

Key Native Ecosystem Operational Plan for Parangarahu Lakes Area

2020-2025



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1. Purpose

The purpose of the five-year Key Native Ecosystem (KNE) Operational Plan for Parangarahu Lakes Area KNE site is to:

- Identify the parties involved
- Summarise the ecological values and identify the threats to those values
- Outline the objectives to improve ecological condition
- Describe operational activities (eg, ecological weed control) that will be undertaken, who will undertake the activities and the allocated budget

KNE Operational Plans are reviewed every five years to ensure the activities undertaken to protect and restore the KNE site are informed by experience and improved knowledge about the site.

This KNE Operational Plan is aligned to key policy documents that are outlined below (in Section 2).

2. Policy Context

Regional councils have responsibility for maintaining indigenous biodiversity, as well as protecting significant vegetation and habitats of threatened species, under the Resource Management Act 1991 (RMA)¹.

Plans and Strategies that guide the delivery of the KNE Programme are:

Greater Wellington Long Term Plan

The Long Term Plan (2018-2028)² outlines the long term direction of the Greater Wellington Regional Council (Greater Wellington) and includes information on all our major projects, activities and programmes for the next 10 years and how they will be paid for. This document outlines that Greater Wellington will actively manage selected high value biodiversity sites. Most of this work is undertaken as part of the KNE Programme.

Proposed Natural Resources Plan

The Proposed Natural Resources Plan (PNRP) provides the high level strategic framework which sets out how Greater Wellington, Mana whenua partners and the community work together and includes:

- Guiding Principles that underpin the overall management approach of the plan (eg, Kaitiakitanga)
- Sites with significant indigenous biodiversity values
- Sites of significance to mana whenua (refer Schedules B, C, Schedule D)

Greater Wellington Regional Pest Management Plan 2019-2039

The KNE programme is an important driver for managing many of the pests that are prioritised in this KNE Operational Plan. Without active management of KNE sites,

many native plants and animals in these ecosystems would struggle to thrive. The KNE programme aims to provide protection to maintain or restore the ecological function of these ecosystems as well as the native plants and animals they support. This is done mainly by managing threats such as harmful pests or introduced plants and animals.

Parks Network Plan

Management of East Harbour Regional Park as a whole, which contains the Parangarahu Lakes Area KNE site, is guided by the Greater Wellington Parks Network Plan (PNP). This plan guides the recreational and amenity uses of East Harbour Regional Park as well as identifying opportunities to protect biodiversity values.

Parangarahu Lake Area Co-Management plan

The Co-Management Plan outlines the approach to be taken by Port Nicholson Block Settlement Trust (PNBST) and Greater Wellington to fulfil their kaitiaki and legal responsibilities. Te Rōpū Tiaki (a guardianship group of PNBST and Greater Wellington members) have prepared the Co-Management Plan for the Parangarahu Lakes Area. The Co-Management Plan is a guiding document which sets the vision, guiding principles, historical context, management objectives and priority actions for management of the Parangarahu Lakes Area. Directions of the co-management plan have been incorporated into the Park Network Plan

Greater Wellington Biodiversity Strategy

The Greater Wellington Biodiversity Strategy³ (the Strategy) is an internal document that sets a framework that guides how Greater Wellington protects and manages biodiversity in the Wellington region to work towards the Vision.

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

The Strategy provides a common focus across Greater Wellington’s departments and guides activities relating to biodiversity. The Vision is underpinned by four operating principles and three strategic goals. Goal One drives the delivery of the KNE Programme.

Goal One
Areas of high biodiversity value are protected or restored

3. The Key Native Ecosystem Programme

The KNE Programme is a voluntary programme of work. There is no statutory obligation for Greater Wellington to do this work. Greater Wellington invites selected landowners to discuss whether they would like to be involved in the programme. When work is done on private land, it is at the discretion of landowners, and their

involvement in the programme is entirely voluntary. Involvement may just mean allowing work to be undertaken on that land.

The programme 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 continue to influence the site and resilience of the ecosystem is likely under some realistic level of management.

KNE sites can be located on private or publicly owned land. However, land managed by the Department of Conservation (DOC) is generally excluded from this programme.

KNE sites are managed in accordance with five-year KNE plans prepared by Greater Wellington’s Biodiversity department. Greater Wellington works with the landowners, mana whenua and other operational delivery providers to achieve mutually beneficial goals.

4. Parangarahu Lakes Area Key Native Ecosystem site

The Parangarahu Lakes Area KNE site (471 ha) is located on the Pencarrow headland on the eastern side of Wellington Harbour (Appendix 1, Map 1). The KNE site is part of the larger East Harbour Regional Park and contains land protected as Conservation Covenants, Scientific Reserve, Recreation Reserve, Māori Reservation, and Historic Reserve. The Parangarahu Lakes Area is managed by Greater Wellington and Port Nicholson Block Settlement Trust under a co-management agreement, with operational decisions made by Te Rōpū Tiaki.

Parangarahu Lakes Area KNE site contains the nationally recognised Lake Kohangatera and Lake Kohangapiripiri (collectively known as the Pencarrow Lakes)⁴, the regionally outstanding Gollans wetland and Cameron’s wetland. These ecosystems are extensive, largely intact and support a wide variety of native aquatic plants, freshwater fish and wetland and shore birds within the Tararua Ecological District.

The KNE site contains important areas of coastal cliffs, coastal platform and shingle beaches important for breeding shorebirds, reptiles and rare cushion plants. Whilst there are remnant forest patches and regenerating gullies present across the KNE site, the area used to be farmed with large tracts of the hillslopes burnt off for grazing. Since the removal of grazing in 2004, a landscape restoration strategy has been in place aiming to re-cloak the hillslopes (in the long term) in native vegetation.

5. Parties involved

There are many organisations, groups and individuals that play important roles in the care of the KNE site.

5.1. Landowners and co-management partners

The KNE site covers land owned by Greater Wellington, Port Nicholson Block Settlement Trust (PNBST) on behalf of Taranaki Whānui ki Te Upoko o Te Ika (Taranaki Whānui) who are mana whenua, the Department of Conservation (DOC), Hutt City Council (HCC) and the Historic Places Trust.

Parangarahu Lakes Area KNE site is part of the larger East Harbour Regional Park and is managed in accordance with the Parangarahu Lakes Area Co-Management Plan⁵ and the broader Greater Wellington Parks Network Plan⁶. This KNE plan is consistent with the objectives and policies of the Parks Network Plan and the Parangarahu Lakes Area Co-Management Plan providing further operational detail to specific biodiversity management activities.

5.2. Operational delivery

The Parangarahu Lakes Area is managed at an operational level by Te Rōpū Tiaki (Guardianship Group) that comprises representatives of the PNBST and Greater Wellington.

Within Greater Wellington, the Biodiversity, Biosecurity and Parks departments are responsible for delivering the KNE operational plan. The Biodiversity department is the overarching lead department for Greater Wellington on the coordination of biodiversity management activities and advice within the KNE site. The Biosecurity department coordinates and carries out pest control activities. The Parks department manages recreational access and supports and facilitates restoration activities within the Regional Park and provides support to the community volunteer group Mainland Island Restoration Operation (MIRO) who have undertaken significant pest control, restoration and monitoring work within the KNE site since 2007.

The Greater Wellington Parks department has an annual Environmental Enhancement Fund (EEF) available to enable local community groups to undertake environmental enhancement projects within the Regional Park. This fund and how it is allocated is determined three yearly in conjunction with the Biodiversity department and the detail annually with MIRO. Examples of how this fund has been spent previously includes fencing revegetation plots, nursery materials support, signage (information boards), fencing of dotterel breeding and cushion plant areas, and fixing boundary fencing to prevent stock incursion.

Both HCC and DOC contribute funds to biodiversity management activities within the KNE site. HCC is also a key stakeholder as it owns land within the KNE site and manages the controlled-access coastal road⁷ from Eastbourne via the locked Burdans Gate and the sewer outfall at Pencarrow Head. DOC has statutory responsibilities relating to administering the conservation covenants and scientific reserves within the KNE site.

5.3. Mana whenua partners

Taranaki Whānui are Greater Wellington's mana whenua partners in Parangarahu Lakes Area KNE site. The area is a site of significance for Taranaki Whānui (see Table 1). Greater Wellington is committed to working with Taranaki Whānui in the development of the plan and exploring opportunities where mana whenua may be involved in the operational delivery of the KNE site.

Table 1: Taranaki Whānui sites of significance in Parangarahu Lakes Area KNE site⁸

Sites of significance	Mana whenua values
Parangārahu Lakes (Kohangatera, Kohangapiripiri including catchments)	<p>Ngā Mahi a ngā Tūpuna:</p> <p>The lakes are significant to Te Ātiawa/Taranaki Whānui and they were received back by the iwi through the treaty settlement process because of their significance for the iwi identity.</p>
	<p>Te Mahi Kai:</p> <p>The lakes were a superior fishery for Te Ātiawa/Taranaki Whānui. Fish included eel, mullet, kahawai and whitebait. Karaka groves were planted alongside the lakes as a food source and the tributaries contain watercress. The raupō beds were used and summer camps were used by whanau as they fished not only the lakes but the sea.</p>
	<p>Wāhi Whakarite:</p> <p>This is a place of ritual related especially to the mahinga kai activities. The presence of the dendroglyphs require rituals specific to them and provide a place of wānanga. Rituals are still undertaken by whanau today.</p>
	<p>Te Mana o te Tangata:</p> <p>The fishery of the lakes enabled Te Ātiawa/Taranaki Whānui to manaaki manuhiri who came in peace to Te Whānganui a Tara and supported the early growing of wheat in Fitzroy Bay.</p>
	<p>Te Manawaroa o Te Wai:</p> <p>The water quality of the lakes is already very high and the iwi along with the co-management partner Wellington Regional Council have drafted a management plan jointly to support the ecology.</p>
	<p>Te Mana o te Wai:</p> <p>Parangārahu lakes support the identity of Te Ātiawa ki Te Whānganui a Tara/Taranaki Whānui as a place that enables the protection of the iwi in times of attack working closely with Oruaiti, Te Mahanga and Whetu Kairangi Pā across the harbour entrance on the Miramar Peninsula.</p>
	<p>Wāhi Mahara:</p> <p>The lakes are crucial to iwi story of ahikaa in Te Whānganui a Tara and are used for oral traditional knowledge both of history and environmental matters.</p>

Greater Wellington recognises the value and importance of working with mana whenua in their roles as kaitiaki in areas within the KNE site. The KNE operational plan activities will:

- make a small but valuable contribution to the overall expected PNRP outcomes including mahinga kai
- ensure people working in KNE sites understand the requirements of the Accidental Discovery Protocol
- endeavour to ensure that Taranaki Whānui values for the site are protected

5.4. Stakeholders

Stakeholders at the KNE site include the Heritage New Zealand (which owns the Pencarrow Lighthouse land), the Fish and Game New Zealand, and Wellington Wildfowlers (who use the site for duck shooting under permit), and the neighbouring landowners.

6. 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.

6.1. Ecological designations

Table 2, below, lists ecological designations at all or part of the Parangarahu Lakes Area KNE site.

Table 2: Designations at the Parangarahu Lakes Area KNE site

Designation level	Type of designation
National	Parts of the KNE site are designated as Scientific Reserve: <ul style="list-style-type: none"> • Water and air column above Lake Kohangapiriri • Water and air column above Lake Kohangatera
Regional	Parts of the KNE site are designated under GWRC’s proposed Natural Resources Plan (pNRP) as Ecosystems and Habitats with Significant Indigenous Biodiversity Values: <ul style="list-style-type: none"> • Outstanding waterbodies (Schedule A): Lake Kohangapiriri; Lake Kohangatera; Kohangapiriri wetlands and Kohangatera wetlands • Significant habitat for indigenous birds in the coastal marine area (Schedule F2c): Pencarrow foreshore and Wellington harbour foreshore • Significant habitat for indigenous birds in lakes (Schedule F2b): Lake Kohangapiriri and Lake Kohangatera • River with Significant Indigenous Ecosystems - habitat for threatened and at risk fish species (Schedule F1): Gollans Stream and Eastbourne Stream • River with Significant Indigenous Ecosystems - habitat for six or more migratory fish species (Schedule F1): Gollans Stream and Eastbourne

	<p>Stream</p> <ul style="list-style-type: none"> • River with Significant Indigenous Ecosystems – high macroinvertebrate community health (Schedule F1): Gollans Stream • Lakes with significant aquatic plants (Schedule F1c): Lake Kohangapiriri; Lake Kohangatera
Other	<p>Part of the KNE site is protected via conservation covenants:</p> <ul style="list-style-type: none"> • Bed of Lake Kohangapiriri and former esplanade reserve • Bed of Lake Kohangatera and former esplanade reserve <p>Part of the KNE site is protected via 50 year Forest Sink Covenant:</p> <ul style="list-style-type: none"> • The majority of the Parangarahu Recreation Reserve at Parangarahu Lakes <p>Parts of the KNE site is scheduled under GWRC's pNRP as a site with significant mana whenua values (Schedule C) and Nga Taonga Nui a Kiwa (Schedule b) to Taranaki Whānui ki te Ika a Maui:</p> <ul style="list-style-type: none"> • Parangarahu Lakes (Kohangapiriri, Kohangatera including catchments) <p>Parts of the KNE site are designated as a Māori Reservation:</p> <ul style="list-style-type: none"> • 2 parcels containing dendrogyphs <p>Parts of the KNE site is designated as a Recreation Reserve:</p> <ul style="list-style-type: none"> • Parangarahu Recreation Reserve • Pencarrow Head Recreation Reserve <p>Part of the KNE site is designated as an Historic Reserve:</p> <ul style="list-style-type: none"> • Historic Pencarrow Lighthouse <p>Part of the KNE site is designated for drainage purposes to accommodate the main sewer outfall in the area</p>

6.2. Ecological significance

The Parangarahu Lakes Area KNE site is considered to be of regional importance 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 ecosystem types represented within the KNE site boundary, including several naturally uncommon ecosystems
- Its **ecological context** is valuable at the landscape scale as it contains a variety of inter-connected habitats and, provides core/seasonal habitat for threatened indigenous species within the KNE site

Representativeness

The Threatened Environment Classification system⁹ indicates many ecosystem types in the KNE site as being threatened. The freshwater/estuarine wetlands and some lake margins are 'Acutely Threatened'; the degraded freshwater wetlands, coastal

escarpments and shingle beaches are 'Chronically Threatened'; and the regenerating forest remnant and regenerating scrub and shrublands are mostly classed as being 'At Risk' or 'Critically Underprotected'.

Wetlands are now considered an uncommon habitat type in the Wellington region with less than 3% remaining of their original extent. The lakes and the shingle beaches at Kohangapiripiri have been described as the best examples of their ecosystem type nationally, while the associated swamp wetlands are some of the best condition wetlands of their type in the country.

Rarity/distinctiveness

Several naturally uncommon ecosystem types are present within the KNE site¹⁰. These are: shingle beaches, active sand dunes and lagoons (all Nationally Endangered¹¹), lake margins and estuaries (both Nationally Vulnerable), and coastal rock stacks.

There are eight species classified as 'Threatened' and 30 species classified 'At Risk' within the KNE site. There are also two 'Threatened' species that are only occasional visitors (the Nationally Vulnerable New Zealand falcon and reef heron). The 'At Risk' sand tussock (*Poa billardierei*), recorded prior to 2002, is thought to no longer occur within the KNE site, but still remains in the Baring Head/Ōrua-pouanui KNE site along the coast to the southeast. An observation of the Nationally Critical purple crassula (*Crassula peduncularis*) from the 1980s has not been confirmed.

Several additional 'Threatened' or 'At Risk' bird species have been recorded at this KNE site, but are either considered vagrants or irregular visitors (e.g. little black shag, reef heron, grey duck, little blue penguin) or are oceanic species that are unlikely to make landfall (e.g. fluttering shearwater). Australasian bittern (*Botaurus poiciloptilus*) and spotless crane (*Porzana tabuensis*) are possibly present at this KNE site, but no recent records have been confirmed. See Appendix 2 for a list of 'Threatened' and 'At Risk' species.

Diversity

The Singers and Rogers (2014)¹² classification of pre-human vegetation indicates that six original ecosystems would have been present within the KNE site: a coprosma, muehlenbeckia shrubland/herbfield/rockland vegetation type (CL3) would have been present along much of the lower escarpment; titoki, ngaio (WF1); Hard beech forest (MF20); Black beech forest (MF5); Raupō reedland (WL19); Flaxland (WL18) along with extensive areas of open water and strand. Although in a modified condition, aspects of the original vegetation types remain within the KNE site and provide valuable foundations for natural and assisted regeneration of ecosystems with similar characteristics to the original ones.

Ecological context

Lake Kohangatera is considered as a lake of national significance and several ecosystems present are considered national priorities for conservation as they are ecosystem types that have become uncommon on a national scale primarily due to human activity¹³, this includes active sand dunes and wetlands.

6.3. Ecological features

The area contains a complex assemblage of vegetation which is habitat for a very high number of threatened species. See Appendix 1, map 2 for broad scale habitat locations.

Vegetation communities and plants

Lakes and wetlands

Lake Kohangapiripiri (including the shingle beach at Lake Kohangapiripiri) and Lake Kohangatera^{14,15} have been described as the best examples of their ecosystem type nationally. The wetlands associated with Cameron Creek and Gollans Stream are some of the best condition wetlands of their type in the country¹⁶.

Blunt pondweed (*Potamogeton ochreatus*) dominates the aquatic vegetation of Lake Kohangatera, but closer to the coast the naturally uncommon sago pondweed (*Stuckenia pectinata*) and horse's mane (*Ruppia polycarpa*) become more abundant. Native milfoil (*Mriophyllum triphyllum*) and *Lepilaena biloclaris* commonly co-dominate with blunt pond weed. The invasive aquatic weeds; egeria (*Egeria densa*) and Canadian pondweed (*Elodea canadensis*) are known to be present within Lake Kohangatera and Gollans Wetland and stream.

Beds of emergent lake club rush (*Schoenoplectus tabernaemontani*) are widespread in Lake Kohangapiripiri and turf species dominated by *Glossostigma cleistanthum*, *Lilaeopsis novae-zelandiae* and *Elatine gratioloides*, are present on the open shore. Native milfoil and blunt pondweed dominate the lake bed vegetation along with small patches of the charophyte *Chara australis*. There are also some areas with low vegetation cover which may be a result of grazing by swans (as other areas at a similar depth support high native plant cover)¹⁷. New Zealand now has few examples of these dense, tall-growing macrophytic lake communities left, as most other lakes have been significantly altered as a result of exotic aquatic weed invasion¹⁸.

The emergent vegetation within both wetlands is dominated by raupō (*Typha orientalis*), lake club rush, toetoe (*Austroderia toetoe* and *A. fluvida*), harakeke (*Phormium tenax*) and the giant umbrella sedge (*Cyperus usulatus*). Between these large clumps, many small herbs and sedges form a dense grass-like sward. Salt-marsh species, such as the jointed wire rush or oioi (*Apodasmia similis*) and glasswort (*Sarcocornia quinqueflora*), coexist with freshwater species near the coast. The invasive species yellow flag iris (*Iris pseudacorus*) and beggars' ticks (*Bidens frondosa*) are also present.

Coastal escarpments and shingle beaches

The coastal escarpments are typically covered in wind-sheared mingimingi (*Coprosma propinqua*), wharariki (*Phormium cookianum*), pōhuehue (*Muehlenbeckia complexa*), coastal tree daisy (*Olearia solandri*) and tauhinu. Interspersed with these are a number of hardy tree species, including taupata (*Coprosma repens*) and ngaio (*Myoporum laetum*). Notable herbs present include the native New Zealand spinach (*Tetragonia implexicoma*) and taramea/speargrass (*Aciphylla squarrosa* var. *squarrosa*).

On the shingle beaches, scabweed (*Raoulia australis*) and pinātoro (*Pimelia* sp.) form extensive cushionfields that are considered to be some of the most extensive in the

region¹⁹. Pīngao (*Ficinia spiralis*) and spinifex (*Spinifex sericeus*) are beginning to build low sand dunes at the toe of the escarpments and inland edges of shingle beaches.

Other sand binding plants, such as shore bindweed (*Calystegia soldanella*), sand sedge (*Carex pumila*), *Poa cita* and the introduced horned poppy (*Glaucum flavum*) and marram (*Ammophila arenaria*) occur occasionally.

The dunes and shingle beaches are important breeding habitat for banded dotterels (*Charadrius bicinctus*) and support a number of nationally and regionally threatened species including sea holly (*Eryngium vesiculosum*) and leafless muehlenbeckia (*Muehlenbeckia ephedroides*) which is considered a population at the northern extent of its range²⁰.

Regenerating hillslopes

The vegetation on the hills has been highly modified by more than 150 years of burning and grazing. Grazing ceased in 2004 and the area is now regenerating primarily with gorse (*Ulex europaeus*), mānuka (*Leptospermum scoparium*) and tauhinu (*Ozothamnus leptophyllus*).

Some remnants of native forest do remain in the north-eastern part of the KNE site and further natural regeneration of a wider range of native species is occurring in the more sheltered gullies throughout the KNE site.

Active restoration planting plots have been developed since 2007 by MIRO with Greater Wellington and Taranki Whānui support. These plots aim to provide a number of seed sources for birds to actively disperse throughout the site aiding natural regeneration of KNE site.

Species

Birds

The lakes are significant habitats for many bird species including: New Zealand dabchick (*Poliiocephalus rufopectus*), pied stilt (*Himantopus himantopus*), grey duck (*Anas superciliosa*), Australasian shoveler (*Anas rhynchotis*), New Zealand scaup (*Aythya novaeseelandiae*), Australasian bittern (*Botaurus poiciloptilus*) and spotless crake (*Porzana tabuensis*)²¹. Pāteke (*Anas chlorotis*) has also been recorded in the recent past²². The Black shag colony on the edge of Lake Kohangatera is considered one of the treasures of the Lakes Area.

The shingle beaches are important breeding habitat for banded dotterel (as it is the second largest coastal breeding population in the Wellington region²³). The banded dotterels arrive in July and nest from September through to March. Also present are variable oystercatchers, New Zealand pipit (*Anthus novaeseelandiae*) and Caspian terns (*Hydroprogne caspia*). New Zealand falcon (*Falco novaeseelandiae*) are known to visit and hunt at the KNE site.

Other common species often sighted at the lakes are Californian quail (*Callipepla californica*), fantail (*Rhipidura fuliginosa*), pukeko (*Porphyrio melanotus*), black swan (*Cygnus atratus*), mallard (*Anas platyrhynchos*), bellbird (*Anthornis melanura*) and paradise shelduck (*Tadorna variegata*).

Reptiles (herpetofauna)

Parangarahu Lakes Area is considered a significant mainland lizard site for Wellington. Raukawa gecko (*Woodworthia maculata*), common skink (*Oligosoma polychroma*) and a copper skink (*Oligosoma aeneum*) have been observed in the coastal habitats where boulder beds and creviced cliff faces provide protection from predation.

Fish (inc Kōura/crayfish)

Lake Kohangapiripiri, Lake Kohangatera and their associated wetlands and streams are considered regionally important for freshwater fish, including migratory species. However, Lake Kohangatera has a wider species diversity compared to Lake Kohangapiripiri. Species present include longfin eel (*Anguilla dieffenbachii*), shortfin eel (*Anguilla australis*) lamprey (*Geotria australis*), īnanga (*Galaxias maculatus*), giant kōkopu (*Galaxias argenteus*), kōaro (*Galaxias brevipinnis*), common bully (*Gobiomorphus cotidianus*), common smelt (*Retropinna retropinna*) and banded kōkopu (*Galaxias fasciatus*).

Kōura (*Paranephtops planifrons*) and kākahi (*Echydrella menziesii*) are also known to be present in the Lakes. Kākahi were recently part of a translocation to Zealandia under permit.

Invertebrates

Three rare species of native moth live amongst the cushion plants here. They are *Ericodesma aerodana*, *Agrotis innominata* and a species of *Notoreas*. These species are largely or totally dependent on the cushion plant community.

Katipō spiders may be present as they have recently been identified at the nearby Baring Head/Ōrua-pouanui KNE site.

Recent dragonfly and damselfly surveys have identified two species of adult damselfly, (*Xanthocnemis zealandica* /Common Redcoat) and (*Austrolestes colensonis* /Blue Damselfly), and six species of adult dragonfly, (*Uropetala caroveii* / Bush Giant), (*Hemianax papuensis* /Baron), (*Aeshna brevistyla* /Lancer), (*Hemicordulia australiae* /Sentry), (*Procordulia grayi* /Yellow-Spotted Dragonfly), and (*Procordulia smithii* /Ranger)²⁴.

7. Threats to ecological values at the KNE site

Ecological values can be threatened by human activities, and by introduced animals and plants that change 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.

7.1. Key threats

There are a number of pest animal species known to exist within the KNE site. The species considered to pose the greatest threat to the ecological values of the KNE site are hedgehogs (*Erinaceus europaeus*), stoats (*Mustela erminea*), weasels (*Mustela nivalis*) possums (*Trichosurus vulpecula*) and feral goats (*Capra hircus*).

Ecological weeds are prevalent and widespread throughout the KNE site. Key species known to have a big impact on the functionality of the ecosystems with the KNE site are marram grass (*Ammophila arenaria*), lupin (*Lupinus arboreus*) and gorse (*Ulex europaeus*) on the beaches and escarpments and Egeria (*Egeria densa*) within the Lakes. Hares-foot trefoil (*Arvensus trifolium*) appears to becoming an increasingly problematic weed in banded dotterel nesting beaches.

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 3 presents a summary of all known threats to the 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 operational activities.

Table 3: Summary of all threats to ecological values present at the Parangarahu Lakes Area KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Ecological weeds		
EW-1	Ground covering ecological weeds smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species for control include marram (<i>Ammophila arenaria</i>), Hares-foot trefoil (<i>Arvensus trifolium</i>) and horned poppy (<i>Glaucium flavum</i>).	Coastal escarpments and shingle beaches
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species include include boneseed (<i>Chrysanthemoides monilifera</i> subsp. <i>Monilifera</i>), gorse (<i>Ulex europaeus</i>) and lupin (<i>Lupinus arboreus</i>).	Coastal escarpments and shingle beaches
EW-3	Climbing weeds smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition. Key climbing ecological weed species include man's beard (<i>Clematis vitalba</i>).	Coastal escarpments
EW-4	Aquatic weeds out-compete native aquatic species and choke watercourses. Key weed species include Egeria (<i>Egeria densa</i>), Canadian pondweed (<i>Elodea canadensis</i>), yellow flag iris (<i>Iris pseudacorus</i>) and beggar's ticks (<i>Bidens frondosa</i>).	Lakes and wetlands

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Pest animals		
PA-1	Possums (<i>Trichosurus vulpecula</i>) browse palatable canopy vegetation until it can no longer recover ^{25,26} . This destroys the forest's structure, diversity and function. Possums may also prey on native birds and invertebrates ²⁷ .	Entire KNE site
PA-2*	Rats (<i>Rattus</i> spp.) 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 ^{28,29} .	Entire KNE site
PA-3	Mustelids (stoats ^{30,31} (<i>Mustela erminea</i>), ferrets ^{32,33} (<i>M. furo</i>) and weasels ^{34,35} (<i>M. nivalis</i>)) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions.	Entire KNE site
PA-4	Hedgehogs (<i>Erinaceus europaeus</i>) prey on native invertebrates ³⁶ , lizards ³⁷ and the eggs ³⁸ and chicks of ground-nesting birds ³⁹	Entire KNE site
PA-5*	House mice (<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 ^{40,41} .	Entire KNE site
PA-6	Feral, stray and domestic cats (<i>Felis catus</i>) prey on native birds ⁴² , lizards ⁴³ and invertebrates ⁴⁴ , reducing native fauna breeding success and potentially causing local extinctions ⁴⁵ .	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 ⁴⁶ . 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
PA-8*	Feral pigs (<i>Sus scrofa</i>) root up the soil and eat roots, invertebrates, seeds and native plants preventing forest regeneration ⁴⁷ .	Entire KNE site
PA-9	Feral goats (<i>Capra hircus</i>) browsing affects the composition and biomass of native vegetation in the understory tiers of forest habitats, preventing regeneration of the most palatable understory species and reducing species diversity ⁴⁸ .	Entire KNE site
PA-10*	Brown trout (<i>Salmo trutta</i>) and rainbow trout (<i>Oncorhynchus mykiss</i>) prey on native fish and compete with them for food resources ⁴⁹ .	Lakes and wetlands
PA-11	Fallow deer (<i>Dama dama</i>) browse the forest understory and can significantly change vegetation composition by preferential browsing and preventing regeneration ^{38,39,40}	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Human activities		
HA-1*	Agricultural practices, particularly incursions of grazing livestock into the Park can result in pugging soils, grazing native vegetation inhibiting regeneration, wildlife disturbance and increasing nutrient content of soils and watercourses ⁵⁰ . Farm sheep and cattle have been known to walk over banded dotterel nests and rare shore plants.	Entire KNE site
HA-2*	Recreational use such as tramping, mountain biking and horse riding can cause damage and disturbance of the native ecosystem. It is also likely to disturb native fauna and introduce ecological weeds.	Entire KNE site
HA-3	Impediments to fish passage. Roads and culverts at the outlets of both lakes have altered connections to the sea, limiting the diversity and abundance of most native fish species that naturally occur in the lakes. In particular, the road and perched culvert at the mouth of Lake Kohangapiripiri restricts the passage of migratory species of native fish and the culverts under the road at the mouth of Lake Kohangatera may constrain the passage of fish at high flows.	Coastal escarpments and shingle beaches Lakes and wetlands
HA-4*	Freshwater activities such as boating, fishing, white baiting and duck shooting can introduce aquatic weed species to waterways	Lakes and wetlands
HA-5*	Recreational vehicles such as 4WDs and motorbikes can cause damage to dune systems and disturbance of the native ecosystem.	Entire KNE site

*Threats marked with an asterisk are not addressed by actions in the operational delivery schedule

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

8. Vision and objectives

8.1. Vision

Healthy and dynamic lakes, wetlands and coastal ecosystems are surrounded by a flourishing forested landscape that supports a multitude of native wildlife.

8.2. Objectives

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

The following objectives will guide the operational activities at the KNE site:

1. **Protect and enhance the Lake's and wetland's biodiversity values**
2. **Protect and enhance the coastal shore bird populations and habitat**
3. **Protect and enhance rare and threatened species**
4. **Enhance the landscape regeneration potential of the KNE site**
5. **Support Taranaki Whānui as Tangata Kaitiaki of the KNE site**

9. Operational Activities

Operational activities are targeted to work towards the objectives above (Section 8) by responding to the threats outlined in Section 7. The broad approach to operational activities is described briefly below, and specific actions, with budget figures attached, are set out in the operational delivery schedule (Table 4).

It is important to note that not all threats identified in Section 7 can be adequately addressed. This can be for a number of reasons including financial, legal, or capacity restrictions.

9.1. Ecological weed control

Past ecological weed control work has been successful in reducing large infestations of gorse, lupin, marram, yellow-flag iris and boneseed to protect the values of some of the highest value ecosystems within the KNE site. Aerial control of egeria has also been undertaken at Gollans wetland to try and control its impact and spread. This has now proved unsuccessful with egeria recently confirmed present within the Lake Kohangatera itself.

Over the next operational plan cycle, ecological weed control is again aimed at protecting and enhancing the highest value ecosystems; the lakes and wetlands, the coastal platform and the coastal escarpment. General side-wide surveillance and control is also undertaken for some targeted species across the hillslopes to help facilitate natural regeneration.

Progressive/ Sustained control and management of Egeria and elodea

Within Lake Kohangatera and the Gollans Wetland, the aquatic weeds egeria and Canadian pondweed are present. These invasive oxygen weeds are known to dominate

areas of open water and impact on the native aquatic plant and potentially animals within the Lake.

These aquatic weed species will therefore be targeted for control during the operational cycle of this plan to maintain and improve the values at Lake Kohangatera. Greater Wellington is currently developing a management response with NIWA to prevent the weeds from having a significant impact on ecosystem function and aquatic values present. Although eradication is currently thought to be unachievable, Greater Wellington will pursue the best management response available. This response will be determined annually based on surveillance and monitoring of the known infestations. Management response options available include aerial and diver applied herbicide directly into the Lakes and Wetlands.

Greater Wellington has a resource consent (WGN140240) to control both egeria and Canadian pondweed. This resource consent permits the application of herbicide (Diquat) to control these species within four operational areas (see appendix 1; map 3). Prior to any application of herbicide, an Operational Plan and Monitoring Plan are produced by Greater Wellington and provided to the Environmental Regulation department and other named stakeholders within the resource consent.

Control along coastal platform for marram, horned poppy and lupin

Control of marram grass across the coastal platform has been jointly funded by Greater Wellington, DOC and HCC with the aim of eradicating it from the coastal platform. This would protect rare plants within the cushion fields, nesting shore bird habitat and to maintain natural coastal processes.

Progressive control has reduced the extent of marram across the KNE site, however small isolated infestations are still present and will continue to be targeted for control annually. In conjunction with the annual marram control operation, other weeds will be targeted for control including horned poppy, lupin and gorse. This activity needs to be timed to avoid the shore-bird breeding season (September – March).

Over the operational cycle of this plan Greater Wellington will review and reassess the management along the coastal platform (potentially including neighbouring properties if permitted) to expand control of coastal weeds along the entire coastal line, linking up with management at Baring Head/Ōrua-pouanui KNE site.

Lake-edge and wetlands survey and control

Around Lake Kohangatera lake-edge and Gollans wetland yellow flag iris and beggar's ticks are targeted for control annually to maintain the wetland condition.

Lake Kohangapiripiri wetland edge is relatively weed-free. Greater Wellington has undertaken periodic surveillance surveys to monitor for new incursions (the last being completed in 2018). In 2023, a repeat surveillance for weeds will be undertaken and control will be undertaken where necessary.

Site-wide surveillance and reactionary control of other high priority weed species

Site-wide surveillance for high priority weed species will be undertaken to prevent incursions of new weeds and allow regeneration of native species. Should any high priority weed species be reported, Greater Wellington's Biosecurity department will schedule them for control during the course of their other operations. High priority

species for surveillance and control include hares-foot trefoil, boneseed, wilding pine species, karo, willow sp., old man's beard and boxthorn.

Previously, aerial control of gorse has proved successful in suppressing gorse on the coastal escarpments. During the cycle of this operational plan surveillance, of the coastal escarpments for gorse regrowth and other high priority weeds, will be undertaken annually to determine if an aerial control operational is required.

9.2. Pest animal control

Pest animal control is undertaken by Greater Wellington staff and volunteers within the KNE site. Ground-based shooting targets goats, possums, feral cats, rabbits and hares across the KNE site, whilst a network of kill-traps is used to target mustelids, rats, hedgehogs and possums (see Appendix 1, Map 4).

Ground-based shooting

Greater Wellington undertakes feral goat control and night shooting to target possums, rabbits, hares and feral cats across the escarpments and shingle beaches up to six-times a year. The intention is to reduce these species' numbers to low levels across the KNE site to help maintain shorebird populations.

Kill trap network

A network of DOC 200, Possum Master and Timms kill-traps have been installed across the entire KNE site (including along the coast road starting from Burdens Gate) targeting possums, feral cats, mustelids, rats and hedgehogs to help maintain shore bird safety and aid natural regeneration across KNE site. All kill-traps are serviced by MIRO volunteers on a monthly basis, except for the kill-traps on the shingle beaches that are serviced approximately every two weeks between August and February (the main shore bird breeding season). Greater Wellington provides the bait.

The kill-traps installed on the shingle beaches are placed at a higher density to afford greater protection for nesting shore birds.

Possum kill-traps (Timms) have been installed near revegetation planting plots to provide protection for the plants from possum browsing. These traps are checked by MIRO volunteers monthly with bait provided by Greater Wellington.

Sensitive cultural and historic sites such as the remnant karaka groves and dendroglyphs (see co-management plan for locations) are to be avoided when reviewing the pest control locations.

Maintenance and safety audits

Greater Wellington Biosecurity staff will undertake an annual audit of the kill-trap network. Maintenance of traps will be undertaken as required to ensure they are able to be operated in a safe and effective manner by MIRO.

MIRO also undertake biennial servicing of the DOC200 traps to ensure they are calibrated for maximum effectiveness.

9.3. Revegetation

The hillslopes are currently dominated by gorse and pasture grasses. These areas have not been targeted for management and can be used to facilitate forest restoration by providing shelter for native colonising scrub species such as mānuka, kānuka and tauhinu. It is expected that gorse and native scrub will initially replace the open grassland, but will eventually facilitate succession to a native dominant land cover. In some areas māhoe, tree ferns and coastal tree daisy are already starting to naturally regenerate.

Revegetation is undertaken within the KNE site to assist natural regeneration of the previously farmed hillslopes. Plots of native trees have been established and are managed across the KNE site with the long-term aim of providing a native seed source for dispersal.

See appendix 1; map 5 for existing planting locations.

Revegetation is undertaken in the KNE site by MIRO using locally eco-sourced plants with support provided by Greater Wellington Parks department, who assist with site preparation, logistics and materials for planting days. Species and numbers planted are determined annually by MIRO.

Planting sites are predominately fenced (some remain unfenced 'freedom' plots) for protection from browsing animals. Timms kill-traps are also installed at/near to these plots to protect the plantings from possums.

MIRO and Greater Wellington Parks department agree on the location of new planting sites. During this process the cultural significance of the area must be taken into account when planning new planting plots to avoid known archaeological or cultural sites (see co-management plan page 23 for archaeological/cultural site locations).

9.4. Banded dotterel nest monitoring and management

The shingle beaches within the KNE site are an important habitat for the banded dotterel, and other native shore birds. The banded dotterel colony is one of a number of breeding colonies along the Wellington south coast and harbour.

In 2011 and 2012 GW contracted Annette Harvey to monitor the banded dotterel at the Pencarrow Lakes. In 2013 MIRO suggested they take over that roll on a voluntary basis as there was no further funding for Annette. In 2015 MIRO received a high impact permit from GW to protect and monitor the colony at Pencarrow Lakes during the breeding season. Since then MIRO have been working with Greater Wellington, Hutt City Council and Taranki Whānui to monitor banded dotterels during the nesting period between July – March. The monitoring and protection include banding the birds by DOC approved level 2 banders who offer their time on a voluntary basis. In 2016 MIRO was offered help by Birds New Zealand (was OSNZ) to assist in the protection and monitoring efforts.

Whilst the dotterels are still extremely vulnerable during the nesting period, additional management measures have incrementally improved the protection afforded to the breeding dotterels and the monitoring has indicated improved nesting success as a result. Additional management measures have included improving and upgrading the

pest control network and servicing; Taranaki Whānui kaitiaki (guardians) placing a rāhui (access restriction) on the breeding beaches during the birds' nesting season; Greater Wellington and MIRO placing temporary fencing and signage around the rāhui areas to prevent access and disturbance of the nests.

The banded dotterel monitoring and management work within the KNE site are central to our understanding and informing management along the Eastbourne to Baring Head coastline. This is a significant area and breeding ground for banded dotterel and other shore birds. During the operational cycle of this plan GW/MIRO/Birds New Zealand will develop a coastal dotterel strategy that documents what management and monitoring work has been undertaken to date and start to develop a plan for the coastline as a whole management unit for shore birds. This will, in effect connect and improve the existing management activities undertaken at Eastbourne, Parangarahu Lakes Area and Baring Head.

9.5. Investigations to restore the Lakes' access to the sea (restoring the mauri)

The hydrology and geography of both lakes changed with tectonic uplifts. As a result, the lakes to sea outlets are subject to the natural blocking by a gravel bar (caused by the accretion of sand and gravel build-up). However, since the 1960s the outlets of both lakes have been culverted to provide for an access road around the coastline that may have exacerbated the natural blocking frequency. This is thought to have changed the functioning of both lakes and has had the effect of reducing the connection to the lakes and declines in populations for migratory indigenous fish species including tuna, īnanga, giant kōkopu.

During the operational cycle of this plan, an investigation into finding the best solution to restoring the lakes natural ability to reconnect with the sea will be undertaken by the co-management partners (Te Rōpū Tiaki). This investigation will aim to provide for improved fish passage and therefore, mauri of the lakes whilst also taking into account the need for access for vehicles and bicycles, effects on neighbours and other stakeholder groups.

The investigation will aim, over the five year operational plan period, to develop and agree a proposal for restoring access to facilitate natural access to sea and confirm funding to implement this project.

This is expected to follow the following process (timeframe is indicative and subject to change):

2020/21	Collect all relevant existing data and scope out all potential stakeholders/neighbours
2021/22	TRT to host a stakeholder/landowner workshop to flesh out their needs and concerns
2022/23	TRT to seek expert advice, contract out for option analysis based on workshop feedback
2023/24	Discuss option analysis with stakeholders and neighbours and agree concept
2024/25	Develop final design and financial costings
2025 onwards (if approved)	Implementation of final design

9.6. Boundary fencing review and upgrade

During the term of this operational plan (2020-2025) Greater Wellington Parks and neighbouring property owners will develop a maintenance plan and undertake an annual programme of surveying and repairing/upgrading the boundary fenceline of the regional park. This will prevent stock incursions into the regional park from neighbouring properties and help protect the highly valued wetlands within the regional park in accordance with the rules set out in the PNRP.

9.7. Wetland monitoring

The wetlands within the KNE site are part of Greater Wellington's Wetland Health State of the Environment (SoE) monitoring programme that is undertaken by the Environmental Science Department on a five-yearly basis at key wetland sites across the region. As part of this survey the vegetation composition, soil condition, plant nutrient status, wetland condition and wetland pressure index are recorded. The KNE site will be surveyed again during year four of this plan (2023/24).

10. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the KNE site, and their timing and cost over the five-year period from 1 July 2020 to 30 June 2025. The budget for years 2021/22 to 2024/25 are indicative only and subject to change. A map of operational areas can be found in Appendix 1.

Table 4: Five-year operational plan for the Parangarahu Lakes Area KNE site

Objective	Management Activity	Operational area	Actions	Intended 5 year outcome	Implementing party	Frequency (and assigned budget where known)				
						2020/21	2021/22	2022/23	2023/24	2024/25
1, 3	Ecological weed control	Lake Kohangatera and Gollans wetland See map 3	Egeria/elodea control planning operation, and monitoring under resource consent WGN140240	Target weeds suppressed to 'no impact' levels within Lake Kohangatera	GWRC Biodiversity/ NIWA	✓ \$15,000	✓ \$15,000	✓ \$15,000	✓ \$15,000	✓ \$15,000
1	Ecological weed control	Lake Kohangatera wetlands	Targeted control of the lake edge for yellow flag iris and beggar's ticks.	Target weeds suppressed to 'no impact' levels within Lake Kohangatera wetlands	GWRC Weed Team	✓ \$14,000	✓ \$14,000	✓ \$7,000	✓ \$7,000	✓ \$14,000
1	Ecological weed control	Lake Kohangapiri piri wetlands	Surveillance and control of any identified high priority weeds in the Lake Kohangapiripiri wetlands	No new high priority weeds established within Lake Kohangapiripiri wetlands	GWRC Weed Team			✓ \$7,000		

Objective	Management Activity	Operational area	Actions	Intended 5 year outcome	Implementing party	Frequency (and assigned budget where known)				
						2020/21	2021/22	2022/23	2023/24	2024/25
2, 3	Ecological weed control	Coastal platform and shingle beaches	Weed control along the coastal platform targeting marram, horned poppy, and lupin. Progressive control towards Baring Head NOTE: Use up to \$2,000 of this budget for reactionary control of new weed incursions and historic weed sites, if needed.	Target weeds suppressed to 'no impact' levels within KNE site boundary	GWRC Weed Team	✓ \$5,000	✓ \$5,000	✓ \$5,000	✓ \$5,000	✓ \$5,000
3	Ecological weed control	Coastal escarpment	Assessment and control of gorse on escarpment, if needed.	Maintained suppression to low-level impact of target species	GWRC Biodiversity				✓ \$7,000	
2, 3, 4	Pest animal control	Site-wide	Site-wide multi-species pest animal control	Maintained suppression to low-level impact of target species	MIRO	✓ \$500 (HCC for bait)	✓ \$500 (HCC for bait)	✓ \$500 (HCC for bait)	✓ \$500 (HCC for bait)	✓ \$500 (HCC for bait)
2, 3, 4	Pest animal control	Site-wide	Pest animal kill-trap network safety audit. Also covers minor maintenance.	Maintained suppression to low-level impact of target species	GWRC Pest animals	✓ \$1,500	✓ \$1,500	✓ \$1,500	✓ \$1,500	✓ \$1,500
2, 3, 4	Pest animal control	Site-wide	Ground-based shooting to control goats and other pest. 6 visits per year.	Maintained suppression to low-level impact of target species	GWRC Pest animals	✓ \$8,000	✓ \$8,000	✓ \$8,000	✓ \$8,000	✓ \$8,000

Objective	Management Activity	Operational area	Actions	Intended 5 year outcome	Implementing party	Frequency (and assigned budget where known)				
						2020/21	2021/22	2022/23	2023/24	2024/25
4	Revegetation	See map 5	Maintenance of existing revegetation planting plots and seed collection for future planting sites	Seed dispersal across the KNE site and greater diversity of natural generation	MIRO	✓ ¥	✓	✓	✓	✓
1, 3	Restoring the lakes' access to the sea (restoring the mauri)	Lake Kohangapiri piri Lake Kohangatera	<ul style="list-style-type: none"> - Collect all relevant existing data and scope out all potential stakeholders/neighbours - TRT to host a stakeholder/landowner workshop to flesh out their needs and concerns - TRT to seek expert advice, contract out for option analysis based on workshop feedback - Discuss option analysis with stakeholders and neighbours and agree concept - Develop final design and financial costings 	Proposal for restoring access to facilitate natural access to sea is agreed and funding confirmed	GWRC/TW	✓	✓	✓	✓	✓
2, 3	Banded dotterel management	Coastal platform	Banded dotterel monitoring (July – Feb)	Monitor breeding success and inform on the effectiveness of dotterel management	MIRO/OSNZ	✓	✓	✓	✓	✓

Objective	Management Activity	Operational area	Actions	Intended 5 year outcome	Implementing party	Frequency (and assigned budget where known)				
						2020/21	2021/22	2022/23	2023/24	2024/25
2, 3, 5	Banded dotterel management	Coastal platform	Rāhui and temporary fencing installed/removed (July – Feb)	Raised awareness and protection of breeding band dotterels	TW/GWRC Parks	✓ ¥	✓ ¥	✓ ¥	✓ ¥	✓ ¥
2, 3, 5	Banded dotterel management	Coastal platform	Develop coastal strategy for band dotterel	Coordinated strategy from Eastbourne to Baring Head is developed and operationalised	OSNZ/MIRO	✓				
1, 4, 5	Boundary fence review	Northern boundary fenceline	Annual programme of survey and repair/upgrade the boundary fence to prevent stock incursions	No stock incursions into the park and wetlands protected as per PNRP requirements	GWRC Parks	✓*	✓*	✓*	✓*	✓*
1	Wetland monitoring	Lake Kohangatera and Lake Kohangapiri piri	SoE wetland condition index monitoring	Wetland condition index scores maintained or improved	GWRC Env. Science				✓ ≠	

¥ Funded through the Environmental Enhancement Fund but needs are determined annually.

≠ Funded by the SoE monitoring programme and cost unknown at this stage

* Funding to be determined

11. Funding contributions

11.1. Budget allocated by Greater Wellington

The budget is indicative only and subject to change.

Table 5: Greater Wellington allocated budget for the Parangarahu Lakes Area KNE site

Management activity	Annual resourcing allocation
Ecological weed control: non-Egeria control operations	\$17,000
Ecological weed control: Egeria control operations only	\$15,000
Pest animal control	\$9,500
Environment Enhancement Fund [available to community groups and administered by Parks]	\$4,000

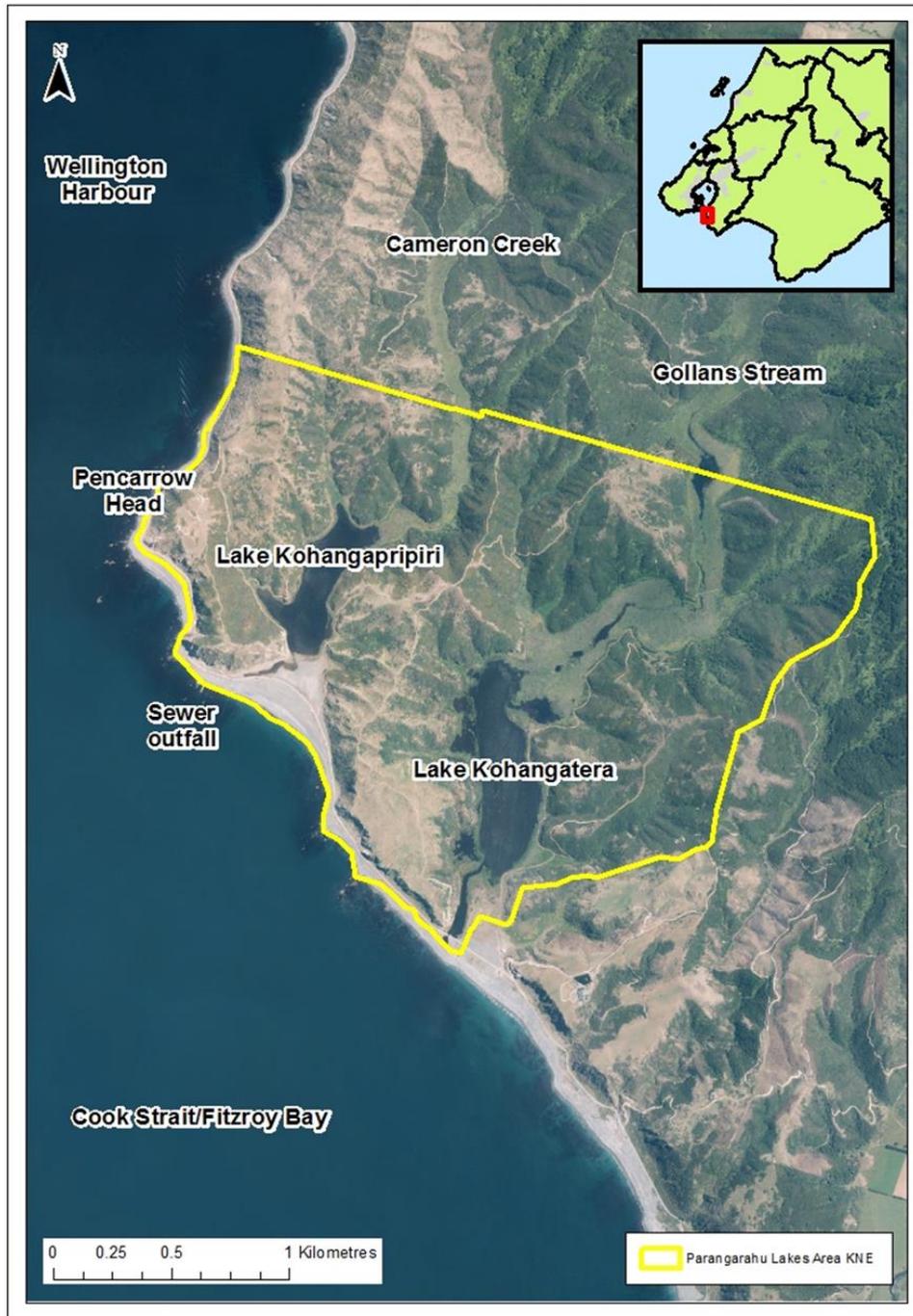
Other contributions

The budgets allocated are indicative only and subject to change.

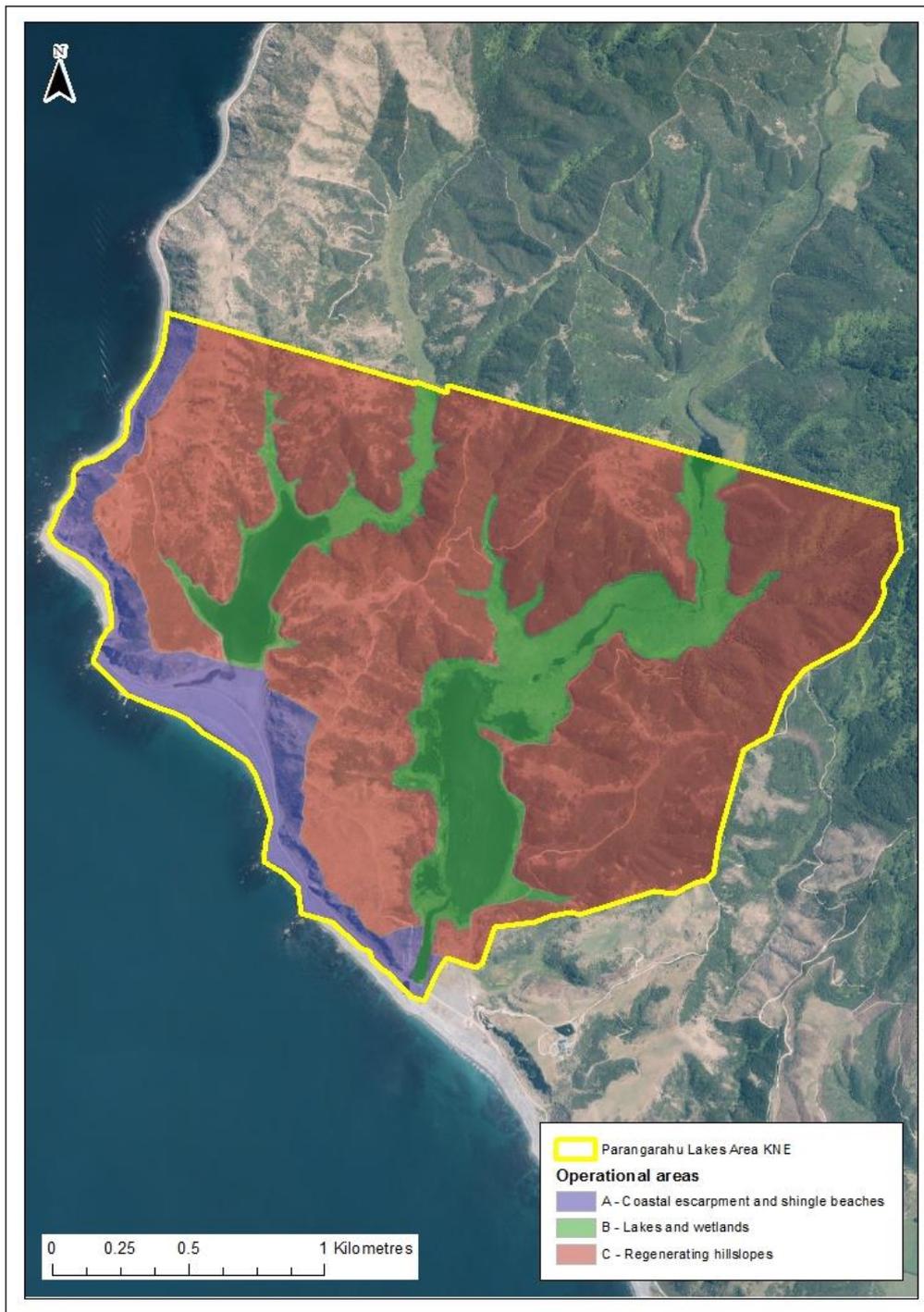
Table 6: Allocated budget for Parangarahu Lakes Area KNE from other management partners

Management activity	Annual resourcing allocation
HCC: - Bait for pest animal control	\$500
HCC: - Ecological weed control for marram	\$1,000
DOC: - Ecological weed control for marram	\$1,000

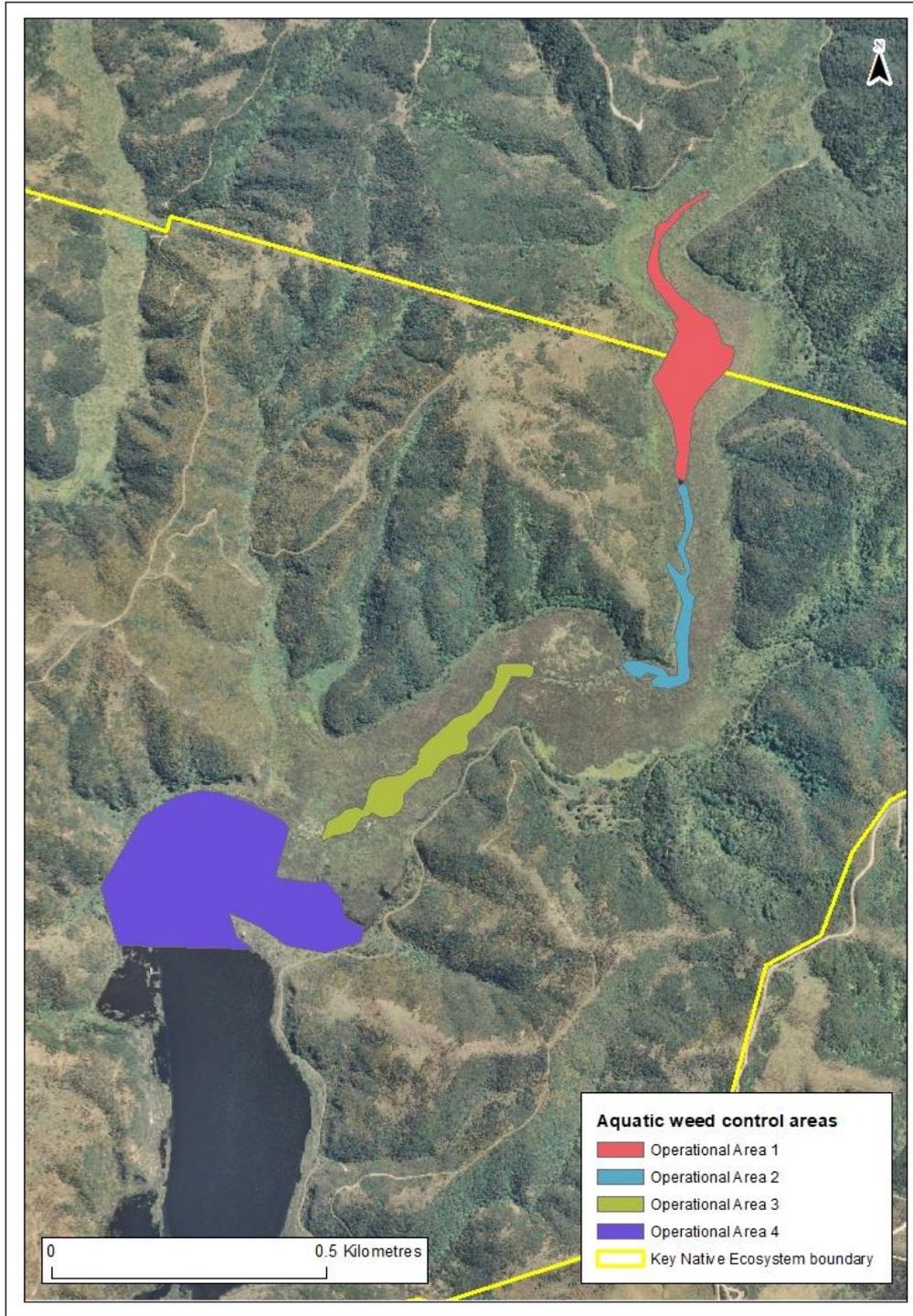
Appendix 1: Site maps



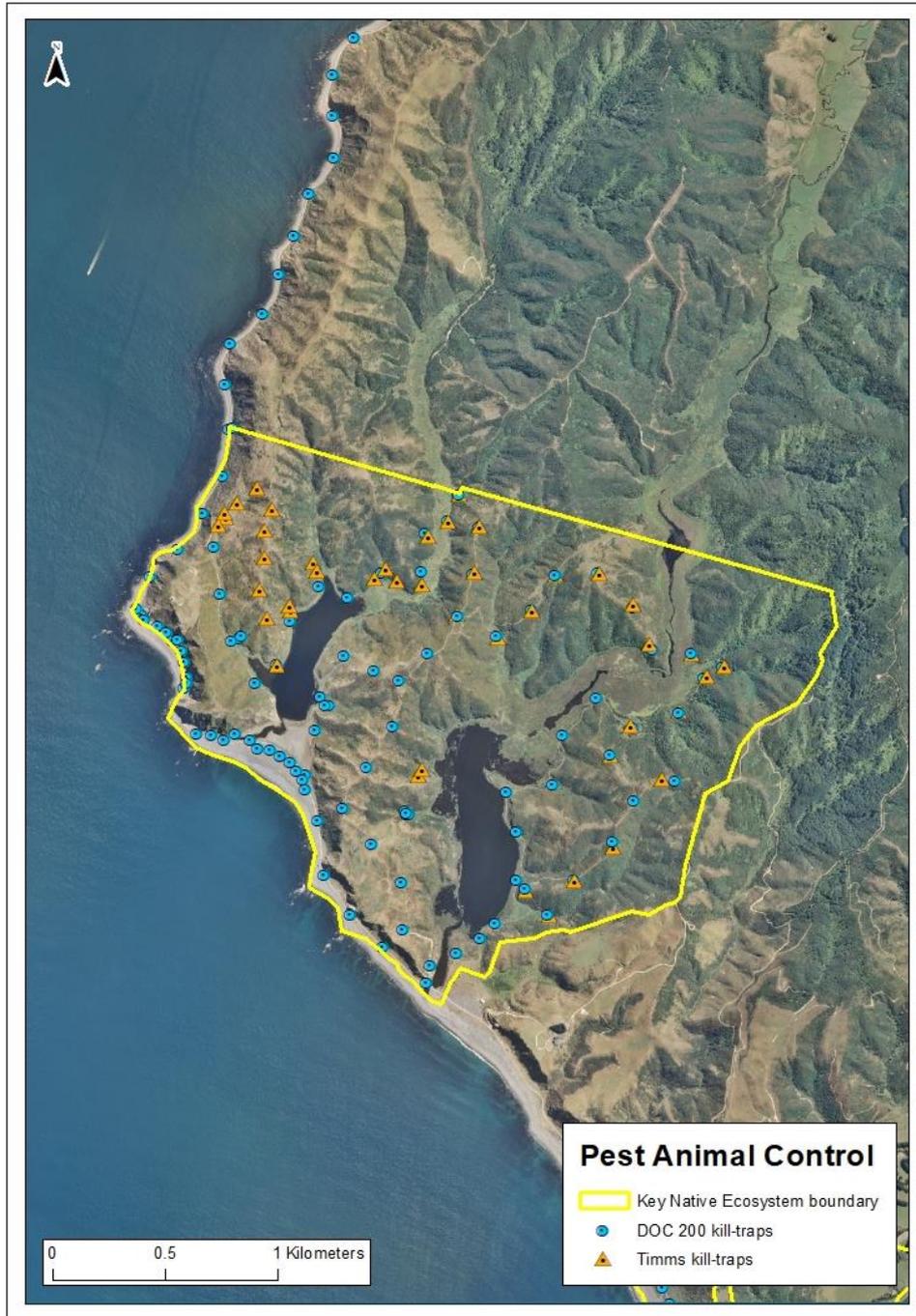
Map 1: The Parangarahu Lakes Area KNE site boundary



Map 2: Broad scale habitat types at the Parangarahu Lakes Area KNE site



Map 3: Aquatic weed operational areas 1-4 at Lake Kohangatera and Gollans Wetland



Map 4: Pest animal control in the Parangarahu Lakes Area KNE site



Map 5: Revegetation planting areas in the Parangarahu Lakes Area 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 five-year cycle⁵¹. 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 Parangarahu Lakes Area KNE site.

Table 7: Threatened and At Risk species at the Parangarahu Lakes Area KNE site

Scientific name	Common name	Threat status	Source/Comments
Plants (vascular)⁵²			
<i>Centipeda aotearoana</i>	Sneezeweed	At Risk - Naturally Uncommon	Gibbs (2002) ⁵³
<i>Craspedia uniflora</i> var. <i>maritima</i>		At Risk - Naturally Uncommon	Gibbs (2002)
<i>Crassula kirkii</i>	Kirk's crassula	At Risk - Naturally Uncommon	Gibbs (2002)
<i>Crassula sinclairii</i>		At Risk - Naturally Uncommon	Gibbs (2002)
<i>Chenopodium allanii</i>		At Risk - Naturally Uncommon	Gibbs (2002)
<i>Eryngium vesiculosum</i>	Sea holly	At Risk - Declining	Gibbs (2002)
<i>Ficinia spiralis</i>	Pīngao	At Risk - Declining	Gibbs (2002)
<i>Geranium</i> aff. <i>microphyllum</i>		At Risk - Naturally Uncommon	Gibbs (2002)
<i>Geranium retrorsum</i>		Threatened - Nationally Vulnerable	Gibbs (2002)
<i>Lepilaena bilocularis</i>		Threatened - Nationally Vulnerable	de Winton (2013a) ⁵⁴
<i>Leptinella dispersa</i> subsp. <i>dispersa</i>		At Risk - Naturally Uncommon	Gibbs (2002)
<i>Melicytus</i> aff. <i>obovatus</i> (Cook Strait)		At Risk - Naturally Uncommon	Gibbs (2002)
<i>Melicytus crassifolius</i>	Thick-leaved māhoe	At Risk - Declining	Gibbs (2002)
<i>Muehlenbeckia ephedroides</i>	Leafless pōhuehue, dead stick plant	At Risk - Declining	Gibbs (2002)
<i>Nematoceras macranthum</i>	Spider orchid	At Risk - Naturally Uncommon	Gibbs (2002)
<i>Nematoceras trilobum</i> agg. (Rimutaka)	Spider orchid	Data Deficient (Taxonomically uncertain entity)	Gibbs (2002)

Scientific name	Common name	Threat status	Source/Comments
<i>Pimelea</i> spp.	New Zealand daphne	Data Deficient (undescribed species/hybrid swarm)	Gibbs (2002)
<i>Ranunculus limosella</i>		At Risk - Declining	Gibbs (2002)
<i>Ranunculus macropus</i>	Swamp buttercup	Data Deficient	Gibbs (2002)
<i>Stuckenia pectinata</i>	Sago pondweed	At Risk - Naturally Uncommon	de Winton (2013a)
<i>Zannichellia palustris</i>	Horned pondweed	At Risk - Naturally Uncommon	de Winton (2013a)
Birds⁵⁵			
<i>Anthus novaeseelandiae</i>	NZ pipit	At Risk - Declining	Gibbs (2002)
<i>Charadrius bicinctus</i>	Banded dotterel	Threatened - Nationally Vulnerable	Gibbs (2002)
<i>Hydroprogne caspia</i>	Taranui, Caspian tern	Threatened - Nationally Vulnerable	Gibbs (2002)
<i>Larus novaehollandiae scropulinus</i>	Tarāpunga, red billed gull	At Risk - Declining	Gibbs (2002)
<i>Phalacrocorax carbo</i>	Large black shag	At Risk - Naturally Uncommon	Gibbs (2002)
<i>Phalacrocorax varius varius</i>	Pied shag	At Risk - Recovering	Gibbs (2002)
<i>Poliiocephalus rufopectus</i>	NZ dabchick	At Risk - Recovering	Gibbs (2002)
<i>Sterna striata striata</i>	Tara, white fronted tern	At Risk - Declining	Gibbs (2002)
Freshwater fish⁵⁶			
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk - Declining	Gibbs (2002)
<i>Galaxias argenteus</i>	Giant kōkopu	At Risk - Declining	Gibbs (2002)
<i>Galaxias brevipinnis</i>	Kōaro	At Risk - Declining	Gibbs (2002)
<i>Galaxias maculatus</i>	Inanga, whitebait	At Risk - Declining	Gibbs (2002)
<i>Geotria australis</i>	Lamprey	Threatened - Nationally Vulnerable	Gibbs (2002)
<i>Gobiomorphus huttoni</i>	Redfin bully	At Risk - Declining	Gibbs (2002)
Invertebrates (less well known terrestrial invertebrates)⁵⁷(butterflies and moths)⁵⁸			
<i>Ericodesma aerodana</i>	Moth	Threatened - Nationally Endangered	Gibbs (2002)
<i>Hyridella menziesi</i>	Kākahi, freshwater mussel	At Risk - Declining	McEwan (2013) ⁵⁹
<i>Notoreas perornata</i> (Wellington)	Coastal moth	Threatened - Nationally Critical	Gibbs (2002)

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Greater Wellington Regional Council:

Wellington office
PO Box 11646
Manners Street
Wellington 6142

T 04 384 5708
F 04 385 6960

Upper Hutt office
PO Box 40847
Upper Hutt 5018

T 04 526 4133
F 04 526 4171

Masterton office
PO Box 41
Masterton 5840

T 06 378 2484
F 06 378 2146

Follow the Wellington
Regional Council



info@gw.govt.nz
www.gw.govt.nz

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