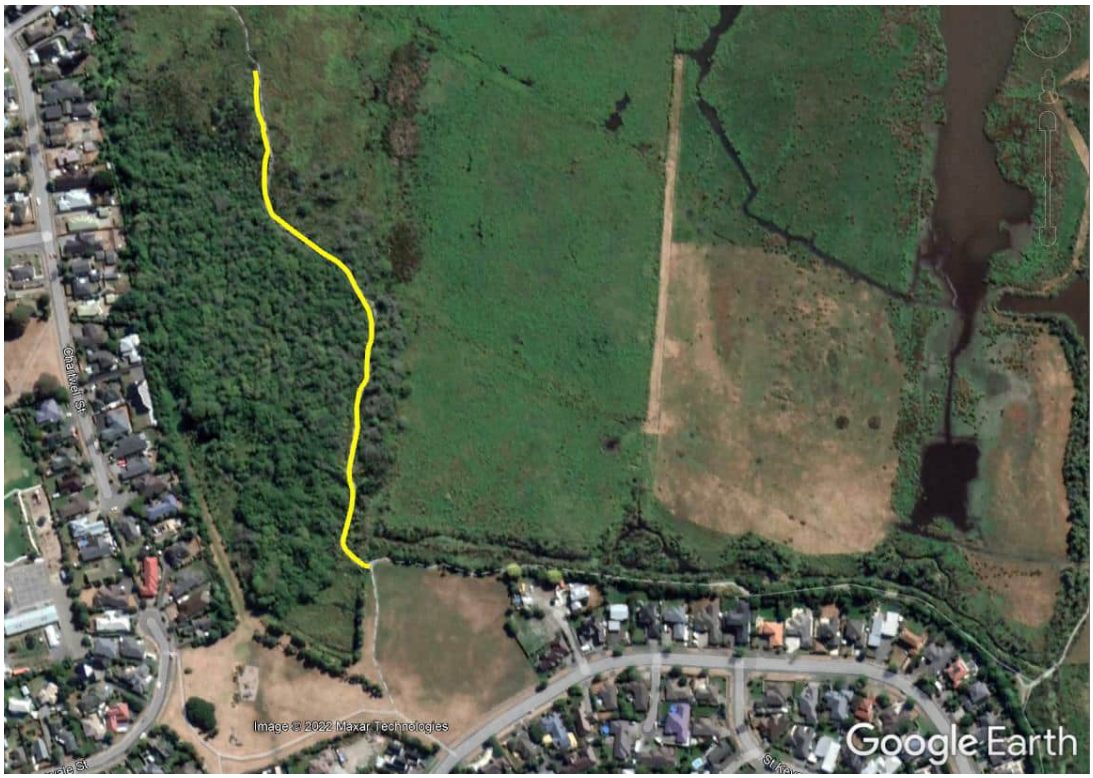
Appendix 2: Bird monitoring

Woodland/bush bird monitoring

A Council woodland bird monitoring programme using the slow walk transect method commenced in 2003 and covers more than 60 sites across the city, Port Hills and Banks Peninsula. Scheduled woodland bird surveys commenced at Travis Wetland in July 2005 – June 2006, repeated in July 2008 – June 2009 and July 2020 – June 2021. The next repeat is programmed for 2025/2026.

Method: The principal survey method used for woodland bird surveys is the slow walk transect where all individual birds of every species present (both native and introduced) are counted within a defined survey area 10 m either side of a defined transect line. Birds are detected either visually, by hearing calls, or by hearing the distinctive sounds made by the wings of birds (such as Kereru, Bellbird and California Quail) in flight. This survey method was adopted over the alternative 'five-minute bird count' method because, following testing in Christchurch woodland habitats, it was found to have a higher detection rate for less conspicuous species. It also enables a whole site to be sampled, rather than just one or more points within the site.

The survey site for Ōruapaeroa-Travis Wetland is within the western willow area[6], and comprises a 424 m transect along the pathway and boardwalk system that runs through the centre of the woodland patch. The starting point is the entrance gate on the boundary of Ōruapaeroa-Travis Wetland and Clarevale Reserve, and the end point is the outside edge of the manuka shrubland on the northern side of the willows as shown below.



[6] During the first survey series this transect comprised a willow *(Salix spp.)* canopy with an understorey of native fern and regenerating shrubs. However, as time passes and repeat surveys are carried out at 3-4 yearly intervals, the vegetation characteristics of the study site are expected to change with a more substantial indigenous vegetation component emerging at all strata levels.

Birds are surveyed using the slow walk transect method once per month for 12 months every four years. Wherever possible, surveys shall be undertaken commencing after the first seven days of the month and completed prior to 7 days before the end of the month (i.e., between day-seven and day 24 of any given month). All surveys shall be undertaken during mid-morning and mid-afternoon – to avoid distortions caused by increased singing activity at dusk and dawn. For consistency, all surveys shall be undertaken by the same observer.

Wetland bird monitoring

Council's Wetland Bird monitoring commenced in 1989 with a minimum of two full site counts per year, increasing to monthly counts some years (E.g., 1989-1991, 2012-2013). These surveys are complemented by other incidental counts throughout the year. The next series of monthly counts is due sometime in the 2024 – 2026 period.

Method: For monitoring of conspicuous wetland birds (i.e., excluding cryptic species like crakes, bittern and kingfisher), the site is divided into 14 sectors. Each is counted on foot by an experienced team of 1-3 observers, while other observers survey other sections concurrently. Indicative survey routes (white dashed line) and defined sectors are shown below and may vary slightly based on location of birds on a given survey date.

Changes in the status of wetland bird species from 1989 to 2022

Bird monitoring has kept track of the status of both wetland birds and land birds over the last 30+ years. The tables below document the arrival period of different species, and how the status of those species (such as rare or seasonal visitor, resident, etc) has changed over the years as habitats have been developed, disturbance minimised, and predation pressures reduced.

Key:

R: Resident species with year-round stable population

RS: Resident with seasonal influxes

S: Seasonal visitor

V: Vagrant or rare visitor

RI: Reintroduced species (assumed surviving)

RI(f): Reintroduced species (failed to establish)

Wetland birds	1989	1992	1996	2002	2004	2005	2009	2013	2017	2022
Australasian Crested Grebe									V	V
Black Cormorant	S	V	S	S	S	S	S	S	S	R
Pied Cormorant			V	V	V	V	V	V	V	S
Little Cormorant	V	V	V	S	S	S	R	R	R	R
Little Black Cormorant					S	S	S	S	S	RS
Spotted Shag							V	V	V	V
White-faced Heron	RS	R	S	RS	S	S	S	S	S	R
White Heron	V	S	S	S	V	S	S	S	S	V
Cattle Egret	S	S	S	V	V	V	V	V	V	V
Australasian Bittern		?	V	S	S	S	S	S	S	R
Royal Spoonbill			V	V	V	V	V	V	V	RS
Glossy Ibis				S	S	S	S	S	S	V
Mute Swan				S	V	V	V	V	V	V
Black Swan		V	S	RS	RS	RS	RS	RS	RS	RS
Canada Goose	S	S	S	RS	RS	RS	RS	RS	RS	RS
Feral (greylag) Goose		R	V	RS	V	V	V	V	V	V
Cape Barren Goose							V	V	V	S
Paradise Shelduck	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS
Mallard/Grey Duck	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS
Grey Duck	RS	RS	RS	RS	RS	RS	RS	RS	RS	S
Grey Teal	V	V	V	RS	RS	RS	RS	RS	RS	RS
Brown Teal							RI	RI	RI(f)	RI(f)
New Zealand Shoveler	V	RS	RS	RS	RS	RS	RS	RS	RS	RS
NZ Scaup				RS	RS	RS	RS	RS	RS	RS

Cont'd from previous table	1989	1992	1996	2002	2004	2005	2009	2013	2017	2022
Australasian Harrier	R	R	R	RS	RS	RS	RS	RS	Rs	RS
Banded Rail						RI	RI	-	RI(f)	RI(f)
Marsh Crake		?	?	V	V	V	S	S	S	RS
Spotless Crake									S	RS
Pukeko	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS
Australasian Coot					V	V	V	R	R	S
Variable Oystercatcher								V	V	V
SIPO				S	S	S	S	S	S	S
Spur-winged Plover	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS
Banded Dotterel				S	S	S	S	S	S	S
Black-fronted Dotterel							V	V	V	V
Bar-tailed Godwit								V	V	V
Pectoral Sandpiper							V	V	V	V
Pied Stilt	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS
Black Stilt				V	V	V	V	V	V	V
Black-backed Gull	R	S	S	S	S	S	S	S	S	S
Red-billed Gull	S	S	V	S	S	S	S	S	S	S
Black-billed Gull	S	V	V	S	S	S	S	S	S	S
Caspian Tern				V	V	V	S	S	S	S
Whiskered Tern							V	V	V	V
Gull-billed Tern										V
Black-fronted Tern				V	V	V	V	V	V	V
New Zealand Kingfisher	S	S	S	S	S	S	S	S	S	S
Welcome Swallow	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS

Woodland/bush birds	1989	1992	1996	2002	2004	2005	2009	2013	2017	2022
New Zealand Falcon		V	V	V	V	V	V	V	V	V
Kereru								V	V	V
Shining Cuckoo	S		S	S	S	S	S	S	S	S
New Zealand Pipit	S	S	S	S	S	S	S	S	S	S
Grey Warbler	S	RS	RS	RS	RS	RS	RS	RS	RS	RS
South Island Fantail	S	RS	RS	RS	RS	RS	RS	RS	RS	RS
Silvereye	S	RS	RS	RS	RS	RS	RS	RS	RS	RS
Bellbird			S	S	S	S	S	S	S	R

Appendix 3: Pest plant control

High priority pest plant species

Species	Comments	Photo
Purple loose strife *(Lythrum salicaria)*	• While there are currently no stable populations within Ōruapaeroa-Travis Wetland, purple loosestrife is a highly invasive species in waterways and plants occasionally arrive from surrounding areas and need to be controlled. • Purple loosestrife should be checked for annually before the seeding period in March and all records and control actions reported as per the species-led plan for purple loosestrife. • Small plants can be dug out, however larger plants have a rootstock that is not always possible to remove by digging. In such situations, cut and herbicide paste of the stems will be necessary.	
Grey willow *(Salix cinerea)*	• Grey willow is the most invasive of the willow species occurring at Ōruapaeroa-Travis Wetlands. • Historically, managers have targeted female grey willow trees for control only, however experience has shown that this approach has not been successful, and instead complete eradication of both male and female trees has been initiated. • Control/eradication is to be undertaken using cut & paste or drill & inject herbicide methods to prevent seeding. • All species of willow seedlings and saplings within the carex/peat swamp area need to be controlled annually by herbicide using knapsacks. • All records and control actions need to be reported as per the species-led plan.	 

Yellow flag *(Iris pseudacorus)*	• Annual control of yellow flag needs to be undertaken. • The Three Waters Unit is responsible for the control in the surrounding waterways to prevent the spread of seed upstream. • Travis Wetland has been identified as a Priority Control Site within the species-led pest plan for yellow flag. • All records and control actions need to be reported as per the species-led plan.	
Bindweed/convolvulus *(Calystegia silvatica)*	• It is recommended that bindweed is controlled manually in amenity and restoration planting areas only. • Bindweed is a summer-green climber with underground stems, so any control needs to take this growth pattern into account.	
Great Willow Herb *(Epilobium hirsutum)*	• Currently MPI surveillance and control (although now handed to land managers to control voluntarily). • Inform MPI on 0800 80 99 66 • A recent arrival in Canterbury. • Prefers wet or damp sites. • Mainly spreads by windblown seeds and rhizomes once established. • Check annually, easy to spot when flowering. • Control cut and paste small plants, large plants must use Grazon herbicide. Glyphosate ineffective	
Mayten *(Maytenus boaria)*	• Occasional checks for Mayten seedlings need to be carried out and any plants found are to be removed manually. • Plants are easily missed so ongoing vigilance is important.	

Medium priority pest plant species

Species	Comments	Photo
Old man's beard *(Clematis vitalba)*	• There are no current infestations of old man's beard at Travis Wetlands reserve. • However, this species should be checked-for annually and control undertaken immediately when plants are found.	
Gorse *(Ulex europaeus)* and Broom *(Cytisus scoparius)*	• There are no large infestations of gorse or broom in Travis Wetlands reserve. • Control needs to be undertaken on scattered plants as required under the Regional Pest Management Strategy. • All records and control actions need to be reported as per the species-led plans for gorse and broom.	
Beggars Ticks *(Bidens frondosa)*	• Beggar's ticks is actively controlled only within the Manuka area, by hand pulling. • It is no longer actively controlled across the whole of Travis Wetland because previous control efforts were ineffective. • Instead, in appropriate areas sheep grazing has been utilised to control beggar's ticks. • Furthermore, in other areas Rangers are to encourage low-growing wetland vegetation (mostly of the exotic sedges *Carex flacca* and *C. leporina*) to be subsequently replaced by taller native species such as *C. secta* in the hope that such plants would tend to exclude beggar's ticks.	
Japanese honeysuckle *(Lonicera japonica)*	• This species should be checked for and control annually along with other woody pest plant species. • This species should be controlled using spray, cut & spray or cut and stump methods.	

Periwinkle *(Vinca major)*	• This species is being controlled using herbicide and shading out with plastic sheets. • Small infestations on the boundary with neighbours. • The desired outcome is for this species to be out competed by native species through restoration plantings.	

Low priority pest plant species

Species	Comments	Photo
Ivy *(Hedera helix ssp. helix)*	• Smothers low vegetation and suppresses regeneration • Ivy is controlled using chemical and manual removal methods so that seeding is avoided. • Ivy tends to seed after growing vertically. • Areas of climbing ivy should be prioritised	
Crack willow *(Salix fragilis)*	• Crack willow is managed by containment within its current sites (map??). • Although sterile (male only), seedlings of the backcross (formerly known as *S. X rub*ens) with white willow (also possibly present at Travis) are occasionally encountered and removed manually if they threaten a high value area. • Willow is also managed as important habitat for birds.	
Blackberry *(Rubus fruticosus agg.)*	• Blackberry is to be removed manually in the 'Manuka' area annually (figure 1) and also within restoration planting sites. • Larger areas including Travis Stream are sprayed annually.	
Aluminium plant *(Lamium galeobdolon)*	• Mostly found along boundary with Chartwell Street houses. • Currently volunteers from the Travis Wetlands Trust manually remove this species from the Manuka area. • Now managed by contractors along the boundary.	

Tortured willow *(Salix matsudana)*	• Plants of this are occasionally encountered and removed.	
Potato vine *(Solanum jasminoides)*	• The storm water drainage inlet from Tumara Park subdivision into Ōruapaeroa-Travis Wetlands can become blocked by Potato vine. • When this occurs this species is controlled with herbicide.	
Sea aster *(Symphyotrichum subulatum)*	• Sea aster is mainly controlled by the grazing which is implemented for the control of beggar's ticks. • Additionally, this species should be cut back before restoration plantings.	
Blue sedge *(Carex flacca)*	• Blue sedge and the other exotic species *Carex leporina* (formerly *C. ovalis*) are the preferred habitat of beggar's ticks and sea aster. • Best done by cutting with scrub-bar and using the cut stuff as mulch, may also require newspaper as weed mat. • It is recommended that this species is managed by planting dense Carex secta.	
Pampas *(Cortaderia selloana)*	• There are only very low densities of pampas left in Travis Wetlands reserve mainly along the park boundary. • Pampas should be controlled during an annual check for woody pest species. • Seedlings are best controlled manually and mature plants are best controlled using knapsack spray. • However, mature plants are known to re-sprout so rangers should be prepared to administer a follow up spray while monitoring. • Ongoing surveillance required.	

Other

Species	Comments	Photo
Raupo *(Typha orientalis)*	• Raupo may need control to maintain sightlines around (e.g.) the information kiosk and the Angela Stream Bridge. • An important plant for cultural harvest.	

Appendix 4: Implementation/budget (Capex)

Note: The figures presented in the table below are high-level capital (capex) and operational (opex) estimates intended to inform the funding of future work programs.

Capital development projects	**Short term** *(1 – 5 years)*	**Medium term** *(5 – 10 years)*	**Long term** *(10 – 30 years)*	**Total**
Planning & investigation				
Study to inform water circulation and water levels.	$50,000	$0	$0	$50,000
Willow control and/or eradication				
Hard Rush Corner	$50,000	$100,000	$50,000	$200,000
ANZAC Drive wetland	$10,000	$50,000	$0	$60,000
Frosts Road corridor	$50,000	$100,000	$50,000	$200,000
Western boundary	$50,000	$50,000	$50,000	$150,000
Central willow area	$25,000	$50,000	$25,000	$100,000
Planting				
Establish screening along ANZAC Drive	$30,000	$50,000	$0	$80,000
Plant understorey of Frosts Road willow woodland	50,000	$100,000	$50,000	$200,000
Plant western willow area	$50,000	$100,000	$50,000	$200,000
Plant grassed areas at corner of Frosts & and Beach Road	$40,000	$0	$0	$40,000
Plant dense buffer around lowland podocarp forest	$15,000	$15,000	$0	$30,000
Plant *Carex secta* to displace beggar's ticks (11.4 ha)	$325,000	$325,000	$325,000	$975,000
Establish 5 m wide ecotone around 'Grazing Marsh East'	$40,000	$40,000	$10,000	$90,000
Establish secondary plantings and threatened species	$25,000	$50,000	$75,000	$150,000
Secondary planting - Eco Action Nursery site	$10,000	$5000	$3000	$18,000
Species reintroductions				
Reintroduce invertebrates and lizard species	$5000	$5000	$10,000	$20,000
Reintroduce locally extinct bird species	$50,000	$150,000	$200,000	$400,000
Reintroduce threatened & uncommon plant species	$8000	$7000	$32,000	$47,000
Miscellaneous				
Install environmental interpretation throughout site	$10,000	$15,000	$25,000	$50,000
Monitoring equipment, including bird monitoring towers	$2000	$43,000	$5000	$50,000
Assess and remediate fish barriers	$5000	$25,000	$10,000	$40,000
Replace and/or install woody debris as roosting features	$10,000	$20,000	$50,000	$80,000
Enhance moats and natural waterways	$0	$150,000	$300,000	$450,000
Manipulate water levels and circulation		$250,000		$250,000
TOTAL	**$910,000**	**$1,700,000**	**$1,320,000**	**$3,530,000**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