

Waitohu Wetland

Ecological Report & Reserve Management Plan

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Summary

The Waitohu wetland is a remnant of the once vast coastal wetland system linking together along the Kapiti Coast. Few such remnants now survive. The Waitohu, though degraded by introduced species and grazing, still retains much of the original vegetation and provides habitat for a diverse array of wildlife.

The Waitohu Stream Care Group wish to restore the natural values of this coastal wetland, as well as enhance the state of the Waitohu Stream, by providing a buffer between the stream and current land use activities.

This report proposes a number of different stages to the restoration process. The key components of the wetland restoration project are weed and pest control, and planting to increase species diversity and ground cover.

It is recommended that the Care Group:

- Control plant pests and establish a weed management plan.
- Plant locally-sourced native wetland species.
- Provide a predator control program.
- Covenant the reserve to protect its conservation values in perpetuity.
- Instigate future management including increasing awareness of wetland ecosystems, and remedying the adverse effects from surrounding land uses.

1. Introduction

1.1 The Site

Otaki Beach is a small urban community on the Kapiti Coast. The Waitohu wetland is separated from the residential properties in the town by the Waitohu stream and is just upstream from the stream mouth and dunes.

The fenced wetland area is approximately 3000 m², or a third of a hectare in size. To the north and east it is bordered by farmland. To the south and west it is bordered by the stream, on the opposite side of which lie residential properties and a motor camp.

The only foot access to the wetland is from the adjacent Wootten farm land. For planting and site assessment, access was gained by boat from one of the residential properties that border the other side of the stream.

1.2 The People

The protection of this remnant ecosystem was instigated by local residents who formed the Waitohu Stream Care Group. Care Groups are managed and funded primarily by the Greater Wellington Regional Council through the Take Care programme. The Waitohu Stream Care Group was concerned about the gradual loss of wildlife from the wetland area and the state of the wetland area and stream. They are also working to protect the adjoining dune system. Nigel Clarke from the Greater Wellington Regional Council is the co-ordinator for the care group.

The farm on which the wetland is situated belongs to the Wootten family. The fence was erected around the majority of the wetland area in February of 2003 with the Wootten's permission. The very south-eastern tip of the wetland is owned by the motor camp, however, as it is remote from the rest of the camp ground it has always been grazed as part of the farm. The neighbouring farm, that borders the stream as it runs to the sea, is owned by the Sims family.

1.3 Vision and Objectives

The Waitohu Wetland is particularly important to protect because:

- It provides an intact, representative example of a significantly diminished vegetation type, as signified by its inclusion as a WERI (Wetlands of Ecological and Representative importance).
- It provides important habitat for wildlife, as signified by its inclusion as a SSWI (Site of Special Wildlife Importance).
- Its proximity to the Otaki Beach township makes it ideal for a community project and for future conservation advocacy and public education.

The vision for the Waitohu Wetland is to:

Protect and enhance the natural values of the Waitohu wetland remnant towards a self-sustaining wetland ecosystem.

Provide, in conjunction with the protected dune area, an intact native coastal vegetation sequence and habitat link for indigenous wildlife.

Provide an opportunity for the local community to appreciate the local wildlife, and contribute to the enhancement of the wetland, and the other adjoining natural areas.

The objectives of this report are to:

Describe the ecology of the wetland and its surrounds.

Provide a management plan that focuses efforts towards achieving the vision by:

- *Increasing the robustness of the wetland ecosystem;*
- *Balancing the desire to return the wetland to its original state with creating a more diverse array of vegetation types and in turn diversifying the habitat of the wetland;*
- *Improving water quality in the Waitohu Stream and wetland;*
- *Increasing community awareness of the wetlands' special ecological values and encouraging a commitment to protect them and*
- *Providing an area that locals and visitors can enjoy and learn about.*

2. Site Ecology

2.1 Site Characteristics

Otaki Beach sits within the Foxton Ecological District which covers the narrow strip of land along the west coast of the North Island from Hawera to Paekakariki. The area is characterised by an extensive, mobile sand dune system.

The soils of the Foxton Ecological District tend to be sandy; however where sediment is carried downstream and deposited on the coastal flats near streams and estuaries the soil tends to be richer and is made up of muds, silts and clays. The soil in the wetland area is saline due to its proximity to the sea.

2.2 Flora

2.2.1 The Foxton Ecological District

The Protected Natural Areas Programme (PNAP) Report for the ecological district lists the predominant vegetation types in the district (Ravine 1992). Ravine notes that less than 5% of the surface area within the ecological district has indigenous vegetation cover.

The ecological district is characterised by low stature dune systems at the ocean interface. On deeper soils further in from the dunes there would have been many shrubs and trees, although Ravine notes that the predominance of kanuka is likely to be a successional stage following clearance by burning. Ravine also notes that a great part of the ecological district would have been swamp forest dominated by kahikatea and pukatea with plentiful rimu and, south of Foxton, swamp maire. Less fertile sand plain areas would have been covered in scrub. There would have been extensive flax swamps and flax/shrub lands.

2.2.2 Waitohu Wetland

A twelve hectare area called the 'Waitohu Rivermouth' encompasses the wetland and dune area. This area has a WERI (Wetlands of Ecological and Representative Importance) ranking of 2 (moderate/high) and a SSWI (Site of Special Wildlife Interest) ranking of 'moderate'. This indicates that although the wetland was not listed as a Recommended Area for Protection (RAP) within the PNAP report for the Foxton Ecological District, it was recognised as a good example of a threatened vegetation type and as having significant wildlife habitat values. It is likely that it was not chosen as a RAP due to its size and degraded state. The 12 hectare site is listed as an Ecological Site of Importance in the Kapiti District Plan.

Site visits to the property in July, September and October of 2003 supplemented the previous observations of the Levin Native Flora Club and Waitohu Stream Care Group.



Figure 1: Aerial photograph of the wetland taken in 2002

The fenced area of wetland sitting within the bend of the river is very low-lying and large parts of it were covered in water when the first site visit occurred. When high tide combines with high rainfall, much of the area is under water. In dry periods surface water is reduced to isolated pools. A drain has been dug into the wetland within the northern fenced riparian area and extends some way into the wetland. This is gradually filling in with sediment.

The predominant rush in the wetland area is searush (*Juncus maritimus* var. *australiensis*). Also present is the sedge, three square (*Schoenoplectus pungens*) and knobby clubrush (*Isolepis nodosa*) and a few scattered clumps of the large, introduced sharp rush (*Juncus acutus*). In the centre of the wetland, the rushes are intermingled with giant umbrella sedge

(*Cyperus ustulatus*). Around the edges of the stream and pools of water *Isolepis prolifer* is common.

Saltmarsh ribbonwood (*Plaginathus divaricatus*) is scattered throughout the wetland and forms a significant part of the vegetation in the eastern (upstream) fenced and unfenced end of the wetland. The rusty red of oioi (*Leptocarpus similis*) is scattered in small clumps amongst the sea rush. All of these species indicate that there is a regular saltwater influence.

There are a few scattered plants of *Carex* (species unknown) in amongst the rushes. A small area of stunted gorse bushes have established in the very centre of the wetland area, presumably where the ground is slightly raised.

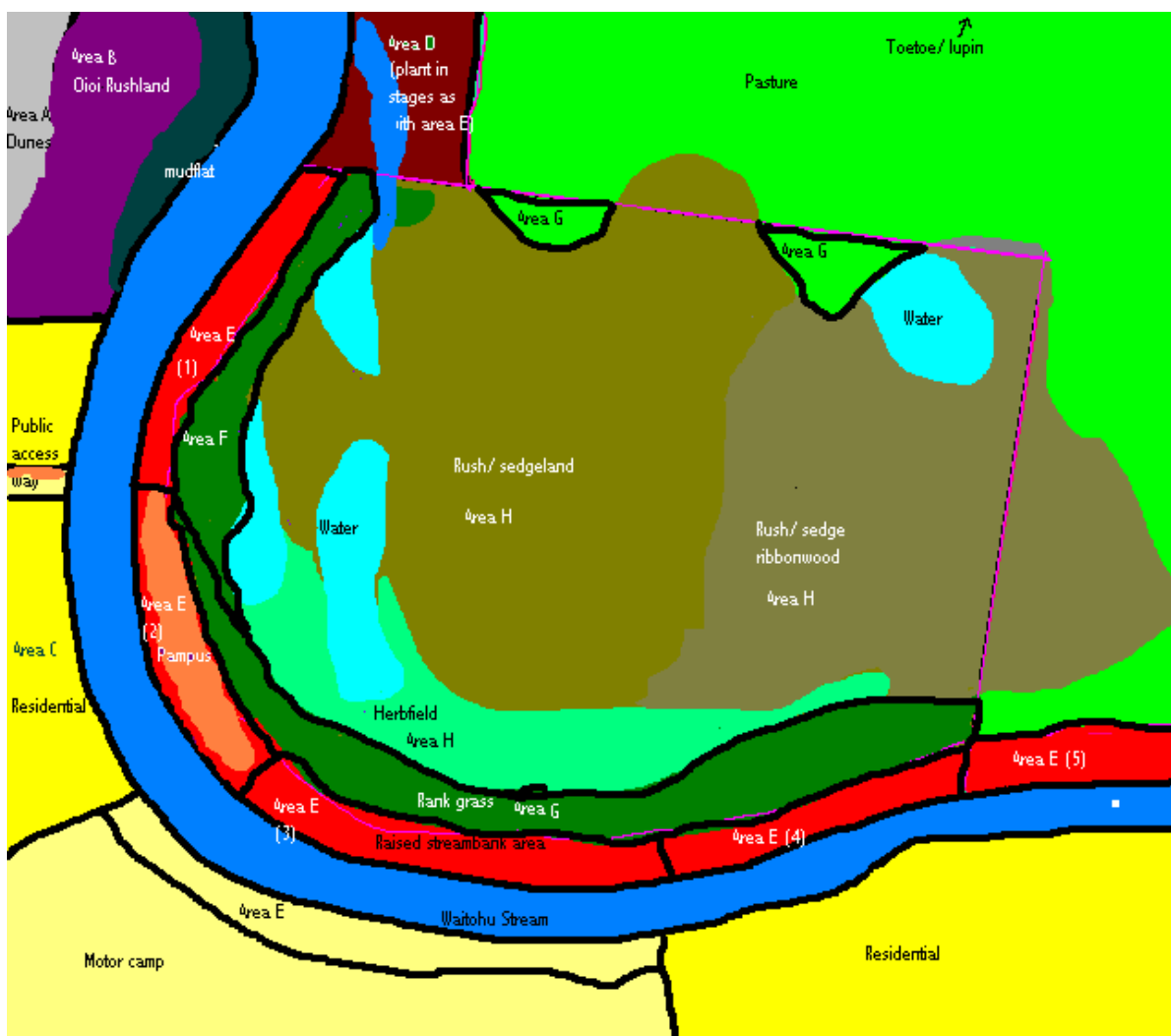
A very small patch of raupo (*Typha orientalis*) exists near the fence line at the upstream end of the wetland which indicates that this part of the wetland has enough fresh water influence to allow brackish water tolerant plants to establish.

Around the edges of the wetland, the pools and the shallow part of the drain, herbs and grasses dominate. Bachelor's button (*Cotula coronopifolia*) prefers the wetter areas. Buck's horn plantain (*Plantago coronopus*), an exotic plantain grows amongst the bachelor's button. Pasture grasses, adapted to having their roots in wet soil and being periodically submerged, have taken over the dryer margins of this low-lying land, which is only flooded during spring tides.

The dominant exotic grass species in the wetland is tall fescue (*Festuca arundinacea*), with some beard-grass (*Polypogon monspeliensis*), and creeping bent (*Agrostis stolonifera*) also occurring. The native arrow grass (*Triglochin striata*) is dispersed amongst these. Where the tall fescue is dense it has excluded all other species and taken over areas that would have been covered by native herbs and rushes. The fescue is tolerant of both semi-saline and wet conditions, although it appears most vigorous in the dryer areas. Some areas of tall fescue have been controlled and replaced with planted native species. These plantings have been a mixed success, with those on the raised stream bank areas doing well, especially the karo and ngaio, but the manuka in the fenced wetland area has died (possibly due to wind exposure or excessive water logging). The kahikatea however, have persisted and should be ideally suited to this wet environment.

The river edge is slightly raised, forming a small stopbank. Adjoining the wetland area this raised area is covered in weeds, including a large, solid area of pampas on the western wetland bank. Just to the east of the wetland, crack willow (*Salix fragilis*) lines the stream. The banks are also covered in rank grass, including tall fescue. Vetch (*Viscia sativa.*), which looks like a wild sweet pea, appears to becoming more prolific in the riparian area and convolvulus was also found here. Several taupata (*Coprosma repens*) shrubs grow amongst the willow and an occasional flax (*Phormium tenax*). There are a couple of small pine trees adjacent to the stream. There are also clumps of native celery (*Apium prostratum*) growing along the edges of the bank and into the stream.

The area of stream bank where the drain enters the stream is mainly covered with rank grass. This area has been recently planted with ngaio, several carex species including *Carex geminata*, *C. lessoniana*, *C. secta* and *C. testacea*, cabbage tree and karo. They appear to be doing well. The grassy stream bank downstream from the drain has not been planted yet.



Map 1: Drawing illustrating the main vegetation types within the Waitohu wetland area (the letters identify different areas for the Planting Plan)

At the mouth of the river, on the opposite side of the river, are dune hills. Behind them is an area of oioi and some pohuehue (*Muehlenbeckia complexa*). An unsuccessful attempt has been made to plant oioi further out where there is bare mud at the side of the stream. The oioi may have reached its physiological limit here and this anaerobic mud dotted with crab holes is most likely to be a naturally open mud flat. This area is the only area of stream bank that has not had its form modified.

Residential properties extend down to the river edge on the south and western side of the river and here the riparian margin is dominated by lawns, garden plants and exotic trees. A large section of the river next to the wetland is bordered by the motor camp which also has an open lawn down to the river edge. Arum lilies (*Zantedeschia aethiopica*) form clusters on the bank opposite willows. Between two of the houses a public access way, lined with rank grass and pampas, leads to the stream.

The fenced off wetland covers most of the wettest parts of the former paddock. However, in the paddocks beyond, some wetland species predominate, despite ongoing grazing. There are clumps of sea rush and salt marsh ribbon wood and some oioi at the eastern end. The delineation between the grazed and ungrazed area is already becoming clear as more wetland species replace the pasture grass species inside the fenced-off wetland area. Pugged soil and crushed vegetation are evident within the unfenced wetland area.

The stream upstream of the wetland area is fenced off and has some taller vegetation (mostly willow) which provides some shade to the water.

The dune ridges behind the wetland are covered in pasture and lupin. At the foot of these ridges is a strip of toetoe (*Cortaderia toetoe*).

2.3 Fauna

2.3.1 Birds

The original extensive wetlands of the Foxton Ecological District would have been home to a wide variety of common native wetland birds and those now considered nationally or regionally threatened, such as North Island fernbird, Australasian bittern, and banded rail (Ravine 1992).

The Waitohu wetland area is a tiny remnant of these once expansive wetlands. Bird populations have shrunk into these remnant areas and in some cases small isolated populations have survived. Bittern have been heard calling within the wetland, (Monk and Treacher Pers. Comm. 2003) and although no conclusive records of them have been reported in the last couple of years, they may still be there. A rarely recorded marsh crane was found dead on the road next to the wetland in 2002 and it now resides (stuffed) in the Te Papa National Museum collection. Fernbirds have not been recorded at the site, but are likely to have existed here. Ravine (1992) notes that, “the apparent decline of fernbird numbers is probably the result of habitat deterioration through drainage, stock damage and weed invasion as much as predation by cats, rats and mustelids”. This is certainly likely to have been the case here, where the habitat size is too small to provide habitat for many birds and the remaining small populations are vulnerable to predation.



Figure 2: Bittern (photo from Complete Book of New Zealand Birds)

The wetland is also important for migratory birds. Shoveller ducks arrive on the ponds at the end of each winter and stay through spring. Older ducklings were sighted again in November (G Monk, Pers. Comm. 2003). A pair of grey duck had six ducklings on the western-most pond at the time of the last site visit in October. Mallard ducks also use the ponds. Pukeko are regularly seen, although numbers have dropped, seemingly linked to the rabbit poisoning. Black fronted dotterel visit from the dunes. Fantails, grey warblers, blackbirds, thrush, starlings, welcome swallows and sparrows are all regular visitors. Black shags nest in the large macrocarpa tree in the motor camp and had chicks at the time of the site visit. White-faced herons, pied stilts, plovers, black backed gulls and magpies are all present. White herons visit occasionally. A shining cuckoo was heard for the first time in November (G Monk, Pers. Comm.2003).



Figure 3: Secretive marsh crake (photograph from Complete Book of New Zealand Birds)

2.3.2 Aquatic fauna

The original wetland vegetation and stream-side vegetation would have provided food, shelter and spawning habitat for estuarine and migratory freshwater fish. Native fish such as the short-jawed kokopu, koaro, banded kokopu and giant kokopu would have been a common part of pre-human New Zealand freshwater communities (McDowall, 1990). These species are now considered threatened due to loss of habitat and degradation of water quality (McDowall, 1990; Rowe et.al., 2000).

When forest cover is removed fish fauna changes abruptly due to the instability of banks and river bed. The river habitat diversity declines and water quality decreases. Usually streams without forest cover or good riparian edges hold only lamprey, eels, bullies and sometimes torrent fish and blue-gilled bully. Larger galaxiids like banded kokopu and koaro disappear.

The Waitohu stream has a modified catchment, but large areas of the stream banks are fenced and have some riparian vegetation. The NIWA fresh water fish database (2002) indicates that the Waitohu stream contains populations of: giant kokopu, common bully, common smelt, upland bully, long and short finned eels, inanga, and red finned bullies. Further upstream where the stream enters areas of forest, banded kokopu and koaro are also present. Observations have been made of herring and flounder being caught in the ponds within the wetlands after exceptionally high tides (Monk & Treacher, Pers. Comm. 2003).

A survey of the Waitohu stream is planned to be carried out this spring/summer, the results of which can be added to this report and inform the management plan. This study will look at the entire catchment hydrology as well as instream fauna.

Brown mudfish

The brown mudfish (*Neochanna apoda*) is widespread in the southern half of the North Island and northern half of the South Island. It can occupy a great variety of habitats including overgrown weedy creeks, weed choked farm and road-side drains, open boggy swamps, pools of water in podocarp forest and forest swamps, as well as coastal sand-dune swamps. McDowell (1990) indicates that they are always found in clear rather than muddy water. Mudfish aestivate (hibernate) in mud when water in their habitat dries up. It is this habit which can give them a competitive edge over other fish. In permanent water, other fish species generally out-compete the mudfish.

Mudfish have been reported in Otaki in the past (McDowell 1990) and it is likely that they still occur in some areas of undisturbed habitat, even in undisturbed farm drains. They may be found in the Waitohu wetland within the ephemeral pools and permanently wet areas, where other fish cannot enter. Removing stock from the wetland area is likely to have greatly improved the habitat for mudfish as the ground will not be pugged and pools will remain clear.



Figure 4: Brown mudfish (*Neochanna apoda*)

2.3.3 Reptiles & Amphibians

Reptile populations have been significantly reduced through habitat destruction and introduced predators. The reptiles that inhabit coastal forest and wetland areas of the Foxton Ecological District include the northern grey gecko and common skink. Amphibians recorded include two introduced frogs (golden bell frog and whistling tree frog), Ravine 1992. Both of these frogs have been heard and seen within the wetland (pers. comm. Treacher & Monk, 2003) although they have been only heard very infrequently in the past few years. A dead golden bell frog was found during the October site visit. It is likely that, like other frogs throughout New Zealand, they have reduced significantly in number due to the introduced chytrid fungus disease.

2.3.4 Mammals

No native mammals exist in the Foxton Ecological District. Introduced feral mammals that are likely to be present or transitory in the wetland include: mice, Norway and ship rats, stoats and weasels. Hedgehogs and rabbits can also be significant predators and browsers, but are generally not found in the wetland due to the barrier created by the stream and also due to the wet nature of the area. Dogs, and particularly cats, may also enter the wetland from the residential properties. During the October site visit, when the grassed areas of the wetland had dried out substantially, several animal tracks were noted. Some belonged to a mustelid (probably a ferret) and one may have belonged to a cat.

2.3.5 Invertebrates

The invertebrate fauna of the Foxton Ecological District is large but has not been comprehensively studied. Of the insects, moths are the most common, followed by flies and then beetles (Ravine 1992). Dragonflies and butterflies are also likely to be found in the wetland area. No invertebrate survey has been conducted in the wetland.



Figure 5 – View from a neighbouring house looking down at the wetland. The stream curves round the wetland and separates it from the residential properties and motorcamp. The different areas of vegetation dominated by tall fescue, herbfield, and rushes are easily identified from this elevated position.



Figure 6: The dominant species in the wetland is sea rush, with umbrella sedge (in the centre) and saltmarsh ribbonwood (dark patches further back) also important species.



Figure 7: This picture is taken from the southern end of the wetland looking north. You can see the herb fields around the standing pools of water. In the foreground is tall fescue; sea rush surrounds the pool and pampas lines the side of the stream.



Figure 8: This shows a typical stretch of stream bank. On the far side is residential property with lawn to the edge of the stream. Native celery clings to the stream edge. Rank grass covers most the stream bank on the wetland side.



Figure 9: Looking north: The drain runs through the wetland in the foreground. This section of stream bank has already been planted up. The stream widens and flows through the dunes to the sea.



Figure 10: Looking east (upstream). Rank grass and crack willow cover this stretch of stream bank, and the bank further upstream. A few taupata and flax also occur.

3. Discussion

The current vegetation, topography and saltwater/fresh water gradients of the area indicate that the original vegetation community of the Waitohu wetland would have been (and still is) a brackish, eutrophic, lowland wetland. Eutrophic wetlands have high fertility due to sediment carried down the rivers from the hill country.

Because the wetland area is adjacent to the tidal stream, it has a strong saline influence. This, combined with the constant wetness, would have precluded many tall tree species from establishing. Only on the localised raised areas would taller vegetation have occurred. Taller coastal vegetation would have occupied the sand hills and ridges; although this would have been stunted by the wind and salt. On the rich soils of the stream or river plain, away from the saline influence of the sea, swamp forest would have dominated.

The following vegetation types found in the Foxton Ecological District are most likely to represent the wetland areas' historic vegetation cover. This is based on the existing wetland plant species and the topography of the area relative to similar areas in the Foxton Ecological District:

- Sea rush rushland
- Salt marsh ribbonwood/sea rush shrubland
- Three square/raupo sedgeland
- Herb fields

In other words, the wetland area is still characterised by its historic vegetation types, however, it is likely that the species diversity, mix and relative areas would have been different.

Some areas may have contained:

- Shrubland, manuka/ broadleaf mix - predominantly flax/ toetoe/ manuka/ kanuka/ cabbage trees and *coprosma propinqua* in free draining areas
- Lowland swamp forest – kahikatea dominant

It is likely that the swamp forest would have grown a little further upstream away from the saline influence. A list of associated species occurring within these vegetation types is included in Appendix 2.

The existing wetland, even though it has been subject to years of grazing, is relatively intact and does not have an irreversible weed problem. It is also still providing an important habitat for native wildlife. The fencing of the wetland has significantly enhanced its habitat value.

Because the wetland area is so small it is likely that even prior to human modification it would have been covered by one relatively homogenous community type (rushland) as it only represents a small portion of a much larger wetland system. It would have contained some small, localised areas containing other vegetation types. However, for the purposes of this management plan, greater diversity could be encouraged and controlled to some extent by planting to create a compact, highly representative wetland area containing more than one vegetation community. It should be noted however, that where the hydrological/saline

influence is strongest, only saline tolerant plants will grow and therefore the most well suited species will out compete and replace less well suited species. In other words, lower species diversity may be unavoidable. This means that the upstream end of the wetland and the raised, dryer areas, are most likely to be the best areas to try to create other representative vegetation types, such as coastal scrub and forest.

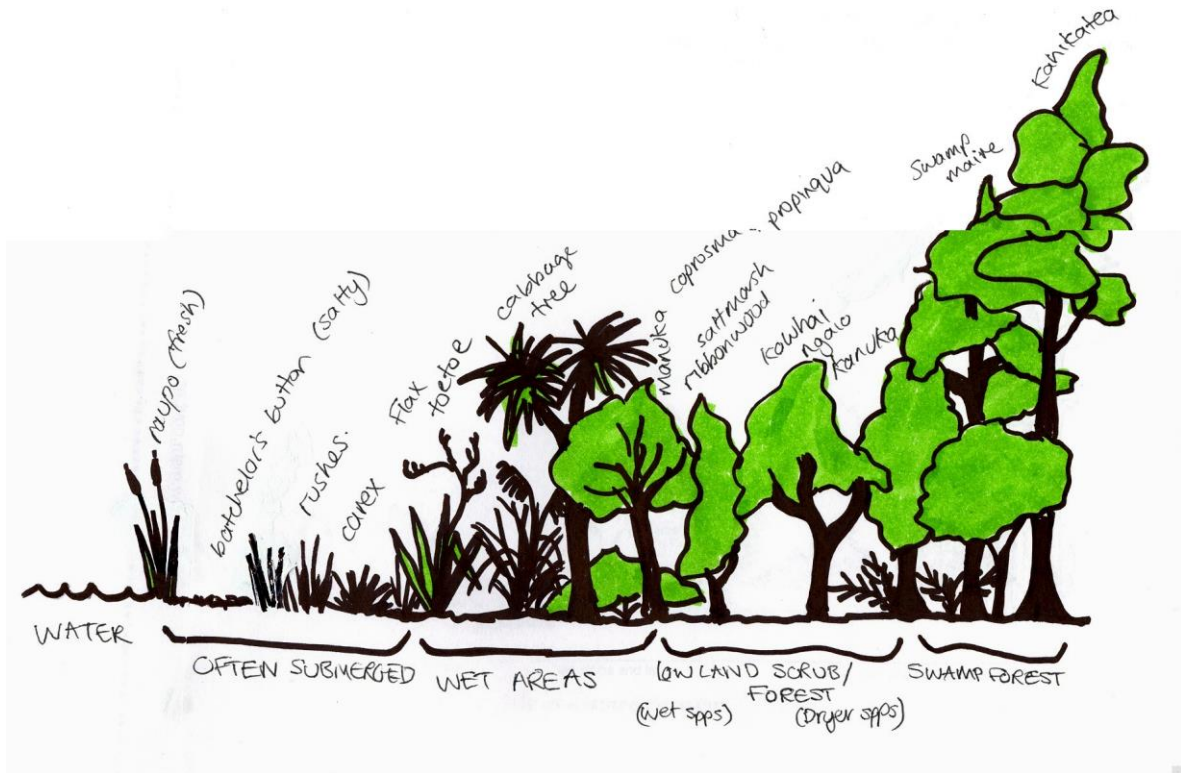
Wetlands also naturally fill in over time as sediment builds up. The land becomes dryer and the vegetation community gradually changes and moves towards a forest ecosystem. This change is sped up by human influences including sedimentation resulting from agricultural and forestry practises. It should be expected that the wetland will change gradually over time.

The wetland will continue to expand and diversify naturally; however weeds and pests, if left unchecked, will slow this recovery. Weeds may even decrease the diversity of native plants when they are no longer controlled by grazing. Some of the weeds within the wetland are relatively benign and will not reinvade an intact wetland once they have been removed and replaced with native species. But some of the species have the ability to grow over and within intact, healthy wetlands, therefore eradication and continual monitoring for such species is essential.

Predators, if left unchecked will severely limit the native wildlife habitat potential of the wetland. Although adult birds continue to visit and ducklings are seen each year, predation may be contributing to annual breeding failure and could eventually lead to these populations becoming locally extinct when the adult birds die. So, even if the habitat is healthy and providing ample food and nesting opportunities, without ongoing predator control the wetland is unlikely to provide a safe habitat for all species of native wildlife.

All native fish species will benefit from any riparian management that provides more instream habitat for them and improved water quality, particularly giant kokopu, koaro, and possibly short-jawed kokopu and brown mudfish (McDowall,1990). The proposed wetland reserve will improve water quality by absorbing nutrients, sediments, pesticides and pathogens. Healthy, vegetated wetlands also act as water absorption 'sponges' which help to dampen flood events.

The increased diversity of the wetland habitats will allow a wider array of wildlife to live and use the area. Providing taller-stature shrubs will increase the habitat value for birds such as fernbird. However, changes to the wetland area can also make it unsuitable for some species. If the open nature of the wetland is altered too much, and the open water areas are reduced, ducks will be less likely to use the area. Such changes can be planned for, partly through planting, but may also need to be actively managed, as the natural progression is towards a more closed habitat.



Drawing 1 : Wetland sequence – showing main vegetation types

4. Ecological Management Plan

This ecological management plan sets out the actions required to:

- *Increase the robustness of the wetland ecosystem;*
- *Return the wetland to its most original state, whilst also creating a more diverse array of vegetation types and in turn diversifying the habitat of the area;*
- *Improve water quality in the Waitohu Stream and wetland;*
- *Increase community awareness of the wetlands' special ecological values and encourage a commitment to protect them and*
- *Provide an area that locals and visitors can enjoy and learn about.*

4.1 Wetland fencing and access

Objective: To provide a protective barrier around the wetland

Methods: Fence the wetland and retain the existing natural barriers

A permanent stock-proof, post and batten fence is essential to begin the restoration process. The Waitohu Stream Care Group erected a fence to separate the wetland from the rest of the paddock in February 2003. The river bank acts as a natural barrier on the southern and western side of the wetland.

It is not recommended that a gate is included in the fence line as gates inevitably get left open, leading to stock damage. The original farm fence along the river bank within the fenced wetland area could be removed, however landowner permission should be sought. It may be more appropriate to erect a stile over the fence so that easier access can be gained from the stream edge into the wetland.

Although it would be nice to allow people closer access to the wetland, it is not recommended that a permanent structure such as a bridge be erected over the stream as this will provide an easier pathway for domestic predators (cats and dogs) into the wetland. A single cat or dog can decimate a population of ground nesting birds. By providing easy access to people it will also result in increased disturbance to wetland wildlife. This is private property therefore providing easier access could not be carried out without the permission of the landowner.

Recommendation 1: Maintain the fence around the wetland area.

Recommendation 2: Ensure that the natural barriers to the wetland remain. If access is required from the farm or stream edge into the wetland, a stile should be erected rather than a gate. No structures should be built across the stream.

4.2 Plant Pests

Objective: The wetland will require only low maintenance, ongoing weed control

Methods:

- Eradicate weeds from the wetland where possible
- Control weeds where it is not possible to eradicate them so as to minimise their impact on the natural values of the wetland
- Extend weed control to surrounding area where possible to reduce the seed source of weeds

Weeds threaten the regenerative ability and ecological integrity of the wetland. There are several weed species currently in the wetland and neighbouring areas that have the potential to seriously impact on the wetland and its margins. Most of the known wetland weeds that are a problem in other wetland areas in the ecological district are also present in the Waitohu wetland. Those that aren't need to be looked out for, especially vines such as Japanese Honeysuckle and Blackberry. Other than tall fescue, none of the present weeds are dominating large areas yet, so control and maintenance should be relatively easy. However with the removal of grazing, many of these weeds are likely to proliferate.

It is always far easier to manage weeds when they first arrive at a site, before they become well established. If they become well established you then face the possibility of having to destroy areas of indigenous vegetation to get rid of the weeds.

Recommendation 3: Control, or where possible, eliminate the existing plant pests in the wetland and surrounding land, listed in Table 1 (note: Priority 1 weeds must be controlled first in order to eliminate them from the wetland / or make their future control manageable).

There are a number of different kinds of weed threats. Weeds that out-compete mature native plants will require ongoing control. These weeds tend to be dicotyledon, climbing species as they can smother both forest and wetland vegetation. Weeds that inhibit immature plantings, such as grasses, will require control during the time it takes for plantings to establish and overtop them. Once this occurs, the plantings will expand their cover and shade out the grasses and small herbs. These weeds tend to be monocotyledons. They only threaten smaller stature species such as herbfield species.

Many native wetland species are monocotyledons (flax, carex, rushes, cabbage trees, toetoe etc.) and therefore if you plant an area entirely in monocots. and use a dicotyledon-specific herbicide (such as Grazon), you can spray the area and control all serious weeds without having to worry about killing the native plants. This makes long term control much easier than trying to spray around native species. It does mean that whilst the plants are establishing you will have to be very careful about controlling grass around the plants (hand pulling is best).

In some areas, taller dicot. vegetation will be planted (swamp and coastal forest areas). Here monocot. specific herbicide such as Gallant can be used to control plants during establishment as it will only kill the grass and not the plantings. However, where the grass is not smothering the plants, it should be left to act as a windbreak to new plants. If it is not one

of the high priority weed species, such as tall fescue, it will not spread rapidly and acts as a ground cover to stop the establishment of more serious weeds.

Recommendation 4: Plant dicotyledon and monocotyledons plants in separate areas so that long term weed control is easier. Generally avoid creating any areas of bare ground as these areas will become colonised by weeds. Control weeds using specific, rather than broad spectrum herbicides.

Recommendation 5: Control grasses around plantings only to the extent to ensure they do not smother plantings. Tall fescue will need to continue to be controlled.

The Greater Wellington Regional Pest Management Strategy, 2002 -2022 (RPMS) identifies plant pests of regional concern. Many of these weed species have the potential to establish in the wetland reserve and compromise its ecological integrity. Nearly all weeds in the RPMS list could establish on the higher ground where there is less saline/wet influence. Only a few weed species can establish within the saline areas. Continual surveillance is required to detect any new weeds early on. (See Appendix 3 for the RPMS weed categories and lists).

Wider surveillance of the area surrounding the wetland is important to identify sources of weeds. It is more efficient to control weeds at source rather than continually control weeds within the wetland due to reintroduction from local sources. Educating surrounding land owners about problem plants is therefore important. Encourage landowners who are growing weed species to use non-weedy alternatives and highlight that none of the plant pest species listed in the Great Wellington Regional Pest Management Strategy should be grown in gardens. Garden waste disposal is a major source of weeds entering natural areas. The Otaki landfill on Riverbank Road will dispose of garden waste for free (06 364 8198).

Recommendation 6: Regularly monitor the wetland (at least every 6 months) for reinfestation of controlled weeds and the presence of any of the weeds listed in the RPMS (see Appendix 3). Particularly look out for Priority 1 weeds, *Spartina anglica* (exotic cordgrass) and vines and climbers, such as blackberry and Japanese Honeysuckle which can take over wetland areas. Check for new weed growth/ species during the spring and carry out weed control during the summer and before seed has set.

Recommendation 7: Provide information to surrounding landowners about the negative impact of weed species on the wetland. Encourage them to plant alternative species to replace weed species. Also explain about problems caused by dumping garden waste.

Table 1. Recommended control methods for weed species

Weed species	Location	Management priority	Control method	Herbicide
Junctus Acutus (sharp rush)	Several isolated plants, scattered through out the wetland	<i>Priority 1 species.</i> Has been recorded to dominate sea rush communities forming continuous swards in other wetlands in area. Control mature plants immediately and monitor for establishment of new plants. If not possible to control before seed sets, remove all seed heads to eliminate spread.	Spray with round up or gallant. (split searush and plant in bare area) May want to dig out root mass as only a few plants to ensure doesn't reappear.	Gallant 1% + Pulse penetrant
Tall fescue	Around the margins of the wetland and the dryer areas.	Recorded as major problem in other wetlands in the area. Will inhibit the establishment of new plants unless controlled. With removal of grazing likely to spread further. Ongoing monitoring will be required. Main long term threat is to herbfields.	knapsack spray	Gallant 1% + Pulse penetrant or round up
Crack willow (Salix fragilis)	Solid band along riverbank has been planted upstream of pampas.	Not currently spreading into wetland but may with removal of grazing. Priority is to remove mature source trees at wetland edge and further upstream. Crack willow breaks off and can spread into wetlands during floods, establishes vegetatively. Ongoing monitoring to check for new plants in wetland area.	Cut and paint stumps or Drill hole in trunk and pore poison in hole.	Use 50% Roundup on cuts and holes (or Grazon)
Pampas	Solid band along eastern edge of river. Also along public access way.	<i>Priority 1 species</i> Remove mature plants as part of planting plan and monitor for re-establishment of seedlings in wetland as pampas ¹ is extremely invasive of disturbed ground and out-competes native species	Knapsack spray	1% Gallant or Roundup + Pulse penetrant
Bucks Horn Plantain	Scattered individual plants amongst the bachelor's button (also found in residential lawns)	Relacing herb fields in other wetlands. This weed will only affect herbfields and not have a large overall impact on the wetland but could be controlled when other weeds are under control.	Hand pull Advocate control in residential properties around wetland	
Convolvulus	Scattered plants, not wide spread	<i>Priority 1 species</i> Requires ongoing control as is a smothering species.	Hand pull	Or spray with Grazon (if in monocots.)
Other	Throughout	Only control in patches around	knapsack	Gallant 1% +

¹ Pampas (weed) = erect dense fluffy flower heads (white or purple), flowers Jan-May, leaf has one distinct vein (easy to tear across). Toetoe (native) = drooping, usually cream flower heads, flowers Nov-Jan, leaf is multi-veined (difficult to tear across).

pasture grasses	wetland and stream banks where no continuous cover	plantings if necessary as grass provides ground cover and prevents colonisation of bare ground by more vigorous species (such as tall fescue). Will be eliminated as plantings increase cover.	spray	Pulse penetrant
Gorse	Only in a small area at the centre of the wetland	Unlikely to be highly invasive due to wet ground but should be removed.	knapsack spray	Grazon (as in middle of wetland and will not harm rushes)
Lupin	On low sand hills behind wetland. One plant in downstream riparian area.	Remove plant on stream bank.	Hand pull or stump paint with herbicide	50% Roundup (or Grazon)
Vetch (sweet pea)	Small patches in riparian area and within dune rush land – spreading	A climber so could be a problem weed. Control whilst has limited range. May be confined to riparian area. Requires control and surveillance.	Hand-pull or spray	1% Roundup + Pulse penetrant (or Grazon if in area of monocots.)
Wild turnip –	Bare areas	Will take over cleared ground. Control as necessary but not a smothering weed so low priority. Just clear around plantings, as necessary.	Hand pull around plantings	

Weed control suggestions:

- Control the weeds during their main growing season, between January and April.
- Herbicides – Use Grazon to release monocots. (many of the wetland species) from dicot. weeds eg vines. Use Gallant (which is monocot. specific i.e. grass specific) where required to release shrub/ forest (dicots.) plantings from grass.
- Be very careful to only spray herbicide on calm days to avoid spray drift and non-target kill.
- Be careful not to spray herbicide directly into waterways.
- Any spraying required near the waters edge should be undertaken over low tide to ensure adequate time for the herbicide to act.
- Spraying should be undertaken in summer before inanga migrate to estuaries to spawn, and when herbicide uptake by the target plants is greatest.

4.3 Planting

Objective:

- To establish a healthy wetland that accurately reflects historic vegetation patterns but also provides small areas of other vegetation types that would have existed within the wider area.
- To provide a diverse wetland environment that continues to provide habitat to existing wildlife, but also increases the habitat diversity for other wildlife.

Methods:

- Use fast growing, dominant wetland species to close up all open, uncolonised ground to form a protective cover against weed establishment.
- Plant specimen plants to increase the species diversity and reintroduce plant species that have been lost from the wetland
- Create small areas of ‘swamp forest’, coastal scrub etc.
- Plant species that provide food sources for birds
- Keep larger, high stature plants and raupo away from western areas of pools and herbfield areas to preserve existing waterfowl habitat

In order to plant the wetland in a manageable and controlled manner, a staged approach is recommended. Map 1 (page 7) shows the different planting zones. Table 2 indicates the species that should be planted in each zone.

The PNAP report lists several areas similar to this wetland which contain established native vegetation sequences ranging from estuarine wetland to coastal forest. The selection of species for the Waitohu wetland plantings have been determined partly from this report (see Appendix 2). Generally it is best to plant only a few species and keep the plantings simple. This makes care easier. Plants such as flax, toetoe, cabbage tree, *Coprosma propinqua* and carex are suitable species and should be used extensively. Greater diversity is likely to occur naturally as the seed source of many plants will still be there. Some of the species listed in the PNAP report are uncommon and would be difficult to propagate and therefore have not been suggested. If they did occur previously they may appear of their own accord. Alternatively, it may be possible to harvest seed or plants from nearby wetland areas.

The saltmarsh and rush vegetation cannot be influenced in any great way as the ecological limits of species within these areas are strongly influenced by salinity and water levels. However, a few specimen plants could be added and lists of plants that naturally occur in other similar areas are provided in Appendix 2. These plants would have to be sourced from other local wetlands. This is really ‘icing on the cake’ work.

Recommendation 8: Undertake a staged planting program, using the zone-based planting program as shown on Map 1 (pg. 7) and listed in Table 2.

If possible, locally-sourced seed or plants should be used. The associated nursery across the road from the wetland, run by the Stream Care Group, will be the main source of local plants. Seed or plants should be gathered from the nearby seed sources, including the patch of toetoe (in the adjacent paddock), *Coprosma propinqua* (large stand in paddock on

northern side of Rangiuru Road, Otaki Beach), kanuka and manuka. It may be possible to cut manuka and kanuka branches and lay these on the dryer areas as a fast and easy alternative to individually growing the plants. Another useful trick is to plant plugs of kanuka and manuka. Do this by scattering seed into pots and planting out these 'plugs' containing several plants. One plant will thrive and the others will protect the dominant one from wind when establishing.

Many species that exist already such as the reeds and carex, can be split and planted on bare areas to provide cover and exclude weeds.

Recommendation 9: Use locally-sourced plants where possible.

Willows have been, and in some places, continue to be used for river bank stabilisation. However, they can block waterways and are also a weed. Their removal will have a positive impact on flood management for the landowner. However they provide shade to the stream and also hold up the stream banks. Removal of these willows will cause the stream banks to erode and become unstable as the roots rot after poisoning. The willows should be removed in stages so as to minimise the amount of bank disturbed and planting should take place immediately. If the removal of all of the willows further upstream is unlikely in the near future, then under-planting of the willows will help by establishing replacement trees. This will allow the new trees to establish roots that can hold the banks as the willows are successively poisoned and die.

Some areas of the stream bank should be planted with low-growing plants that are adapted to flooding, and will also provide shade and habitat to the waterway. Flax, toetoe or *Carex* species, and even rank grass are suitable, and they also make an effective buffer which slows and intercepts surface run-off from the paddocks. Placement of trees should also take into consideration views into the wetland from the motor camp and surrounding properties. An area of *Carex* or low-stature flax, could be planted opposite the motor camp to maintain low-level views. The esplanade strip adjacent to the motor camp has not yet been planted up. It should contain plantings that compliment the plantings in the wetland and riparian area.

Native freshwater fish species (particularly inanga) utilize vegetation in upper tidal reaches (such as the banks of the Waitohu Stream) as spawning grounds. A staged planting approach would limit the amount of exposed bank, and leave areas of fish spawning habitat.

Recommendation 10: Undertake a staged approach for planting along the stream banks (as indicated on Map 1).

Recommendation 11: Contact the District Council to check that the planting plan for the motor camp Esplanade Strip uses appropriate species.

Table 2: Planting lists for specific areas within the wetland
(see Map 1 for the planting zones)

Description of area	Plant Zones	Comments	Species to be planted
Sandy soils on higher ground behind dunes	A	Weed control is important in this area. Cluster plants so that a variety of habitats exist here.	<ul style="list-style-type: none"> • Tauhinu • <i>Coprosma propinqua</i> • Mingimingi (<i>cyathodes juniperaina</i>) (NB these are all dicots. – group together for easy weed control) • Flax • Toetoe • Cabbage tree (NB these are all monocots – group together)
Western saline stream edge	B	<p>Stream edge downstream from residential properties – sand dune side</p> <p>A self regulating area. Bare mud on river edge may be a tiny area of ‘mudflat’ and therefore will not be colonised by plants. If plants do establish they are likely to be herbs or rushes. Plants must be salt tolerant and able to tolerate regular frequent inundation and also being covered by debris such as logs.</p> <p>Control weeds to allow natural expansion of existing plants, but avoid creating large bare areas. Plant some specimen plants as trials here.</p>	<p><u>At back:</u></p> <ul style="list-style-type: none"> • Salt marsh ribbon wood • Manuka <p><u>In very wet areas near stream:</u></p> <ul style="list-style-type: none"> • <i>Isolepis prolifer</i> (split up existing plants) • Could try putting herbs in mud area (see Appendix 2 – herbfield)
Banks in lower reaches of stream	D	<p>Plants must be salt tolerant and able to tolerate regular frequent inundation and also being covered by debris such as logs</p> <p>Logs often come to rest on eastern stream edge, so hardy, flexible plants are essential</p> <p>(plant areas in stages as indicated)</p>	<p><u>At back:</u></p> <ul style="list-style-type: none"> • kanuka • cabbage trees • ngaio • <i>Oleria virgata</i> (NB – all dicots.) <u>Along edge of stream:</u> <ul style="list-style-type: none"> • flax (lots) • carex spp. (<i>C. litorosa</i>) • toetoe (if not too wet) (NB all monocots)
Brackish stream edge (upstream and adjacent to wetland)	C and E	<p>Able to plant wider variety of plants along river margin as slightly raised ground means less water/salt influence.</p> <p>Plant areas in stages as indicated.</p> <p>Plant area E(5) and possibly E(4) with taller species as further upstream so less saltwater influence and taller plants will not block existing views. This area is intended to represent an area of coastal scrub/forest.</p> <p>Plant some low species in front of</p>	<p><u>Plant mostly:</u></p> <ul style="list-style-type: none"> • flax (nectar) • toetoe • giant umbrella sedge • carex (large, dense areas to maintain views) <i>C. virgata</i>, <i>C. germinate</i>, <i>C. litorosa</i>. (NB all monocots) <ul style="list-style-type: none"> • saltmarsh ribbon wood • <i>coprosma propinua</i> • cabbage trees (both low growing – small groups rather than scatter plant) <u>Plant areas E5 and 4 with the following:</u>

		properties (with owner's permission), in order to stabilise river edge and provide instream habitat and spawning areas.	<ul style="list-style-type: none"> • titoki • ngaio • mahoe (for nectar) • <i>coprosma (propinqua and repens)</i> • kowhai – if dry enough/ not salty • manuka (kanuka may colonise later under manuka) <p><u>Plant a few:</u></p> <ul style="list-style-type: none"> • totara, • matai, • wharangi. <p>(NB all dicots.)</p>
Low-lying ground that regularly floods around margin	F	<p>Rank grass, mostly tall fescue As is close to pools and herbfields, keep low stature</p> <p>Higher stature, dense, spreading vegetation should not be planted close to the herbfields and open water as they will cover this low stature vegetation and close in the open spaces that suit wildlife such as ducks.</p>	<ul style="list-style-type: none"> • Carex (on edge of pools use some <i>c.secta</i>) • rushes including sea rush/ three square • giant umbrella sedge • flax (low stature variety) <p>(NB all monocots.)</p>
<p>Grass covered higher ground that does not experience standing water and only floods with spring tides</p> <p>(along the stream fence line from the pampas upstream. Area widens as go upstream. Grassed areas against north fence of wetland</p>	G	<p>Wider variety of plants, forest and shrub areas to create greater diversity</p> <p>Higher stature, dense, spreading vegetation should not be planted close to the herbfields and open water as they will cover this low stature vegetation and close in the open spaces that suit wildlife such as ducks. Keep species low stature between residential area with existing views and pools.</p> <p><u>Swamp forest</u> Plant two areas: one cluster at upstream extreme in corner against fence and another area in grass wedge against farm fence to north boundary</p>	<p><u>Plant at back away from wetland area:</u></p> <ul style="list-style-type: none"> • Manuka (grows on wide range of soils - using techniques suggested) • <i>Coprosma propinqua</i> • (NB both dicots.) • flax (split from flax already there or other local source) <p><u>Plant where adjacent to herbfields and rushes</u></p> <ul style="list-style-type: none"> • flax (low stature) • cabbage trees • carex • toetoe <p>(NB all monocots)</p> <p><u>Swamp forest:</u></p> <ul style="list-style-type: none"> • kahikatea (mostly) (prefers damp open sites with rich soils. Separate male and female plants. Very sensitive to spray) • pukatea • rimu (one or two in dryer areas) • swamp maire <p>(NB all dicots)</p> <ul style="list-style-type: none"> • <i>Blechnum capense</i> (big fern, not saline) may come of own accord when trees estab.
Low-lying ground that regularly floods	H	<p>Majority of wetland area, Mostly covered by rushes, standing water and bachelor's button.</p> <p>This area is self-regulating. The area could be supplemented with some absent species</p>	<p><u>Rushland only –</u> Plant occasional specimens of:</p> <ul style="list-style-type: none"> • <i>Carex secta</i> - on edge of most brackish pool in north east corner. • <i>Saltmarsh ribbon wood</i> - could

	<p>or species with very low numbers. Leave herbfield as is – weed out exotic plantain. This is not essential planting.</p> <p>Raupo – Small patch existing. Excellent habitat for some birds but will exclude others such as ducks as covers open water. Unless is naturally limited by salinity could take over large areas of wetland. Probably best not to plant and may even want to consider pulling up the patch that exists currently. Dies back in winter.</p>	<p><i>extend the areas of saltmarsh ribbon wood if require some ground cover</i></p> <p>Could plant some of the following or scatter seed if find in other wetlands in locality:</p> <ul style="list-style-type: none"> • <i>Schoenoplectus validus</i> • <i>Bolboschonenus caldwellee</i> • <i>Triglochin striatum</i> • <i>Baumea rubiginosa</i>
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Planting Suggestions:

- Plant in autumn for best results (particularly free-draining soils). Note: plant in winter amongst sprayed stream-side plants to avoid fish spawning in autumn.
- Clear only immediate planting area of weeds before planting.
- Use large plants (PB3 or larger) particularly for ‘specimen’ species e.g. kahikatea, as this increases their chance of survival and makes it easier to relocate them for weed-releasing. Plant at 0.5-1.0 metre spacings.
- In wet areas, plant on a formed raised mound to allow the nursery plant’s roots to acclimatise to the damp conditions.
- Stake all shrubs and trees to ensure they can be relocated during weed releasing. Paint the tips of the stakes white.
- Plant in groups of monocots. and dicots. if possible, to make future control using selective sprays much easier.
- Plant species in groups of three. This proves useful when weeding as once you have located one plant you then know to look out for two other plants of the same species Odd number groupings (3 or 5) are also more aesthetically pleasing.
- Control possums and rabbits if they browse the plantings.
- Be prepared for some loss of plants as it is very difficult to assess salinity and water gradients. Therefore it is best to plant up sequentially so you can see what will survive and plant larger more expensive specimen plants, a few at a time.
- Gather and scatter seed. This is the easiest way to establish plants, and using this technique the species seed germinates according to whether the environment is suitable for it or not. The downside to this is the longer and more intensive weeding required, so often a combination of techniques is best.
- Carex, flax, toetoe can be divided and replanted. This way you continue to use local stock.
- Plant lots of flax. It will grow fast, removing weed problems and providing shelter for other native plants.
- Karo has been planted in this area already but it not native to the area so although it isn’t essential to remove those planted, no more should be planted.

4.4 Animal Pests

Objective: Increase bird breeding success and population size by effective control of introduced predators

Method: Provide ongoing animal pest control within and around the wetland.

Rats, mustelids, hedgehogs, possums, dogs, and cats are probably resident or visit the wetland. Introduced animal predators, particularly stoats, ferrets and rats, prevent the regeneration of native trees, destroy insects and lizards, and eat birds and their eggs and fledglings in the nest.

In order to provide effective, targeted pest control the Care Group needs to put together a predator control management plan. It is recommended that the group:

- Find out what predators are present (tracking tunnels or similar methods)
- Decide what the group wants to protect (key species to monitor)
- Identify any constraints (e.g. conflicts if kill domestic cats)
- Implement a control system

It is likely that rats and mustelids are the main predators in the wetland however it is important to identify what the target species are. Tracking tunnels can be used to identify small mammalian predators within the wetland. These work by recording animal prints when they walk through a tunnel and over a dye pad and sheet of paper which records the footprints of the animal. This enables identification of predators in the wetland and allows control methods to be tailored accordingly. It also allows those carrying out the control to monitor the success of the control over time. Black Trakka, make tracking tunnels and can provide advice on effective predator control, look up the internet website of Gotcha Traps and Tracking at www.gotchatraps.com phone (09-425-6483), or email gotcha@best.net.nz.

The Care Group also needs to decide on a sensible target for pest control. This should focus on getting lower levels of predators in the wetland as well as improving the survival or population of species within the wetland. By focussing on one or two key species, the Care group will be able to measure success.

Different methods of predator control exist, including trapping and poisoning. Non-kill traps are labour intensive and involve checking the traps regularly in order to dispose of animals humanely. Using poison close to an urban area could be contentious as dying or dead animals can be eaten by cats or dogs and cause pets to die (often slowly). The most effective and appropriate predator control method for the wetland area is considered to be kill-traps.

The trap recommended for use in the wetland is the DOC120. This trap has an almost 100% effective kill rate and kills rats, mustelids and hedgehogs which are the main predators within the wetland. It also excludes birds from getting into the trap. The trap costs \$25.00 and can be ordered through the Department of Conservation. It requires the construction of a long wooden box to house the trap. The trap excludes cats but could present a problem with regard to public safety therefore it may not be appropriate in the dune area, but should be used in the wetland where people are less likely. The box should be long enough to ensure cats cannot put their paws in it. Live traps should be used in the dune area but must be checked daily when in use.

The Regional Council has laid down poison to control rabbits in the adjacent farmland in the past. This poison is likely to be affecting native wildlife. It was observed that pukeko numbers lowered significantly after poisoning (Pers. Comm. Monk and Treacher). It should be possible to lay rabbit poison so that it is not accessible to birds.

Recommendation 12: Prepare a long-term predator control management plan. It may be prudent to involve surrounding landowners and the Regional Council. This should include predator control being carried out regularly according to monitoring results. Use kill traps in the wetland and live-catch traps within the dune area. Record all species and numbers killed so that this information can then be compared with native wildlife monitoring results.

Recommendation 13: Liaise with the Regional Council about the impact of rabbit control on native wildlife.

Cats and dogs are a significant threat to most native birds but particularly chicks and ground nesting/dwelling birds. Cats can also severely deplete populations of lizards and frogs. It is hoped that the stream will provide some barrier to domestic animals and stop them reaching the wetland. However, both cats and dogs can roam far into wetlands and cross water. Cats can have extensive home ranges and the hunting instinct is strong even if they are well fed (Barratt, 1997).

By providing pet owners with educational material, they can then make informed choices about whether they wish to have or replace their own cats and dogs. Encourage owners to keep them inside at night time. Encourage owners to keep dogs under control, especially within the dune area. If a new subdivision is ever proposed adjacent to the wetland, lobby the Council to ensure that it is made 'domestic-predator-free'.

Recommendation 14: Keep records of any sightings of cats and dogs within the wetland. Provide education material to surrounding owners so that they recognise the values of the wetland and dune environment and understand the impact that cats and dogs have on wildlife.

Magpies aggressively defend their territories and can impact on native bird populations. Mostly they scare other wildlife, rather than kill it. They can be controlled, however, reinvasion rates are high. Shooting them is unlikely to be acceptable adjacent to a built up area. The Regional Council can supply caged magpies that act to attract and then trap other resident magpies. These caged birds can be loaned from the Regional Council.

Recommendation 15: Controlling magpies should be of low priority relative to mammalian predator control. Monitor the magpie numbers in the vicinity of the wetland and observe how they impact on wildlife. Contact the Regional Council if magpie control is considered to be necessary.

4.5 Covenant

Objective: Protection of the wetland ecosystem in perpetuity
Method: Covenant the wetland

The previous sections show how the physical protection of the wetland area can be achieved, however an area is never completely safe from development pressures unless it has legal protection in the form of a covenant. Public funds for further protection work (fencing and weed/pest control) are more likely to be made available if the wetland is covenanted.

The landowner has allowed this restoration project to take place on his property without gaining any development benefits. He may therefore be open to the idea of protecting the wetland in perpetuity. The landowner could be approached about the idea and given information about covenants and grants for protection areas.

A suitable covenant (which includes active management in the form of pest and weed control) over the wetland area would ensure its values are protected in perpetuity. The Care Group could continue to manage the pest and weed control in the wetland.

Recommendation 16: Approach the landowner about the possibility of adding a QEII National Trust covenant, or similar covenant to the title.

QE2 National Trust
PO Box 334
WELLINGTON
Tim Park (Wellington Region Representative)
Ph: 04 4726626
Free phone: 0508 732878
Fax: 04 4725578
Email: qe2@qe2natrust.org.nz
Website: www.nationaltrust.org.nz

Funding further works within the wetland and riparian areas may be possible through the Biodiversity Condition and Advice Fund which has been set up under the Biodiversity Strategy to assist landowners to protect biodiversity on private land and is administered by the Department of Conservation. (www.biodiversity.govt.nz/land/nzbs/land/condition.html)

Recommendation 17: Investigate other forms of funding for further restoration within the wetland and for extending the riparian plantings up and down stream.

4.6 Monitoring

Objective: Have a full understanding of how the management of the wetland is impacting on the wetland and stream's natural processes.
Method: Monitor different environmental variables that reflect ecosystem health.

Monitoring is very important as it provides the 'proof' that the work carried out is improving the health of the wetland and its wildlife. This information can be used to gain further

funding for protection work. Monitoring is also important to motivate the Care Group and increase community and landowner support. Monitoring can be as simple as recording species present each year, or can involve set recordings of particular variables at particular locations and times.

Recommendation 18: Set up a monitoring program which includes monitoring, all or some of the following:

- plant species diversity, including vegetation compositional changes. This could involve recording new species and abundance each year and set photo points to identify vegetation changes;
- predator numbers and species/ weed species present and cover;
- wildlife numbers and species, including timing of visits if not resident;
- water quality monitoring (such as aquatic invertebrate sampling).

5. Future management

The following are further suggestions or recommendations that could improve the natural wetland values and surrounding environments.

5.1 Information

Although the values of wetlands may seem obvious to some people others are unaware of them. Erecting an explanatory sign(s) in front of the wetland is one way of improving people's understanding and appreciation of wetland.

Recommendation 19:Erect a sign providing information about the values within the stream and wetland area. Explain about the community work that has gone into protecting this area. (A sign has already been made).

Erect a sign(s) at access points into the dune area and saltmarsh that state that this is an important wildlife area and dogs must be kept on leads.

Recommendation 20: Investigate the possibility of erecting a seat or a slightly elevated viewing tower/ platform, (preferably within the esplanade strip adjacent to the motor camp, or possibly at the end of the public access way) that allows people to sit and enjoy the wetland and its wildlife without disturbing it. If such a structure were to be erected then an explanatory sign providing information about the wetland and what species might be observed should also be erected. (Need to check with the Council with regard to the terms of the esplanade strip and consult with the motor camp owner and adjoining residents).

Recommendation 21:Investigate the feasibility of holding an annual talk and/or walk through the wetland and dune areas to increase local resident's

awareness of the areas values. If numbers are high then the walk may need to be around the fringes to avoid trampling damage.

5.2 Linkages

The wetland was once part of a much larger sequence of coastal water bodies. It is also part of vegetation sequence from land to sea. The aerial photograph on page 5 shows that there are other remnant habitats in the near vicinity. Behind the estuary and running parallel to the dunes are a series of small, possibly ephemeral dune hollows or lakes. These may still harbour rare herbs. The waterbodies, particularly the largest one with a small island in its centre may provide habitat for birds and insects. These dune hollows could also be the focus of a restoration project and help to complete the picture towards the former landscape. The linkages between these remnant ecosystems could form a wider, larger project. The sea/ dune/ stream/ wetland/ remnant coastal forest and hill forest linkage is also important, particularly for animals that need to move between these habitats. The linkage of different habitat areas is important for aquatic fauna such as native fish as well as birds, some of which live in the larger tracts of hill forest but need to forage in the coastal remnants to supplement food supplies in different seasons. This is a much larger project but smaller parts of it could be picked up at a time, or the concept put forward to Councils and the community.

The wetland is very small and is likely to be limited in terms of providing a full wetland sequence due to its limited extent. It would be greatly enhanced by including the adjacent, upstream area of wetland that is unfenced and possibly a part of the paddock adjacent to the river so that an area with a greater freshwater influence is protected. A greater variety of species could be planted in this area. This would of course result in more paddock being lost from production, however, generally stock health improves when wetland areas are fenced. This is something that should be considered only after all plantings within the original wetland have established and weeds are under control.

Recommendation 22: Identify ecosystem remnants on a map and trace important linkages. Investigate feasibility with local Councils/ landowners and the community of restoring other ecosystems, including improving linkage of habitats through riparian and corridor planting.

Recommendation 23: Consider approaching the landowner about the possibility of moving the fence to include the wedge of paddock containing the remaining wetland area and area of stream bank into the protected area.

5.4 Habitat Creation

Often overlooked due to their small size are the reptiles. Cats, rats and mustelids all prey on lizards and geckos and can severely reduce their populations. Artificial reptile habitats create refuge areas for reptiles where they can escape from predators. To create one, stack materials such as roofing tiles or sheets into piles, allowing 10mm gaps between the material. This effectively creates a lizard apartment block by providing a safe and warm refuge for lizards. Grow pohuehue over the stack to make it look more attractive.

Recommendation 24: Create lizard friendly habitat (may need to provide a temporary explanatory sign to the public about what it is so that they recognise that it is not just a pile of rubbish).



Drawing 2: Illustration of artificial lizard house with *muehlenbeckia* growing over it (taken from Kiwi Conservation Club magazine)

Mudfish may well live within the wetland. They thrive in areas of clear water where other fish cannot get to, such as the pools within the wetland. They also require some cover for sheltering under (aestivating) and laying their eggs on. Mudfish have often been found under stumps and sheets of metal roofing within wet areas. Their natural habitat in this area is likely to have been in swamp forests around the bases and buttresses of trees, particularly kahikatea.

Recommendation 25: Improve mudfish habitat within the wetland by providing structures to hide under and also plant kahikatea to provide future mudfish habitat.

5.5 Reintroduction of lost species

Even if the perfect environment and habitat is provided, some rare species that are no longer found in the wetland will not come back to the wetland without active reintroduction. This is mostly true for animals as plants often have seed sources still available.

The wetland may harbour a number of rare plants such as the rare orchid *Spiranthes sinensis*. If rare plants such as this one are not found here, it may be worth investigating the possibility of bringing them here (note orchids are hard to translocate and are probably not suitable for this). This would require the knowledge and permission of the staff at the

Department of Conservation. It may be considered beneficial to have another 'protected' site for some rare native plants, if plants or seeds can be transferred safely and would not endanger stocks in existing areas. *Carex virgata* is nationally threatened and can be supplied by the Department of Conservation. Other plants including the rare mistletoe, *Ileostylus micranthus* can also be obtained from sites in the vicinity (DOC can help with locating sites). The rare nettle (*urtica spp.*) would also do well here.

The same is likely to be true for some bird species. Fernbird are likely to have lived within this wetland but appear to be locally extinct. The planting of shrubs is likely to provide more suitable habitat for fernbirds. It may be possible to investigate introducing some birds into the wetland, however, it may be that the wetland is considered too small to sustain a population of fernbirds or reintroduce other rare birds.

(Please note that these are merely ideas and may not be possible or may only be possible in the future)

Recommendation 26:When the habitat has been restored, stabilised and successful predator control is underway, the reintroduction of locally extinct species may be investigated.

5.6 Consultation and Management

The Regional Council performs a number of management tasks that impact upon the wetland and dunes. These include poisoning of rabbits, dredging of the river mouth and maintenance of drains. For example, a straight course to the sea is bulldozed almost every year when the moving stream mouth threatens the nearby plantation forest. An assessment is needed of the relative values of the plantation compared to the value of the dunes and the impact that artificially altering the course of the river is having upstream. Other techniques may be more appropriate.

Recommendation 27:Set up regular meetings with key staff at the Regional Council (perhaps invite them to some Care Group meetings) to enable information to be exchanged and to have input into management decisions.

The drain within the wetland/ riparian area was formed by the Regional Council to help dry out the paddock. It has not been maintained and is gradually filling in. This infill process will help keep the natural high groundwater level in the wetland and should be encouraged.

Recommendation 28:Consult with landowners and the Regional Council about the importance of not dredging this drain and not creating new drains around the wetland area.

5.7 Surrounding land use and Stream care

The Water clarity of the Waitohu Stream is quite good before it reaches and mixes with the Mangapouri Stream. Although the brackish water at the river mouth will never be entirely clear (as sediment stays in suspension where fresh water meets salt water) the water quality could still be improved. By re-creating the wetland area and planting the stream sides to the

river mouth, a significant area of habitat for aquatic and terrestrial wildlife is restored and water quality improved. However, the water quality cannot be fully restored without proper management of the entire catchment.

- Recommendations 29:** Investigate the sources and causes of sediment and pollution entering the Waitohu Stream. Assess the land use within the catchment and identify what kind of runoff is entering the streams, where and how (i.e. diffuse, such as runoff from paddocks or direct discharge such as dairy shed effluent discharge to a drain).
- Pinpoint areas without effective riparian areas such as unfenced streams or drains. In consultation with landowners, the community and Councils, investigate starting a progressive fencing off and native revegetation of the Waitohu Stream (this could be linked in with the restoration program being carried out for the Mangapouri Stream).
 - Contact the Regional and the District Council and enquire about grant schemes for fencing and planting riparian areas.
 - Find out how much water is being taken out of the stream. How many water takes are operating on the stream? Are they monitored?
 - Are there any obstructions to fish passage in the stream? Can culverts be made fish-friendly or replaced with bridges? (See the Regional Council inventory of stream barriers that need to be removed.)
 - Find out about land use consents in the area. Ask the Regional and District Councils to consult the wetland group about any upstream discharge or water take consents.
 - Investigate, in conjunction with landowners and the Regional Council, installing sediments traps in drains to remove sediment entering the stream.

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Appendix 1: Species Lists

(*denotes introduced species)

VASCULAR FLORA

Common name	Taxonomic name	Description
* annual beard grass	<i>Polypogon monspeliensis</i>	Large clumps (being sprayed)
arrow grass	<i>Triglochin strataium</i>	Scattered around wet areas
* arum lily	<i>Zantedeschia aethiopica</i>	
bachelors button	<i>Cotula coronopifolia</i>	
* buck's Horn Plantain	<i>Plantago cornopus</i>	
* buttercup	<i>Ranunculus</i> sp.	
cabbage trees	<i>Cordyline australis</i>	
carex	<i>Carex</i> spps.	<i>Carex</i> in wetland unknown, several planted species
celery (native)	<i>Apium prostratum</i>	
* convolvulus	<i>Calystegia soldanella</i>	
coprosma	<i>Coprosma Propinqua</i>	Not on site but in locality
coprosma	<i>Coprosma repens</i>	Riverbank
* crack willow	<i>Salix fragilis</i>	
creeping bent (grass)	<i>Agrostis stolonifera</i>	
flax	<i>Phormium tenax</i>	
giant umbrella sedge	<i>Cyperus ustulatus</i>	
* gorse	<i>Ulex europaeus</i>	
grass	Species unknown	Soft, dark green, floating on top water in stream, rounded end and small point.
herb	<i>Triglochin striatum</i>	Tiny herb in b button - native
herb (like mealy fat hen)	<i>Rhagodia triandra</i>	
kahikatea	<i>Dacrycarpus dacrydiodes</i>	(planted)
karo	<i>Pittosporum crassifolium</i>	(planting)Not naturally found this far south.
manuka	<i>Leptospermum scoparium</i>	(planting)
muehlenbeckia	<i>muehlenbeckia complexa</i>	Near willows and dune area
ngaio	<i>Myoporum laetum</i>	Planted
oioi	<i>Leptocarpus similis</i>	
* pampas	<i>Cortaderia selloana</i> and <i>C. jubata</i>	
* pine	<i>Pinus</i> Spps.	
raupo	<i>Typha orientalis</i>	
rush	<i>Isolepis nodosa</i>	Knobby clubrush
rush	<i>Isolepis prolifer</i>	Has young plants on end of stems, oval in cross section
salt marsh ribbonwood	<i>Plagianthus divaricatus</i>	
sea rush	<i>Juncus maritimus</i> var. <i>australiensis</i>	Main rush, widespread
sedge	<i>Bolboschoenus</i> sp.	Browns off in summer
* sharp rush	<i>Juncus acutus</i>	Large, dark green, big nut rush

* tall fescue (grass)	<i>Festuca arundinacea</i>	
three square	<i>Schoenoplectus pungens</i>	Single nut sedge
toetoe	<i>Cortaderia toetoe</i>	In paddock
* vetch	<i>Vicia sativa</i>	Legume like sweet pea
* wild turnip	<i>Lobelia anceps</i>	Lopsided pale mauve flowers

FAUNA

Birds

Common name	Taxonomic name
australasian bittern	<i>Botaurus stellaris</i>
* black backed gull	<i>Larus dominicanus</i>
black fronted dotterel	<i>Charadrius melanops</i>
* blackbird	<i>Turdus merula merula</i>
fantail	<i>Rhipidura fuliginosa</i>
grey duck	<i>Anas superciliosa superciliosa</i>
harrier hawk	<i>Circus approximans</i>
kingfisher	<i>Halcyon sancta</i>
* magpie	<i>Gymnorhina tibicen</i>
* mallard duck	<i>Anas platyrhynchos</i>
marshcrake (locally extinct)	<i>Porzana pusilla affinis</i>
New Zealand shovellor	<i>Anas rhynchotis variegata</i>
paradise shelduck	<i>Tadorna variegata</i>
ped stilt	<i>Himantopus himantopus leucocoephalus</i>
pukeko	<i>Porphyrio porphyrio</i>
shag (little black)	<i>Phalacrocorax varius</i>
Shining Cuckoo	<i>Chrysococcyx lucidus lucidus</i>
* spur-winged plover	<i>Vanellus miles</i>
* starling	<i>Sturnus vulgaris</i>
* thrush	<i>Turdus philomelos</i>
tui	<i>Prothemadera novaseelandiae</i>
welcome swallow	<i>Hirundo tahitica neoxena</i>
white heron	<i>Egretta alba modesta</i>
white-faced heron	<i>Ardea novaehollandiae</i>
yellow hammer	<i>Emberiza citronella caliginosa</i>

Aquatic Fauna

(species from NIWA database (2002), no survey of stream on site visit)

Common name	Taxonomic name
brown mudfish (not recorded but likely)	<i>Neochanna apoda</i>
* brown trout	<i>Salmo trutta</i>
common bully	<i>Gobiomorphus cotidianus</i>
common smelt	<i>Retropinna retropinna</i>
eels (long and short finned)	<i>Anguilla spp.</i>
giant kokopu	<i>Galaxias argenteus</i>
inanga	<i>Galaxias masculatus</i>
red-finned bully	<i>Gobiomorphus huttoni</i>
upland bully	<i>Gobiomorphus breviceps</i>

visiting marine species

Herring and flounder

Mammals

Common name

- * cat (feral and domestic)
- * cattle
- * dog
- * hedgehog
- * mouse
- * norway rat
- * possum
- * rabbit
- * ship rat
- * stoat
- * ferret
- * weasel

Taxonomic name

Felis domesticus
Bos taurus
Canis domesticus
Erinaceous europaeus
Mus domesticus
Rattus norvegicus
Trichosurus vulpecula
Oryctolagus cuniculus
Rattus rattus
Mustela erminea
Mustela fero
Mustela nivalis vulgaris

Reptile & frogs

Common name

- common gecko
(Northern grey gecko – PNAP report)
- common skink (dunes)
- * golden bell frog (dead, found in wetland)
- * whistling tree frog (PNAP report only)

Taxonomic name

Hoplodactylus maculatus
Oligosoma nigriplantare polychroma
Litoria aurea
Litoria ewingii

Appendix 2: Vegetation Types

(Summarised from the Foxton Protected Natural Area Program Report)

- **Sea rush dominated rush land**
- **Salt marsh ribbonwood/searush shrubland**
Occasional other associations as below but often homogenous cover
- **Three square/raupo sedgeland**
Schoenoplectus validus
Bolboschonenus caldwelliae
Sea rush
Triglochin striatum
Baumena rubiginosa
oioi
- **Herb field on tidal flat**
Halfstar
Shore primrose
Isolepis cernua
Batchelors button
Triglochin striatum
Isolepis prolifer
Lilaeopsis novae-zelandiae
Leptinella dioica
Limosella lineata
- **Shrubland,/broadleaf – forest within a km of the sea**
Akeake
Rewarewa
Titoki
Ngaio
Mahoe
shrubs – *coprosma* spps.
- **Less fertile areas of scrub**
Flax
Olearia solandri
Karamu
Coprosma propinqua
Coprosma robusta

Kanuka – result of Maori fires

- **Lowland swamp forest – Kahikatea**
Kahikatea
Pukatea
Rimu
Swamp maire
Kohekohe

- **Sand dune**
Tauhinu shrub
Muehlenbeckia complexa
Flax
Toetoe cabbage tree
Jointed wire rush
Bracken

- **Open Water (fresh or slightly saline)**
Carex secta found round edges of open water (not saline)
Raupo

Appendix 3: Plant Pests in the Wellington Region

(This list can be found on the Regional Council's website: www.wrc.govt.nz)

Total Control Pest Plants

These are plants of limited distribution where eradication is considered possible, and/or plants that pose an extreme threat to the regional environment if their spread is not controlled. The complete removal of all plants is a step towards eradication. The sale, distribution and propagation of these plants is prohibited. The following plants are Total Control Pest Plants:

Cathedral Bells (*Cobaea scandens*)

Nodding Thistle (*Carduus nutans*)

Old Man's Beard (*Clematis vitalba*)

Perennial Nettle (*Urtica dioica*)

Wild Ginger

(*Hedychium gardnerianum*, *Hedychium flavescens*)

Hornwort

(*Ceratophyllum demersum*)

Saffron Thistle

(*Carthamus lanatus*)

Woolly Nightshade

(*Solanum mauritianum*)

Marshwort

(*Nymphoides geminata*)

Boundary Control Pest Plants

These plants are widely distributed throughout the region and in such abundance that eradication is not considered possible. These plants will require removal from a specified area. The aim is to prevent the dispersal of these pest plants to adjacent properties. The sale, distribution and propagation of these plants is prohibited. The following plants are Boundary Control Pest Plants:

Gorse (*Ulex europaeus*)

Ragwort (*Senecio jacobaea*)

Variiegated Thistle (*Silybum marianum*)

Educational Pest Plants

These are plants that will be controlled through advice and education to the public. The onus will not be on the occupier to initiate control. The sale, distribution and propagation of these plants is prohibited. The following plants are Educational Pest Plants:

Blackberry [Wild varieties] (*Rubus fruticosus* agg)

Goats Rue (*Galega officinalis*)

Regional Surveillance Pest Plants

These are plants which, because of their potential, may pose significant problems for the region in the future. The Wellington Regional Council will monitor the distribution and spread of these plants. The classification of these pest plants may be re-evaluated if monitoring indicates that their current status is inappropriate. The sale, distribution and propagation of these plants is prohibited. The following plants are Regional Surveillance Pest Plants:

Australian Sedge	<i>(Carex longibrachiata)</i>
Banana Passionfruit	<i>(Passiflora mollissima/mixta)</i>
Boneseed	<i>(Chrysanthemoides monilifera)</i>
Cape Ivy	<i>(Senecio angulatus)</i>
Climbing Asparagus	<i>(Asparagus scandens)</i>
Darwins Barberry	<i>(Berberis darwinii)</i>
Italian Buckthorn	<i>(Rhamnus alaternus)</i>
Manchurian Wild Rice	<i>(Zizania latifolia)</i>
Purple Pampas	<i>(Cortaderia jubata)</i>
Spartina	<i>(Spartina)</i>
Lagarosiphon	<i>(Lagarosiphon major)</i>
Parrots Feather	<i>(Myriophyllum aquaticum)</i>

National Surveillance Pest Plants

These are plants which, while not being an immediate problem to the Wellington Region, have been identified as representing an actual and potential problem elsewhere and over time may become a problem here. The Council will provide advice and education about these plants. The sale, distribution and propagation of these plants is prohibited. The following plants are National Surveillance Plant Pests:

African Love Grass	<i>(Eragrostis curvula)</i>
All Stipa species	<i>(Stipa spp)</i> apart from native spp.
Alligator Weed	<i>(Alternanthera philoxeroides)</i>
Artillery Plant	<i>(Galeobdolon luteum)</i>
Baccharis	<i>(Baccharis halimifolia)</i>
Barberry	<i>(Berberis glaucocarpa)</i>
Bartettina	<i>(Bartettina sordida)</i>
Bathurst Bur	<i>(Xanthium spinosum)</i>
Bladderwort	<i>(Utricularia gibba)</i>
Blue Morning Glory	<i>(Ipomoea indica)</i>
Blue Passion Flower	<i>(Passiflora caerulea)</i>
Bogbean	<i>(Menyanthes urifoliata)</i>
Boxthorn	<i>(Lycium ferocissimum)</i>
Broomsedge	<i>(Andropogon virginicus)</i>
Buddleia	<i>(Buddleia davidii)</i> not including hybrids
Bur Daisy	<i>(Calolis lappulacea)</i>
Burdock	<i>(Arctium minus)</i>
Cape Honey Flower	<i>(Melianthus major)</i>
Chinese Pennisetum	<i>(Pennisetum alopecuroides)</i>
Clasped Pondweed	<i>(Polamogelon perfoliatus)</i>
Coltsfoot	<i>(Tussilago farfara)</i>
Cotoneaster	<i>(Cotoneaster glaucophyllus, C. Franchettii)</i>
Eelgrass	<i>(Vallisneria)</i> Lake Pupuke, Meola Creed varieties
Egeria Oxygen Weed	<i>(Egeria densa)</i>
Elaeagnus	<i>(Elaeagnus x reflexa)</i>
Fountain Grass	<i>(Pennisetum setaceum)</i>
Fringed Water Lily	<i>(Nymphoides peltata)</i>

German Ivy	(<i>Senecio mikanioides</i>)
Green Cestrum	(<i>Cestrum parqui</i>)
Hawthorn	(<i>Crataegus monogyna</i>)
Heather	(<i>Calluna vulgaris</i>) not including double flowered cvs.
Hemlock	(<i>Conium maculatum</i>)
Himalayan honeysuckle	(<i>Leycesteria formosa</i>)
Horse Nettle	(<i>Solanum carolinense</i>)
Horsetail	(<i>Equisetum arvense</i>)
Houttuynia	(<i>Houttuynia cordata</i>)
Hydrilla	(<i>Hydrilla verticillata</i>)
Japanese Honeysuckle	(<i>Lonicera japonica</i>) including cultivars but not hybrids
Japanese Spindle Tree	(<i>Euonymus japonicus</i>)
Lantana	(<i>Lantana camara</i> var. <i>aculeata</i>)
Lodgepole Pine	(<i>Pinus contorta</i>)
Mexican Daisy	(<i>Erigeron karvinskianus</i>)
Mignonette	[Madeira] vine (<i>Anredera cordifolia</i>)
Mile-a-minute	(<i>Dipogon lignosus</i>)
Mistflower	(<i>Ageratina riparia</i>)
Montpellier Broom	(<i>Teline monspessullana</i>)
Moth Plant	(<i>Araujia sericifera</i>)
Nardoo	[Four leaved water clover] (<i>Marsilea mutica</i>)
Noogoora Bur	(<i>Xanthium occidentale</i>)
Nutgrass	[Purple nutsedge] (<i>Cyperus rotundus</i>)
Oxylobium	(<i>Oxylobium lanceolatum</i>)
Palm Grass	(<i>Selaria palmifolia</i>)
Pampas Grass	(<i>Cortaderia selloana</i>)
Phragmites	(<i>Phragmites australis</i>)
Plectranthus	(<i>Plectranthus ciliatus</i> , <i>P. ecklonii</i> , <i>P. grandis</i>)
Plumeless Thistle	(<i>Carduus acanthoides</i>)
Port Jackson Fig	(<i>Ficus rubiginosa</i>)
Privet - tree	(<i>Ligustrum lucidum</i>)
- chinese	(<i>Ligustrum sinense</i>)
Sagittaria	(<i>Sagittaria graminea</i> ssp. <i>platyphilla</i>)
Senegal Tea	[Temple plant] (<i>Gymnocoronis spilanthoides</i>)
Sheeps Bur	(<i>Acaena agnipila</i>)
Skeleton Weed	(<i>Chondrilla juncea</i>)
Smilax	(<i>Asparagus asparagoides</i>)
Spanish Heath	(<i>Erica lusitanica</i>) not including double flowered cvs.
Spiny Broom	(<i>Calicotome spinosa</i>)
St Johns Wort	(<i>Hypericum perforatum</i>)
Sweet Briar	(<i>Rosa rubiginosa</i>)
Sweet Pea Shrub	(<i>Polygala myrtifolia</i>) not including cv. 'Grandiflora'
Tuber Ladder Fern	(<i>Nephrolepis cordifolia</i>)
Tutsan	(<i>Hypericum androsaemum</i>)
Velvet Groundsel	(<i>Senecio petasitis</i>)
Water Poppy	(<i>Hydrocleys nymphoides</i>)
Water Primrose	(<i>Ludwigia peploides</i> ssp. <i>montevicensia</i>)
White Monkey Apple	(<i>Acmena smithii</i>)
White-edged Nightshade	(<i>Solanum marginatum</i>)
Wild Broom	(<i>Cytisus scoparius</i>)
Yellow flag	(<i>Iris pseudacorus</i>)
Yellow Water lily	(<i>Nuphar lutea</i>)

