

# Key Native Ecosystem Plan for Otepua-Paruāuku Wetlands

2016-2019



greater WELLINGTON  
REGIONAL COUNCIL  
Te Pane Matua Taiao





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## 1. Key Native Ecosystem programme

The Wellington region's native biodiversity has declined since people arrived and the ecosystems that support it face ongoing threats and pressures. Regional councils have responsibility to maintain indigenous biodiversity, as well as to protect significant vegetation and habitats of threatened species, under the Resource Management Act 1991 (RMA).

Greater Wellington Regional Council's (GWRC) Biodiversity Strategy<sup>1</sup> sets a framework that guides how GWRC protects and manages biodiversity in the Wellington region to work towards the following vision:

**Vision**  
Healthy ecosystems thrive in the Wellington region and provide habitat for native biodiversity

The Strategy provides a common focus across the council's departments, and guides activities relating to biodiversity under this overarching vision and is underpinned by four operating principles and three strategic goals. Goal One drives the delivery of the Key Native Ecosystem (KNE) programme.

**Goal One**  
Areas of high biodiversity value are protected or restored

The KNE programme is a non-regulatory voluntary programme that seeks to protect some of the best examples of original (pre-human) ecosystem types in the Wellington region by managing, reducing, or removing threats to their ecological values. Sites with the highest biodiversity values have been identified and prioritised for management. Sites are identified as of high biodiversity value for the purposes of the KNE programme by applying the four ecological significance criteria described below.

Representativeness	Rarity/ Distinctiveness	Diversity	Ecological context
The extent to which ecosystems and habitats represent those that were once typical in the region but are no longer common place	Whether ecosystems contain Threatened/At-risk species, or species at their geographic limit, or whether rare or uncommon ecosystems are present	The levels of natural ecosystem diversity present ie, two or more original ecosystem types present	Whether the site provides important core habitat, has high species diversity, or includes an ecosystem identified as a national priority for protection

A site must be identified as ecologically significant using the above criteria and be considered sustainable for management in order to be considered for inclusion in the

KNE Programme. Sustainable for the purposes of the KNE programme is defined as: a site where the key ecological processes remain intact or influence the site and resilience of the ecosystem is likely under some realistic level of management.

KNE sites can be located on private or publically owned land. However, Department of Conservation (DOC) managed lands are largely excluded from this programme.

KNE sites are managed in accordance with three-year KNE plans, such as this one, prepared by the GWRC's Biodiversity department in collaboration with the landowners and other stakeholders. These plans outline the ecological values, threats, and management objectives for sites and describe operational activities such as ecological weed and pest animal control. KNE plans are reviewed regularly to ensure the activities undertaken to protect and restore the KNE site are informed by experience and improved knowledge about the site.

## 2. Otepua-Paruāuku Wetlands Key Native Ecosystem

The Otepua-Paruāuku Wetlands KNE site (35ha) is located approximately 2km north of Ōtaki township and west of State Highway 1 (SH1) (See Appendix 1, Map 1). The KNE site supports a number of wetland habitat types including open water, reed/rushland, flax swampland, wetland scrub and swamp forest. The KNE site is within 5km of the Tararua mountain range and within 3km of several other wetland KNE sites. The site is therefore thought to be an important ecological corridor for birds within the wider landscape.

The water that sustains the current wetlands originates from a small catchment fed predominantly by Pukehou Hill, located to the east. The KNE site is part of what was once a substantially larger wetland area, that has been extensively drained and the land reclaimed for agriculture or development. The largest open waterbody of the Otepua-Paruāuku wetlands (known as the Booth wetland) and the wetlands in western part of the KNE site (known as the Main wetland and Western wetland) are bisected by a railway embankment. Past drainage within the KNE site has included a central drain and ring drains around the Main wetland and the construction of the rail embankment and Taylor's Road with their associated culverting. Historically the Booth wetland was actively drained but in 2001 it was re-watered by the landowners.

### **3. Landowners, management partners and stakeholders**

GWRC works in collaboration with landowners, management partners and stakeholders where appropriate to achieve shared objectives for the site. GWRC also recognizes that effective working relationships are critical for achieving the management objectives for each KNE site. In preparing this plan GWRC has sought input from landowners, management partners and relevant stakeholders, and will continue to involve them as the plan is implemented.

#### **3.1. Landowners**

The majority of the Otepua-Paruāuku Wetland KNE site is owned by 12 separate private landowners. Parts of Booth's wetland (east and west of the rail embankment) are covenanted with the Queen Elizabeth II National Trust (QEII). The part of the Main wetland (west of the railway embankment) that is within four other properties is covenanted with the Department of Conservation (See Appendix 1, Map 2).

There are small land parcels managed by NZ Railways Corporation (on behalf of the Crown) associated with the railway embankment.

#### **3.2. Management partners**

The management partners are the private landowners, Kāpiti Coast District Council (KCDC), QEII and GWRC.

Within GWRC, the management partners are the Biosecurity and the Biodiversity department. The Biodiversity Department is the overarching lead department for GWRC on the coordination of biodiversity management activities and advice within the KNE site. The Biosecurity department coordinates and carries out pest control activities.

Large areas of the KNE site have been identified by the KCDC as sites of ecological significance (SES)<sup>2</sup>, and by DOC as Recommended Areas for Protection (RAPs). Given its high identified ecological value KCDC are providing ongoing support for the projects within this KNE site, and is the main contact for restoration planting activities.

QEII and private landowners with covenants are management partners given that parts of the KNE site are legally protected by QEII Open Space Covenants. The Booth wetland was re-watered in 2001 to create a 5ha open water body and the landowners have been undertaking large scale restoration works there since.

Many of the private landowners without covenanted land parcels have also committed to restoration activities. With assistance provided from GWRC and KCDC these landowners undertake ecological weed control, pest animal control, fencing and restoration planting.

#### **3.3. Stakeholders**

Kiwirail are stakeholders as they manage the NZ Railways Corporation owned land associated with the railway embankment through the centre of the KNE site.

Ngāti Raukawa ki Te Tonga (part of the wider representative iwi group Ngā hapū o Ōtaki) have identified parts of the Otepua-Paruāuku KNE site as having cultural significance for them.<sup>3</sup> The area was known as a place of abode (papa kāinga) and, as valuable a source of fresh water (wai ora), food (mahinga kai), medicinal plants (puna rongoā), weaving materials (puna raranga) and clay (puna uku).

## 4. Ecological values

This section describes the various ecological components and attributes that make the KNE site important. These factors determine the site's value at a regional scale and how managing it contributes to the maintenance of regional biodiversity.

### 4.1. Ecological designations

Table 1, below, lists ecological designations at all or parts of Otepua- Paruāuku KNE site.

**Table 1: Designations at the Otepua- Paruāuku KNE site**

Designation level	Type of designation
Regional	The following areas within the KNE site are scheduled under GWRC's proposed Natural Resources Plan (PNRP): <ul style="list-style-type: none"> <li>Significant natural wetland: Otepua-Paruāuku Wetland (Schedule F3)</li> </ul>
District	Kāpiti Coast District Council has identified parts of the KNE site in the KCDC district plan as: <ul style="list-style-type: none"> <li>an Ecological Site listed in the Heritage Register (Part of KO13; Pukehou Swamp)</li> </ul> Parts of the KNE site is listed in DOC's Manawatu Plains Ecological District Recommended Areas for Protection: <ul style="list-style-type: none"> <li>RAP9 Pukehou Swamp<sup>4</sup></li> </ul>
Other	Parts of the KNE site are covenanted via QEII Open Space Covenant (11.7 ha) and DOC Covenants (4ha): <ul style="list-style-type: none"> <li>Open Space Covenants: 5-07-400; 5-07-404</li> <li>Department of Conservation Covenants</li> </ul> Parts of the KNE site is scheduled under GWRC's PNRP as: <ul style="list-style-type: none"> <li>Site of Significance to Nga hapu o Ōtaki (Schedule C1)</li> </ul>

### 4.2. Ecological Significance

The Otepua-Paruāuku KNE site is considered to be of regional significance because:

- It contains highly **representative** ecosystems that were once typical or commonplace in the region
- It contains ecological features that are **rare or distinctive** in the region
- It contains high levels of ecosystem **diversity**, with several original ecosystem types and several naturally uncommon ecosystems represented within the KNE site boundary
- Its **ecological context** is valuable at the landscape scale as it contain a variety of interconnected habitats and, provides core/seasonal habitat for threatened indigenous bird species within the KNE site.

#### Representativeness

New Zealand's Land Environments New Zealand (LENZ)<sup>5</sup> have identified the majority of the Otepua-Paruāuku KNE site as being in the top threatened land environment category; Acutely Threatened having less than 10% of its indigenous vegetation cover

remaining on a national scale. Some small fragments are classified as Critically Underprotected having less than 20% of its indigenous vegetation cover remaining on a national scale.

Wetlands are now considered an uncommon habitat type in the Wellington region with less than 3% remaining of their original extent<sup>6</sup>. Furthermore, remnant blocks of kahikatea-pukatea forest present on some of the edges above the wetland water level have recently been identified as being extremely rare in the region with only an estimated 1.12% of its original extent left<sup>7</sup>.

The Singers and Rogers (2014)<sup>8</sup> classification of pre-human vegetation indicates the KNE site comprised several ecosystem types with elements that are still present onsite today. These original ecosystem types are:

- Kohekohe-tawa forest (MF 6) on the dune slopes and on the yellow-brown earth soils surrounding the wetlands. Only 15% of this forest type is left in the Wellington Region<sup>9</sup>
- Swamp Mosaic in the wetland areas which comprise :
  - Flaxland (WL16),
  - *Coprosma*-twiggy tree daisy scrub (WL20)
  - Raupō-reedland (WL19)

### Rarity/distinctiveness

Nationally threatened and naturally uncommon species include one species of native plant, one species of native fish and five species of native birds (see Appendix 2) including a breeding colony of dabchicks (*Tachybaptus ruficollis*) on the Booth wetland. There are three regionally threatened plant species (Appendix 3, Table 8).

### Diversity

As well as the four original ecosystem types being present within the KNE site, there are a rich diversity of natural habitats including small pockets of wetland swamp forest, wetland scrub, and open water. At the junction of these habitats are ecotones where the different plant communities meet. These ecotones provide a range of habitats for animal and plant species and a high species diversity. For example 34 different native fern species have been recorded at the KNE site<sup>10</sup>.

### Ecological context

KCDC has identified many parts of the KNE site as having high ecological value. The ecological site survey conducted by Wildland Consultants described Pukehou Swamp as the best and largest representative example of wetland-swamp forest associations in the Manawatu Plains Ecological District 11.

The Otepua-Paruāuku KNE site is also a stepping stone for native birdlife and migrating fish, so is an important part of the wider ecological landscape. The KNE site wetlands are feeder wetlands for a tributary of the Waitohu stream. The Otepua-Paruāuku KNE site is also within 500m of the Forest Lakes KNE site and within 3km of the Waitohu Coast KNE site, Lake Waiorongomai KNE site and the Haruātai/Pareomatangi Wetlands KNE site.

### 4.3. Ecological features

#### Habitats (vegetation)

##### **Regenerating Lowland forest**

In the KNE site there are regenerating elements of two lowland forest types. Previously these elements were more widely distributed across the Foxton ecological district. kohekohe-tawa forest is now mostly absent but seedlings have been recently observed. Totara/matai forest is regenerating in the north-east part of the KNE.

Adjacent to the north-eastern edge of the KNE site is a 1ha kohekohe-tawa forest. This forest is providing a valuable natural seed source assisting the natural regeneration of the swamp forest remnants of the KNE site.

##### **Swamp forest**

There are several small stands of kahikatea-pukatea swamp forest around the edges of the KNE site. These small fragmented and isolated stands are found at the damp flat areas at the foot of the embankments.

Uncommon plants of Kāpiti lowlands found around the edges of the wetlands within the KNE site include rimu (*Dacrydium cupressinum*), narrow-leaved maire (*Nestegis montana*), *Olearia virgata*, four different native orchid species and the giant sedge (*Gahnia xanthocarpa*).

##### **Reedland/rushland/sedgeland**

These areas mainly consist of raupō (*Typha orientalis*) and *Isolepis prolifer*. Native sedges present include *Carex secta* and *C. virgata*.

##### **Flaxland**

Flax (*Phormium tenax*) is the dominant cover in the Main wetland. Some toetoe (*Cortaderia toetoe*) is amongst the flax.

##### **Wetland scrub**

These areas are dominated by mānuka (*Leptospermum scoparium*) and various divaricating *Coprosma* species and wheki tree fern (*Dicksonia squarrosa*).

##### **Open water**

Small areas in the eastern end of Main wetland are standing water. Approximately 5ha of Booth wetlands is open water and provides habitat for wetland birds.

#### Species

##### **Birds**

The KNE supports large numbers of native wetland birds. Some of the more notable species include: spoonbill (*Platalea regia*), Australasian harrier (*Circus approximans*), dabchick (*Tachybaptus ruficollis*), NZ scaup (*Aythya novaeseelandiae*), Australasian shoveller (*Anas rhynchosotis*), grey teal (*Anas gracilis*), paradise duck (*Tadorna variegata*), pied stilt (*Himantopus himantopus*), pūkeko (*Porphyrio porphyrio*), white faced heron (*Ardea novaehollandiae*), black swan (*Cygnus atratus*), little black shag

(*Phalacrocorax sulcirostris*), black shag (*Phalacrocorax carbo*), spotless crake (*Porzana tabuensis*) and Australasian bittern (*Botaurus poiciloptus*).

More common forest birds such as kererū (*Hemiphaga chathamensis*), bellbird (*Anthornis melanura*), silvereye (*Zosterops lateralis*), tui (*Prothemadera novaeseelandiae*). NZ falcon (*Falco novaeseelandiae*) are also present.

### **Fish**

An assessment of migratory fish in the KNE site undertaken in 2014<sup>12</sup> found shortfin (*Anguilla australis*) and longfin eel (*Anguilla dieffenbachii*), common bully (*Gobiomorphus cotidianus*), banded kōkopu (*Galaxias fasciatus*) and the crustacean kōura (*Paranephrops planifrons*) present within the KNE site.

## 5. Threats to ecological values at the KNE site

Ecological values can be threatened by human activities, and by introduced animals and plants that change the ecosystem dynamics. The key to protecting and restoring biodiversity as part of the KNE programme is to manage threats to the ecological values at each KNE site.

### 5.1. Key threats

The main threats identified at the Otepua-Paruāuku KNE site are alterations to the site's hydrology, ecological weeds and pest animals.

Hydrology is the key ecological driver in wetland ecosystems. The extent of wetlands has reduced markedly over the last 100 years through land use change and drainage. The current drainage level maintained by the drainage channels and culverts means that the water level is below its natural level.

Ecological weeds are widespread and abundant throughout the KNE site. They displace indigenous vegetation, affect the structure and composition of ecosystems and can alter hydrological conditions adversely affecting the wetland's native biodiversity values.

Pest animals such as mustelids (*Mustela* spp.), feral cats (*Felis cattus*), rats (*Rattus rattus*, *R. norvegicus*) and hedgehogs (*Erinacues europaeus*) are a threat to bird species present within the KNE site. Possums (*Trichosurus vulpecula*) can also affect the regeneration of the native vegetation by browsing native seedlings, saplings and trees.

While the key threats discussed in this section are recognised as the most significant, a number of other threats to the KNE site's values have also been identified. Table 2 presents a summary of all known threats to the Otepua-Paruāuku KNE site (including those discussed above), detailing which operational areas they affect, how each threat impacts on ecological values, and whether they will be addressed by the proposed management activities.

**Table 2: Summary table of all threats to ecological values present at the Otepua- Paruāuku KNE site**

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
<b>Ecological weeds</b>		
EW-1	Climbing weeds such as Japanese honeysuckle ( <i>Lonicera japonica</i> ), old man's beard ( <i>Clematis vitalba</i> ), blackberry ( <i>Rubus fruticosus</i> agg.) and convolvulus ( <i>Calystegia sylvatica</i> ) smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition (see full weed list in Appendix 4)	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Gorse ( <i>Ulex europaeus</i> ) and willow ( <i>Salix cinerea</i> , <i>S. fragilis</i> ) are abundant in wet and marginally wet areas. Willows are considered ecological transformers due to their ability to trap sediment and alter the hydrology of wetlands. Barberry ( <i>Berberis glaucophylla</i> ) is widespread and abundant on the slopes around the wetlands (see full weed list in Appendix 4)	Entire KNE site
EW-3	Ground covering ecological weeds such as pampas ( <i>Cortaderia selloana</i> / <i>C. jubata</i> ) and arum lily ( <i>Zantedeschia aethiopica</i> ) smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition (see full weed list in Appendix 4)	Entire KNE site
EW-4	Aquatic weeds out-compete native aquatic species and choke watercourses. Hornwort ( <i>Ceratophyllum demersum</i> ) has been located at the edge of the western wetland. Giant reed sweet grass ( <i>Glyceria maxima</i> ) is abundant in the north finger wetland from Forest Lakes Rd through to the north of the Booth wetland	A, B, G
<b>Pest animals</b>		
PA-1	Hedgehogs prey on native invertebrates <sup>13</sup> , lizards <sup>14</sup> and the eggs <sup>15</sup> and chicks of ground-nesting birds <sup>16</sup>	Entire KNE site
PA-2*	House mouse ( <i>Mus musculus</i> ) browse native fruit, seeds and vegetation, and prey on invertebrates. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and small eggs and nestlings <sup>17,18</sup>	Entire KNE site
PA-3	Possums browse palatable canopy vegetation until it can no longer recover <sup>19,20</sup> . This destroys the forest's structure, diversity and function. Possums may also prey on native birds <sup>21</sup> and invertebrates	Entire KNE site
PA-4	Rats browse native fruit, seeds and vegetation. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and native birds <sup>22,23</sup> .	Entire KNE site
PA-5	Mustelids (stoats <sup>24,25</sup> ( <i>Mustela erminea</i> ), ferrets <sup>26,27</sup> ( <i>M. furo</i> ) and weasels <sup>28,29</sup> ( <i>M. nivalis</i> )) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions	Entire KNE site
PA-6*	Feral and domestic cats prey on native birds <sup>30</sup> , lizards <sup>31</sup> and invertebrates <sup>32</sup> , reducing native fauna breeding success and potentially causing local extinctions <sup>33</sup>	Entire KNE site
PA-7*	Rabbits ( <i>Oryctolagus cuniculus</i> ) and hares ( <i>Lepus europaeus</i> ) graze on palatable native vegetation and prevent natural regeneration in some environments <sup>34</sup> . Rabbits are particularly damaging in sand dune environments where they graze native binding plants and restoration plantings. In drier times hares especially, will penetrate into wetland forest areas browsing and reducing regenerating native seedlings	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-8*	Wasps ( <i>Vespula</i> spp.) adversely impact native invertebrates and birds through predation and competition for food resources. They also affect nutrient cycles in beech forests <sup>35</sup>	Entire KNE site
PA-9	Exotic waterfowl such as Canada geese ( <i>Branta canadensis</i> ) and feral geese ( <i>Anser anser</i> ) graze native marginal aquatic plants and in high numbers can result in the eutrophication of waterbodies.	B
<b>Human activities</b>		
HA-1*	Agricultural practices, particularly grazing livestock can result in pugging soils, grazing native vegetation inhibiting regeneration, wildlife disturbance and increasing nutrient content of soils and watercourses <sup>36</sup>	Outside KNE site
HA-2*	Plantation forestry on adjoining land parcels to the KNE site have the potential to cause habitat loss or degradation, disturb native wildlife and increase sediment load in watercourses via surface run-off during harvesting operations	Outside KNE site
HA-3*	In the surrounding catchment intensive farming is accelerating natural flows of nutrients into the system. Increased nutrient flows can affect native biota and eventually cause the open body of water to eutrophy. The proximity of SH 1 means that stormwater runs into the wetland system bringing pollutants in. These pollutants such as heavy metals and brake dust can have an adverse effect on the native biota, in particular on native aquatic invertebrate diversity	Outside KNE site
<b>Other threats</b>		
OT-1*	The current drainage regime means that the hydrology is operating below its natural historical level. This drier regime removes habitat for native wetland plant associations and facilitates the invasion of dry and marginal wetland weed species such as gorse, blackberry and Japanese honeysuckle. These weeds displace the natural habitat of flax, toetoe and wetland scrub, the favoured habitat of native birds	Entire KNE site
OT-2	Edge effects affect forest remnants by changing environmental conditions (e.g. soil moisture or temperature levels), changing physical environment (e.g. different plant assemblages compared to the interior) and changing species interactions (e.g. increased predation by invasive species) <sup>37,38,39</sup>	Entire KNE site

\*Threats marked with an asterisk are not addressed by actions in the operational plan.

The codes alongside each threat correspond to activities listed in the operational plan (Table 3), and are used to ensure that actions taken are targeted to specific threats. A map of operational areas can be found in Appendix 1, Map 4).

## 6. Management objectives

Objectives help to ensure that management activities carried out are actually contributing to improvements in the ecological condition of the site.

The following objectives will guide the management activities at the Otepua-Paruāuku KNE site.

- 1. To improve the structure\* and function† of native plant communities**
- 2. To improve the habitat for threatened native animals (wetland birds)**

\* The living and non-living physical features of an ecosystem. This includes the size, shape, complexity, condition and the diversity of species and habitats within the ecosystem.

† The biological processes that occur in an ecosystem. This includes seed dispersal, natural regeneration and the provision of food and habitat for animals.

## 7. Management activities

Management activities are targeted to work towards the objectives above (Section 6) by responding to the threats outlined in Section 5. The broad approach to management activities is described briefly below, and specific actions, with budget figures attached, are set out in the operational plan (Table 3).

It is important to note that not all threats identified in Section 5 can be adequately addressed. This can be for a number of reasons including financial, legal, or capacity restrictions.

For ease of operations the KNE site has been divided into seven operational areas (see Appendix 1, Map 3):

- A: North feeder wetland
- B: South feeder wetland
- C: Booth wetland
- D: East railway embankment
- E: West rail embankment
- F: Main wetland
- G: Western wetland

### 7.1. Ecological weed control

The objectives of weed control are to reduce the density of ecological weeds in order to maintain native plant dominance and integrity of native plant communities as well as to increase natural native plant regeneration. GWRC will undertake ecological weed control annually throughout the KNE site targeting the species that have the highest ecological impact on the ecosystems. See Appendix 4 for a full list of identified ecological weed species within the KNE site and their ecological impact rating.

High impact climber species, in particular Japanese honeysuckle, blackberry and old man's beard will be controlled annually by GWRC within the entire KNE site. Control in operational areas A, B and C will focus on the swamp forest areas, and regenerating bush above the wetland edges. Where control is undertaken within operational areas F and G all climbers will be control starting from the wetland edges and progressively working towards the centre of the wetlands.

Woody weeds such as wilding pines, gorse, barberry and willow species will be controlled annually by GWRC across the entire KNE site. Some willows may be controlled via aerial herbicide spray due to their inaccessibility. However, this would require landowner approval and resource consent before any action is taken.

The groundcovers species, pampas grass and arum lily will be controlled annually by GWRC around the wetland edges in operational areas F and G.

Reed sweet grass will be controlled by GWRC annually around operational areas A and C.

Kiwirail will control the climbers old man's beard, blackberry and Japanese honeysuckle on the western and eastern rail embankments annually (operational area D and E).

## 7.2. Pest animal control

Pest animal control is undertaken to protect the native bird populations present within the KNE site, including the threatened species and protect the regenerating native vegetation and mature swamp forests.

The pest animal control network includes a total of 28 Pellifeed poison bait stations, 29 DOC 250 and two DOC 200 kill-traps across the KNE site (see Appendix 1 Map 4). The poison bait stations target the control of possums and rats whilst the kill-traps target mustelids, rats and hedgehogs. Landowners check the network on their respective properties on a monthly basis and GWRC undertake an annual service of the overall network.

In operational area C the landowner will cull or engage shooters to cull Canada geese when numbers get too high.

## 7.3. Revegetation

The aim of revegetation work is to improve the structure and function of the native vegetation and to buffer the wetlands from further weed encroachment. In the longer term revegetation will increase the overall native vegetative cover in the local area and link other isolated native vegetation blocks.

KCDC are the primary contact for any revegetation work undertaken in the Otepua-Paruāuku KNE site. KCDC work with landowners to identify suitable planting areas at the Booth wetland (operational area C) and within seven the properties around the Main wetland (operational area F). KCDC are providing approximately 500 eco-sourced plants each year from 2016/17 for the KNE site's landowners to plant and maintain on their properties. Plant species to be planted by landowners include:

- Karamū (*Coprosma robusta*)
- Kōhuhū (*Pittosporum tenuifolium*)
- Kahikatea (*Dacrycarpus dacrydioides*)
- Pukatea (*Laurelia novaezelandiae*)
- Mānuka (*Leptospermum scoparium*)
- Kānuka (*Kunzea ericoides*)
- Five-finger (*Pseudopanax arboreus*)
- Māhoe (*Melicytus ramiflorus*)
- Ngaio (*Myoporum laetum*)

## 8. Operational plan

The operational plan shows the actions planned to achieve the stated objectives for Otepeua- Paruāuku KNE site and their timing and cost over the three-year period from 1 July 2016 to 30 June 2019. The budget for the 2017/17 and 2018/19 years are indicative only and subject to change.

**Table 4: Three-year operational plan for the Otepeua- Paruāuku KNE site**

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2016/17	2017/18	2018/19
1	EW-1	Ecological weed control (Climbers)	A, B,C	GWRC Biosecurity department	Cut and treat all climbers on slopes in mature forest vegetation and regenerating bush on slopes above wetlands.	Reduction in distribution and abundance of climbers	\$1,500	\$1,500	\$1,500
1	EW-1	Ecological weed control (Climbers)	D,E	Kiwirail	Annual control of old man's beard, blackberry and Japanese honeysuckle	Reduction in distribution and abundance of climbers	†	†	†
1	EW-1, EW-2	Ecological weed control (Climbers)	F,G	GWRC Biosecurity department	Progressive control of all climbers from wetland edges towards centre	Reduction in distribution and abundance of climbers	\$5,000	\$5,000	\$5,000
1	EW-2	Ecological weed control (Woody weeds)	Entire KNE site	GWRC Biosecurity department	Basal or aerial spray willows in Main wetland. Basal spray or cut and treat all other woody species	Reduction in distribution and abundance of woody weeds	\$1,500	\$1,500	\$1,500
1	EW-3	Ecological weed control (Groundcovers)	F,G	GWRC Biosecurity department	Control of arum lily and pampas grass	Reduction in distribution and abundance of groundcovers	\$500	\$500	\$500
1	EW-4	Ecological weed control (Aquatics)	A,B	GWRC Biosecurity department	Spray reed sweet grass in north feeder and Booth wetlands (A and C)	Reduction in distribution and abundance of aquatics	\$500	\$500	\$500

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2016/17	2017/18	2018/19
1, 2	PA-1, PA-3, PA-4, PA-5	Pest animal control	Entire KNE site	Landowners	Bait station and trap maintenance. All traps checked monthly	Possums <1% RTC * Rats < 10% TTI** Mustelids <5% TTI**	Nil	Nil	Nil
1,2	PA-1, PA-3, PA-4, PA-5	Pest animal control	Entire KNE site	GWRC Biosecurity department	Bait station and trap annual service and periodic bait provision and delivery to landowners	Possums <1% RTC * Rats < 10% TTI** Mustelids <5% TTI**	\$1,000	\$1,000	\$1,000
1	OT-2	Revegetation	Entire KNE site	KCDC	Provision of all plants to landowners. 500 eco-sourced plants provided annually	>70% survival rate after year 1	\$1,500^	\$1,500^	\$1,500^
1	OT-2	Revegetation	Entire KNE site	Landowners	Planting and maintenance of native plants	>70% survival rate after year 1	Nil	Nil	Nil
Total							\$11,500	\$11,500	\$11,500

^ subject to KCDC riparian fund

† subject to Kiwirail funding and cannot be detailed at this time

\*RTC = Residual Trap Catch. The control regime has been created to control possums to this level but monitoring will not be undertaken. Experience in the use of this control method indicates this target will be met.

\*\*TTI = Tracking Tunnel Index. The control regime has been created to control rats to this level but monitoring will not be undertaken. Experience in the use of this control method indicates this target will be met.

## 9. Funding contributions

### 9.1. Budget allocated by GWRC

The budget for the 2017/18 and 2018/19 years are indicative only and subject to change.

**Table 5: GWRC allocated budget for the Otepua- Paruāuku KNE site**

Management activity	Timetable and resourcing		
	2016/17	2017/18	2018/19
Ecological weed control	\$9,000	\$9,000	\$9,000
Pest animal control	\$1,000	\$1,000	\$1,000
<b>Total</b>	<b>\$10,000</b>	<b>\$10,000</b>	<b>\$10,000</b>

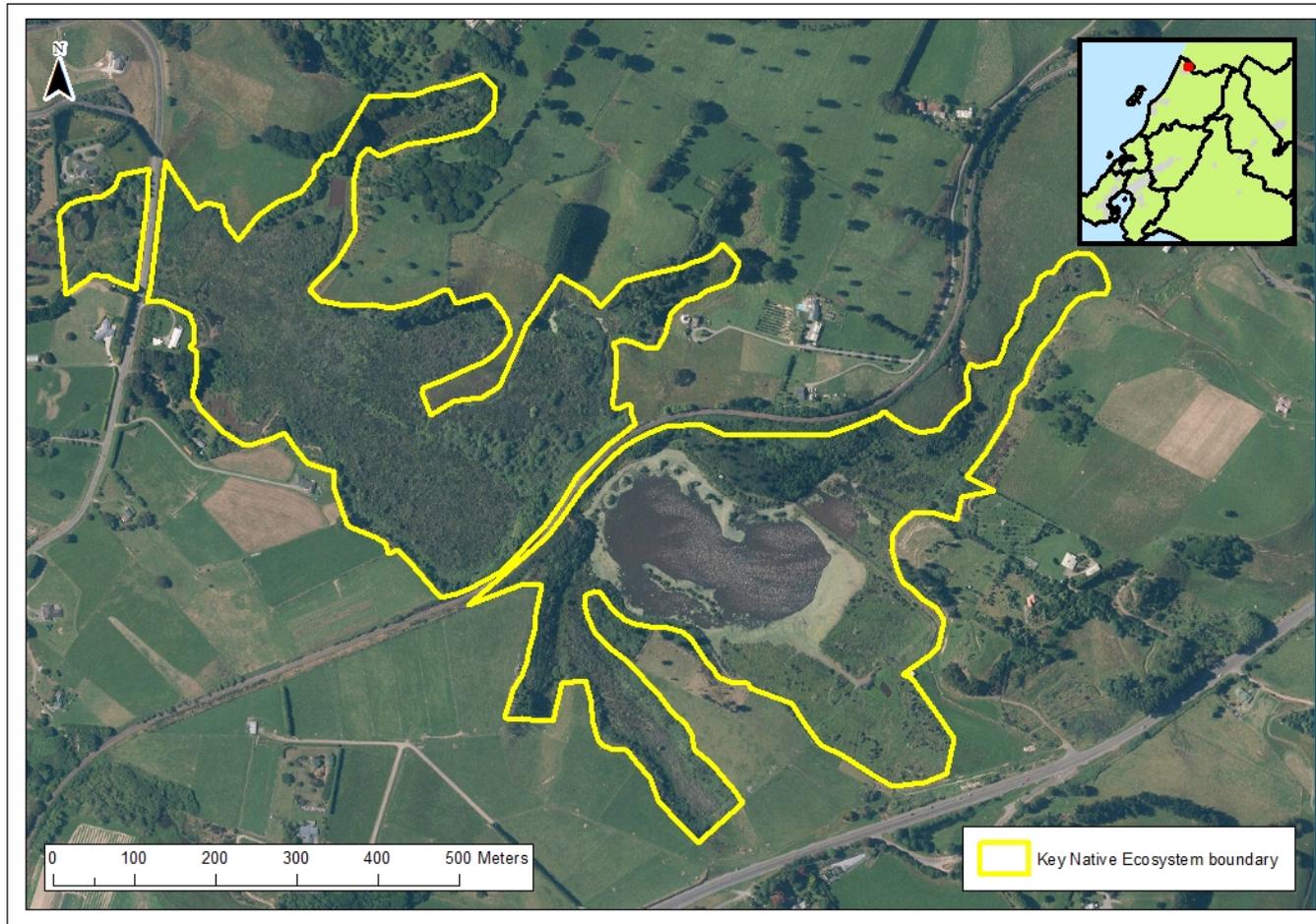
### 9.2. Budget allocated by KCDC

Budget allocations for the 2017/18 and 2018/19 years are indicative only and subject to successful applications to contestable funds and signing Memorandum of Understanding agreements with landowners.

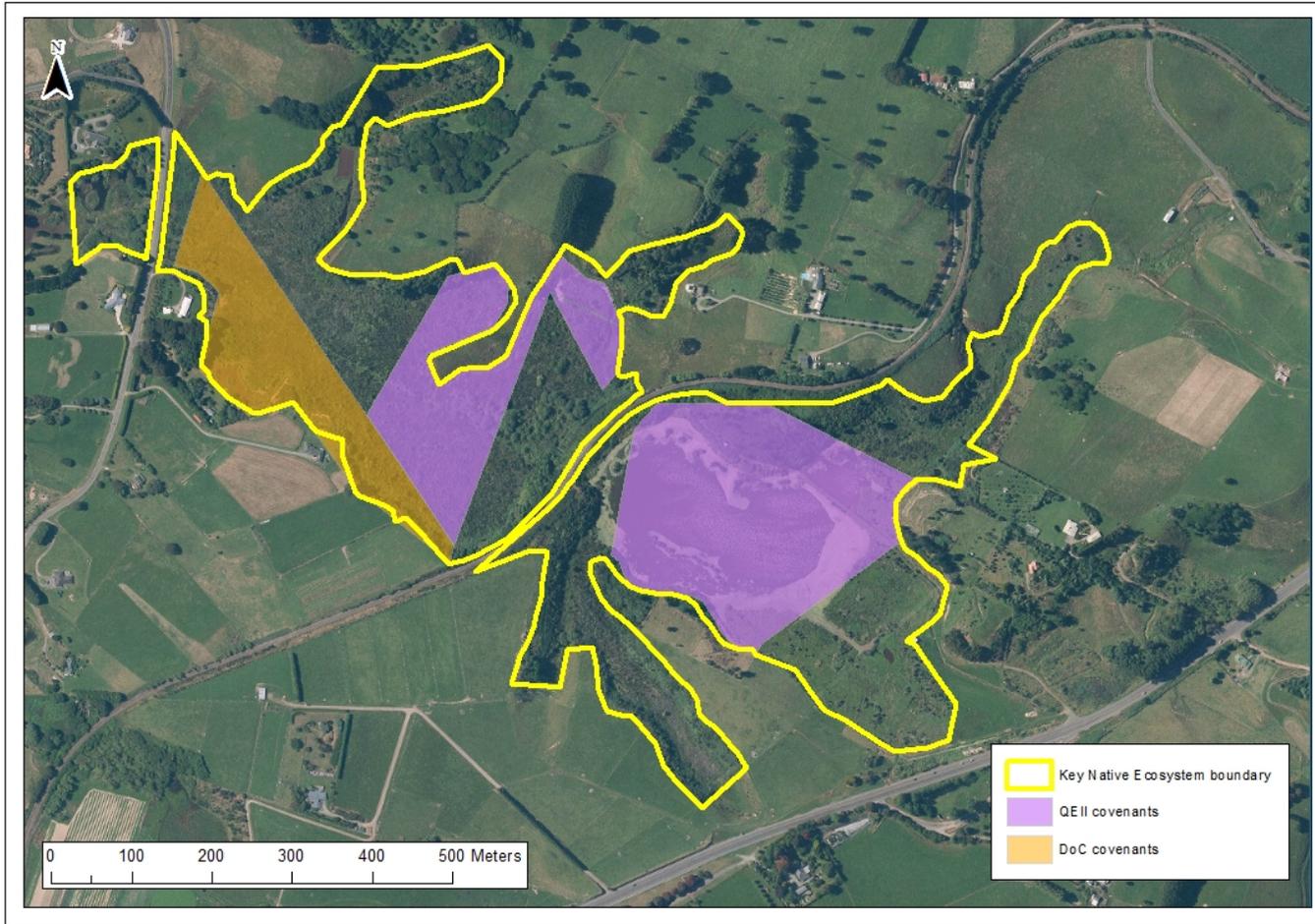
**Table 6: Allocated budget for the Otepua- Paruāuku KNE site from KCDC**

Management activity	Timetable and resourcing		
	2016/17	2017/18	2018/19
Revegetation	\$1,500	\$1,500	\$1,500
<b>Total</b>	<b>\$1,500</b>	<b>\$1,500</b>	<b>\$1,500</b>

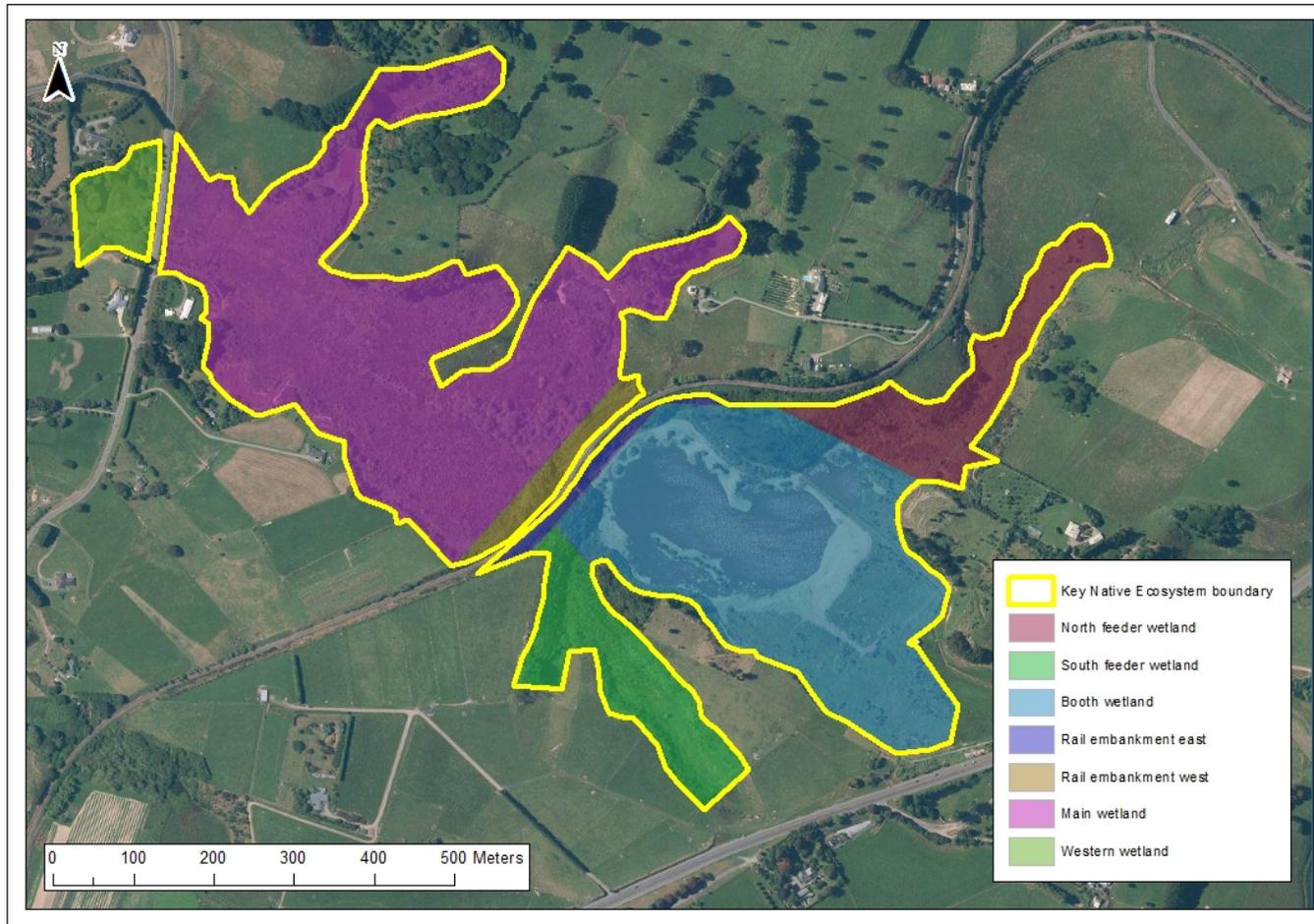
## Appendix 1: Site maps



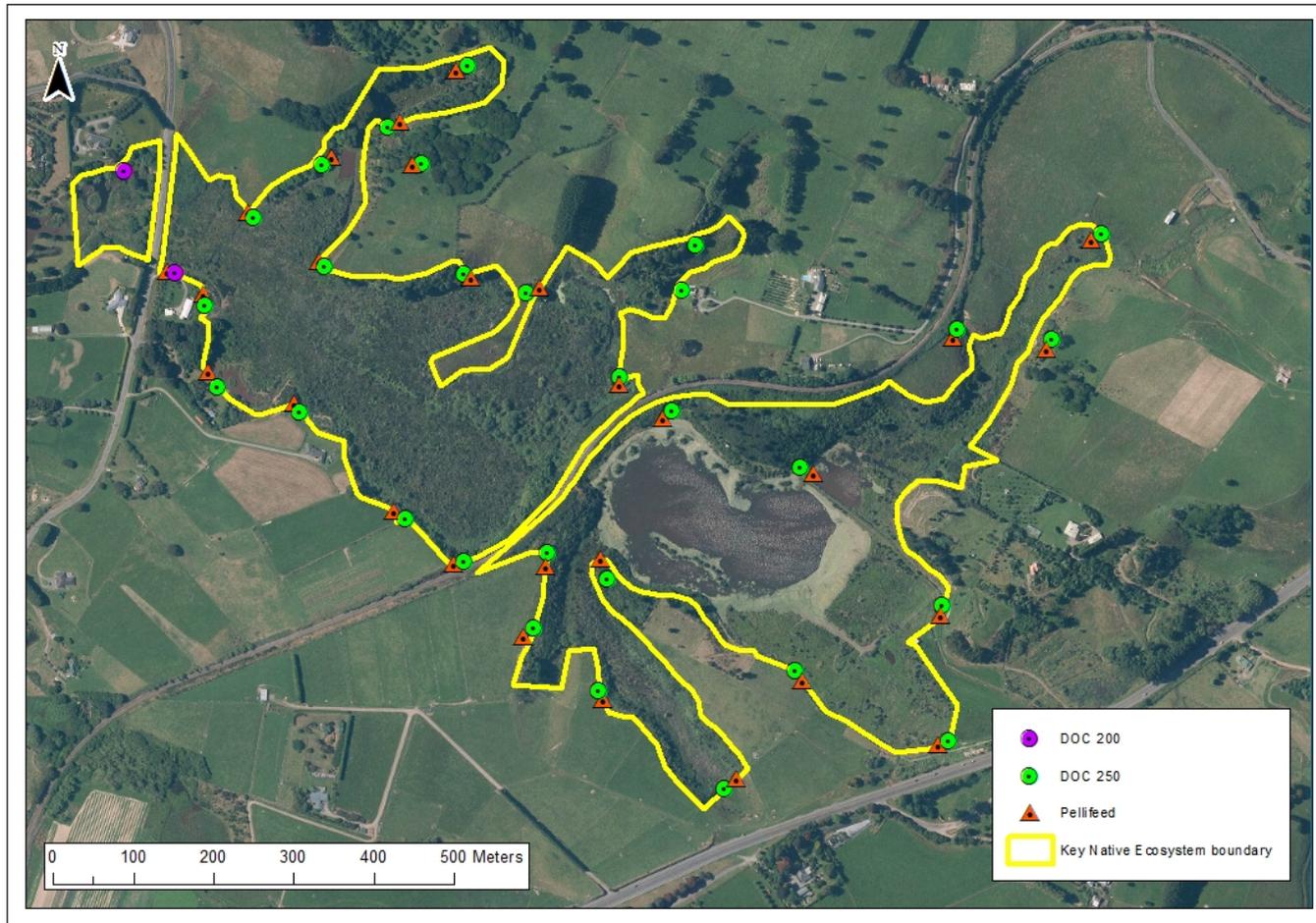
Map 1: The Otepua-Paruāuku KNE site boundary



Map 2: Land protected by covenants within the Otepua-Paruāuku KNE site



Map 3: Operational areas in the Otepua-Paruāuku KNE site



Map 4: Pest animal control in the Otepua-Paruāuku KNE site

## Appendix 2: Nationally threatened species list

The New Zealand Threat Classification System lists species according to their threat of extinction. The status of each species group (plants, reptiles, etc) is assessed over a three-year cycle<sup>40</sup>, with the exception of birds which are assessed on a five-year cycle<sup>41</sup>. Species are regarded as Threatened if they are classified as Nationally Critical, Nationally Endangered or Nationally Vulnerable. They are regarded as At Risk if they are classified as Declining, Recovering, Relict or Naturally Uncommon. The following table lists Threatened and At Risk species that are resident in, or regular visitors to, the Otepua- Paruāuku KNE site.

**Table 7: Threatened and At Risk species at the Otepua- Paruāuku KNE site.**

Scientific name	Common name	Threat status	Observation
<b>Plants(vascular)<sup>42</sup></b>			
<i>Streblus banksii</i>	Large leaved milk tree	At Risk - Relict	Enright 2002 <sup>43</sup>
<b>Birds<sup>44</sup></b>			
<i>Botaurus poiciloptilus</i>	Australasian bittern	Threatened - Nationally Endangered	McLaren pers comm 2014
<i>Falco novaeseelandiae</i>	New Zealand falcon	Threatened - Nationally Vulnerable	Graeme Booth, pers comm 2016
<i>Platalea regia</i>	Royal spoonbill	At Risk - Naturally Uncommon	Graeme Booth, pers comm 2016
<i>Porzana abuensis plumbea</i>	Spotless crane	At Risk - Relict	Peace and Houghton, pers comm 2015
<i>Tachybaptus ruficollis</i>	Dabchick	Threatened - Nationally Vulnerable	Graeme Booth, pers comm 2016
<b>Freshwater fish<sup>45</sup></b>			
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk - Declining	McEwan 2014 <sup>46</sup>

### Appendix 3: Regionally threatened plant species list

The following table lists regionally threatened species that have been recorded in the Otepua- Paruāuku KNE site. Native plant species have been identified in the Plant Conservation Strategy, Wellington Conservancy 2004-2010<sup>47</sup>.

**Table 8: Regionally threatened plant species recorded in the Otepua- Paruāuku KNE site.**

Scientific name	Common name	Threat status	Observation
<b>Plants<sup>48</sup></b>			
<i>Belcnum parrisiae</i>	Rasp fern	Sparse	Enright 2002 <sup>49</sup>
<i>Hypolepsis distans</i>	N/A	Sparse	Enright 2002
<i>Streblus banksii</i>	Large leafed milk tree	Sparse	Enright 2002

## Appendix 4: Ecological weed species

The following table lists key ecological weed species that have been recorded in the Otepua- Paruāuku KNE site.

**Table 9: Ecological weed species recorded in the Otepua- Paruāuku KNE site**

Scientific Name	Common Name	Habit	Relative impact	Notes
<i>Berberis glaucophylla</i>	Barberry	Woody weed	Moderate	Widespread and abundant
<i>Calystegia silvatica</i>	Convolvulus/ Great bindweed	Climber	Moderate	Scattered and abundant
<i>Ceratophyllum demersum</i>	Hornwort	Aquatic	High	Localised and abundant
<i>Clematis vitalba</i>	Old man's beard	Climber	Very high	Patchy and sparse
<i>Cortaderia selloana/C. jubata</i>	Pampas grass	Groundcover	Very high	Localised and sparse
<i>Glyceria maxima</i>	Giant reed sweet grass	Marginal aquatic	High	Localised and abundant
<i>Leycesteria formosa</i>	Himalayan honeysuckle	Groundcover	Moderate	Localised and abundant
<i>Lonicera japonica</i>	Japanese honeysuckle	Climber	Very High	Widespread and abundant
<i>Pinus radiata</i>	Radiata pine	Woody weed	Moderate	Scattered and sparse
* <i>Pittosporum crassifolium</i>	Karo	Woody weed	High	Localised and sparse
<i>Prunus campanulata</i>	Taiwan cherry	Woody weed	Moderate	Localised and sparse
<i>Rubus fruticosus</i> agg.	Blackberry	Climber	High	Widespread and abundant
<i>Salix cinerea</i>	Grey willow	Woody weed	Very high	Localised and abundant
<i>Salix fragilis</i>	Crack willow	Woody weed	High	Scattered and abundant
<i>Sambucus nigra</i>	Elderberry	Woody weed	Low	Localised and sparse
<i>Schedonorus arundinaceus</i>	Tall fescue	Groundcover	Low	Widespread and abundant
<i>Ulex europaeus</i>	Gorse	Woody weed	High	Widespread and abundant

\* Denotes a non-local native plant

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