

Key Native Ecosystem Plan for Raroa-Pukerua Coast

2018-2021



greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao



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1. Key Native Ecosystem plans

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

Greater Wellington Regional Council's (Greater Wellington) Biodiversity Strategy¹ sets a framework that guides how Greater Wellington protects and manages biodiversity in the Wellington region to work towards the vision below.

Greater Wellington's vision for biodiversity

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. The vision 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 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 publically owned land. However, land managed by the Department of Conservation (DOC) is generally excluded from this programme.

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

2. Raroa - Pukerua Coast Key Native Ecosystem site

The Raroa - Pukerua Coast KNE site (18.6 ha) is located 11 km north of Porirua City centre, near Pukerua Bay township (see Appendix 1, Map 1). The KNE site comprises a narrow coastal platform with a rocky shore; a steep coastal cliff; and two forested gullies that extend further inland for nearly 500 m.

The KNE site contains examples of vegetation that represent plant communities that used to be more extensive on Wellington and Kāpiti Coast escarpments including coastal saltmarsh, coastal scree, vineland, flaxland, scrub and coastal kohekohe-podocarp and kānuka forest.

More than 190 indigenous plant species grow in the KNE site including several At Risk and Regionally Uncommon species (see Appendices 2 and 3), more than 36 species of fern, and seven species of orchid.

3. Parties involved

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

Landowner

The whole KNE site is owned by Porirua City Council (PCC) and is named Raroa Reserve in the PCC Reserves Management Plan². The reserve is classified as a Scenic 'A' Reserve under the Reserves Act 1977. The management plan for Raroa Reserve, prepared by PCC, aims to protect and enhance the reserve's natural, recreation and landscape values.

Operational delivery

The departments within Greater Wellington that manage the site are Biodiversity, which coordinates biodiversity advice and management activities and Biosecurity, which delivers pest control work at the KNE site.

PCC helps to fund the ecological weed control and pest animal control operations.

The Friends of Mana Island check predator control traps in Raroa Bush and along the bottom and top of Raroa Escarpment. These traps were installed by DOC to control pest animals in Pukerua Bay Scientific Reserve.

4. Ecological values

Ecological values are a way to describe indigenous biodiversity found at a site and what makes it special. These ecological values can be various components or attributes of ecosystems that determine how important an area is for maintaining regional biodiversity. For example, some sites provide important habitat for threatened species, or contain intact remnants of vegetation typical of the ecosystem type. The ecological values of a site are used to prioritise allocation of resources to manage KNE sites within the region.

The KNE site covers two ecological districts. The escarpment (cliff) falls within the Cook Strait Ecological District³, and is characterised by very exposed, steep coastal escarpments and scree affected by salt-laden wind and frequent gales. It also experiences a high number of sunshine hours and humid conditions⁴. The forested valleys are included in the Foxton Ecological District⁵. This part of the KNE site is characterised by steep hills with geological faults present, and mild, humid coastal climate⁶.

The KNE site is well connected to other sites with high biodiversity value, such as the Pukerua Bay Scientific Reserve and other KNE sites. The Pukerua Bay Scientific Reserve (see Appendix 1, Map 2) is managed by DOC to maintain lizard populations⁷. The Scientific Reserve supports the only mainland population of Whitaker's skink (*Oligosoma whitakeri*), which has declined to nearly non-detectable levels and may become locally extinct⁸. This reserve, and the Raroa Escarpment, which falls within this KNE site, are collectively known as Wairaka Wildlife Refuge⁹.

The Taupō Swamp Complex and the Karehana Bay Bush KNE sites are 2.5 km to the south and the Battle Hill Bush KNE site is 4 km to the east. The Paekākāriki Escarpment KNE site lies 600 m to the east of the KNE site. The close proximity of these other sites provides opportunities for seed dispersal by native bird species and corridors for native invertebrates, lizards and birds.

The Raroa - Pukerua Coast KNE site is managed by focusing on three separate operational areas based on ecosystem type:

- A. Raroa Bush - west of Rawhiti Road
- B. Waimapehi - the forested gully to the east of Rawhiti Road
- C. Raroa Escarpment – south of Pukerua Bay

Important ecological values at the Raroa - Pukerua Coast site include:

Naturally uncommon ecosystems: Stony beach ridges and shingle beaches are naturally rare ecosystem types at a national scale¹⁰ and are classified as Nationally Endangered ecosystem types¹¹.

Threatened environments: The Threatened Environment Classification (LENZ)¹² is a broad classification system which shows how much indigenous vegetation

remains within land environments, how much is legally protected and how past vegetation loss and legal protection are distributed across New Zealand's landscape. Classifications for areas within the KNE site are summarised below: (see Appendix 1, Map 3)

- Waimapehi is Chronically Threatened (Environments with 10-20% indigenous cover remaining nationally);
- Raroa Bush is At Risk (Environments with 20-30% indigenous cover remaining nationally);
- Raroa Escarpment is Critically Under protected (Environments with greater than 30% indigenous cover remaining nationally but less than 10% is legally protected)

Threatened species: Within the KNE site there are ten Nationally Threatened or At Risk plant species and seven regionally threatened plant species. The site provides habitat for four Threatened and five At Risk bird species. One At Risk lizard species is present. Nationally threatened species are listed in Appendix 2 and regionally threatened species in Appendix 3.

The Singers and Rogers (2014)¹³ classification of pre-human vegetation indicates the KNE site comprised coprosma, muehlenbeckia shrubland/ herbfield/ rockland (CL3) on parts of Raroa Escarpment, with more sheltered gullies forested with kohekohe, tawa forest (MF6). There is about 15% of the original extent of the MF6 forest type remaining in the Wellington region, making it a regionally threatened ecosystem type¹⁴.

The KNE site contains a range of habitats including small areas of coastal saltmarsh and herbfield, sparsely vegetated rock and scree slopes, vineland, wharariki (*Phormium cookianum* subsp. *hookeri*) flaxland, scrub, and kohekohe (*Dysoxylum spectabile*) and kānuka (*Kunzea robusta*) forest.

Area A: Raroa Bush

Raroa bush comprises 2.5 ha of coastal broadleaved forest with a kohekohe, ngaio (*Myoporum laetum*), kaikōmako (*Pennantia corymbosa*) canopy on a very rocky substrate. Wind shear and salt burden is extreme on this edge resulting in mature trees, such as tītoki (*Alectryon excelsus* subsp. *excelsus*) and kohekohe, which can grow to 20 metres tall, only achieving 5 metres in height. Away from the edge, trees grow much taller. Other forest types within Raroa Bush include karaka forest, kohekohe/ kaikōmako forest, young ngaio-kaikōmako-kohekohe forest and tall kānuka forest.

The KNE site provides habitat for common forest birds including tūī (*Prosthemadera novaeseelandiae*) and grey warbler (*Gerygone igata*)¹⁵.

Area B: Raroa Escarpment

This steep escarpment (9.3 ha) is peppered with extensive scree slopes and rocky spurs. Vegetation types include:

- Meadow rice grass (*Microlaena stipoides*) and exotic grassland
- Pōhuehue (*Muehlenbeckia complexa*) and *Coprosma propinqua* shrubland
- Wharariki flaxland
- *Coprosma propinqua*, ngaio, karaka (*Corynocarpus laevigatus*), and kawakawa (*Piper excelsum* subsp. *excelsum*) scrub
- Kohekohe, māhoe (*Melicytus ramiflorus*), and karaka forest
- Oioi (*Apodasmia similis*), half-star (*Selliera radicans*), and slender clubbrush (*Isolepis cernua* var. *cernua*) salt marsh on the rock and shingle shore

Four lizard species known to live on the escarpment are glossy brown skink (*Oligosoma zelandicum*), Raukawa gecko (*Woodworthia maculata*), copper skink (*Oligosoma aeneum*) and northern grass skink (*Oligosoma polychroma*)¹⁶.

The coastal platform is habitat for a wide variety of shore birds including reef heron (*Egretta sacra sacra*), white-faced heron (*Egretta novaehollandiae*), red-billed gull (*Larus novaehollandiae scopulinus*), white-fronted tern (*Sterna striata*), black shag (*Phalacrocorax carbo*), pied shag (*Phalacrocorax varius*), little pied shag (*Phalacrocorax melanoleucos*), black-backed gull (*Larus dominicanus*), variable oystercatcher (*Haematopus unicolor*) and paradise shelduck (*Tadorna variegata*). Little (blue) penguin (*Eudyptula minor*) have also been sighted anecdotally by local residents.

Area C: Waimapehi

This area comprises 6.3 ha of tall secondary-growth kānuka with a dense, diverse understory of coastal broadleaf forest species. Canopy species include tree fuchsia (*Fuchsia excorticata*), five-finger (*Pseudopanax arborea*), māpou (*Myrsine australis*), and kaikomako. Whau (*Entelea arborescens*), which is known from a few sites in the eastern Wairarapa, near Paekākāriki and Wellington, is also present¹⁷. *Carex* “raotest” occurs in well-lit areas under the canopy. Flaxland occurs near the coast on the north and lower west facing slopes. The Waimapehi bush gully rises to 60 m above sea level and includes a deeply-incised gorge and the Waimapehi Stream. Some notable species occur in the lower gorge in well-lit areas; shore cotula (*Leptinella dioica*), New Zealand sow thistle (*Sonchus kirkii*), shore lobelia (*Lobelia anceps*) and sea primrose (*Samolus repens*).

Forest birds recorded for this area include grey warbler, New Zealand fantail (*Rhipidura fuliginosa*), kererū (*Hemiphaga novaeseelandiae*), silvereye (*Zosterops lateralis*), and tūī¹⁸. Recently kākā (*Nestor meridionalis*) have been observed by local residents. A New Zealand falcon (*Falco novaeseelandiae*) has been observed feeding on silvereye on the edge of the KNE site¹⁹. The barking gecko (*Naultinus punctatus*) was reported from houses adjacent to Waimapehi bush gully and is likely to occur within the reserve also²⁰.

5. Key threats to ecological values at the site

Ecological values can be threatened by human activities, and by introduced animals and plants, that change the natural balance of native ecosystems. The key to protecting and restoring biodiversity as part of the KNE Programme is to manage the threats to the ecological values at the site.

A wide range of ecological weed species occur at the site which have the potential to outcompete native species and dominate the KNE site. Plants that spread from local gardens and rubbish dumping can introduce new weeds or new populations of weeds inside the KNE site. Ecological weed species and their priority for control are listed in Appendix 4 and additional weed species may occur in adjacent gardens.

Indigenous fauna is at risk from predators such as cats (*Felis catus*), rats (*Rattus* spp.), mustelids (*Mustela* spp.) and mice (*Mus musculus*). Indigenous flora has in the past suffered from possum (*Trichosurus vulpecula*) browsing, grazing by goats (*Capra hircus*) and stock.

While the key threats discussed in this section are recognised as the most significant, a number of other threats to the KNE site have also been identified. Table 1 presents a summary of all known threats to the KNE site (including those discussed above), detailing which operational areas they affect, how the threat impacts on ecological values, and whether they will be addressed by the proposed operational activities.

Table 1: Threats to ecological values present at the Raroa - Pukerua Coast KNE site

The codes alongside each threat correspond to activities listed in the operational delivery schedule (Table 2), and are used to ensure that actions taken are targeted to specific threats. A map of operational areas can be found in Appendix 1 (see Map 4)

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Ecological weeds		
EW-1*	Lizard habitat on the coastal escarpment is being smothered by a range of indigenous and exotic species. The introduced veldt grass (<i>Ehrharta erecta</i>) and other exotic grass species are of particular concern as they reduce underground space that serves as lizard habitat and mass seeding can result in increased rodent and mustelid populations. This increases lizard predation	Area B
EW-2	Ground-covering, scrambling and climbing weeds have the potential to smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species listed in Appendix 4	Entire KNE site especially boundaries
EW-3	Woody weed species have the potential to displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species listed in Appendix 4	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Pest animals		
PA-1*	Feral, stray and domestic cats prey on native birds ²¹ , lizards ²² and invertebrates ²³ , reducing native fauna breeding success and potentially causing local extinctions ²⁴ (eg, Whitaker's skink)	Entire KNE site especially Area B
PA-2	Mustelids prey on native birds, lizards and invertebrates, reducing breeding success and potentially causing local extinctions (eg, Whitaker's skink)	Entire KNE site
PA-3	Hedgehogs (<i>Erinaceus europeaeus</i>) prey on native invertebrates, lizards ²⁵ , and the eggs ²⁶ and chicks of ground-nesting birds	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 ^{27,28}	Entire KNE site especially Area B
PA-5	Possums browse palatable canopy vegetation until it can no longer recover ^{29,30} . This destroys the forest's structure, diversity and function. Possums may also prey on native birds ³¹ and invertebrates	Entire KNE site
PA-6	Goats 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 ³²	Entire KNE site
PA-7*	Rabbits (<i>Oryctolagus cuniculus</i>) and hares (<i>Lepus europeus</i>) graze on palatable native vegetation and prevent natural regeneration in some environments ³³	Area B
PA-8*	House mice 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 ^{34,35}	Entire KNE site
Human activities		
HA-1*	Unauthorised collection of lizards may contribute to the demise of populations	Entire KNE site especially Area B
HA-2	Encroachment and dumping of garden waste can spread weeds into the KNE site (see EW-2, EW-3, EW-4)	Entire KNE site especially residential boundary
HA-3*	Human-induced fire can destroy native vegetation opening it up to weed invasion and edge effects	Entire KNE site especially near residential boundary
HA-4	If fences are not maintained, grazing by stock from adjacent properties could inhibit regeneration processes, reducing indigenous plant species richness and in some cases causing local extinctions of palatable indigenous shrubs, terrestrial orchids and ferns ³⁶	Rural boundary of Areas B & C

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
HA-5*	People accessing the reserve (for recreation, work, or research purposes) can damage native vegetation, disturb native fauna and introduce ecological weed seeds. Places along tracks that are exposed to more light are likely ecological weed reinvasion points	Entire KNE site
Other threats		
OT-1*	Erosion, slips and scouring caused by storm water outlets may be causing erosion that opens up habitat for invasive weeds and reduces habitat for lizards	Entire KNE site

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

6. Objectives

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

The following objectives will guide the operational activities at Raroa - Pukerua Coast KNE site.

1. **To improve the structure* and function† of native plant communities**
2. **To improve the habitat for native birds**
3. **To improve the habitat for native lizards**

* 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 provisioning of food and habitat for animal species.

7. Operational activities

Operational activities are targeted to work towards the objectives above by responding to the threats outlined in Section 5. 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 2).

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. This is discussed in the broad management approach.

Ecological weed control

Weed control in Raroa - Pukerua Coast KNE site has been undertaken since 2006. The aim of weed control is to reduce the distribution and density of weeds to maintain native plant dominance and increase native plant regeneration.

This will be achieved by following up on previously targeted areas (Areas A, C and goat track within area B), whilst expanding the control area along the escarpment proper within Area B on a rolling front from south to north as resources allow.

Weed species present within the KNE site are provided in Appendix 4 with priority 1 and 2 species generally targeted for control. However, Greater Wellington will determine the species targeted for control annually.

Pest animal control

The aim of pest animal control is to reduce predators to maintain populations of ground-dwelling lizards and to reduce browsing mammals that damage the forest canopy.

21 poison bait stations targeting possums and rats were set up in 1999 and are serviced four times annually by Greater Wellington.

A network of DOC200 kill traps were installed at 50 m intervals by DOC along the top and bottom of Raroa escarpment (Area B). The traps are checked twice monthly in summer and, monthly in winter by the Friends of Mana Island, as well as by Predator Free Pukerua Bay³⁷. DOC oversees this work and is the primary contact for these groups.

The Regional Possum Predator Control Programme is operating in the Porirua area. This is likely to reduce possums in the wider landscape and reduce the possibility of possums reinvading the KNE site.

Ground based hunting of goats along the Raroa Escarpment (Operational Area B) will take place in 2018/2019. This work has been approved by DOC and PCC and will be delivered by Greater Wellington.

Stock exclusion

Fences around the KNE site perimeter will be surveyed annually by Greater Wellington to ensure they are stock proof.

8. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for Raroa - Pukerua Coast KNE site, and their timing and cost over the three-year period from 1 July 2018 to 30 June 2021. The budget for the 2019/20 and 2020/21 years are indicative only and subject to change. A map of operational Areas can be found in Appendix 1 (see Map 4).

Table 2: Three year operational delivery schedule for the Raroa - Pukerua Coast KNE site

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable & resourcing		
							2018/19	2019/20	2020/21
1,3	EW-2 EW-3	Ecological weed control	A - Raroa Bush B - Raroa Escarpment C - Waimapehi	Biosecurity department	Follow up weed sweep in Areas A and C Follow up expansion of control on rolling front in Area B	Reduce distribution and abundance of target species	\$9,100	\$13,100	\$13,100
2,3	PA-5	Pest animal control	Entire KNE site	Biosecurity department	Bait stations serviced 4 times annually	Possums <5% RTC * Rats < 10% TTI**	\$4,300	\$4,300	\$4,300
1	PA-6	Goat control	B- Raroa Escarpment	Biosecurity department	Control goats residing on the Raroa escarpment using ground based hunting	Reduce distribution and abundance of target species	\$4,000	Nil	Nil
2,3	PA -2 PA -3 PA -4	Pest animal control	Entire KNE site	Friends of Mana Island and Pest Free Plimmerton	Traps checked twice monthly in summer and monthly in winter	Reduce distribution and abundance of target species	Nil	Nil	Nil
1,3	HA-4	Stock exclusion	KNE site boundary	Biodiversity department	Check boundary fences of adjacent rural land		Nil	Nil	Nil
Total							\$17,400	\$17,400	\$17,400

*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 summary

Greater Wellington budget

The budget for the 2019/20 and 2020/21 years are indicative only and subject to change.

Table 3: Greater Wellington allocated budget for the Raroa - Pukerua Coast KNE site

Management activity	Timetable & resourcing		
	2018/19 (\$)	2019/20 (\$)	2020/21 (\$)
Ecological weed control	7,100	9,100	9,100
Pest animal control	4,850	2,850	2,850
Total	11,950	11,950	11,950

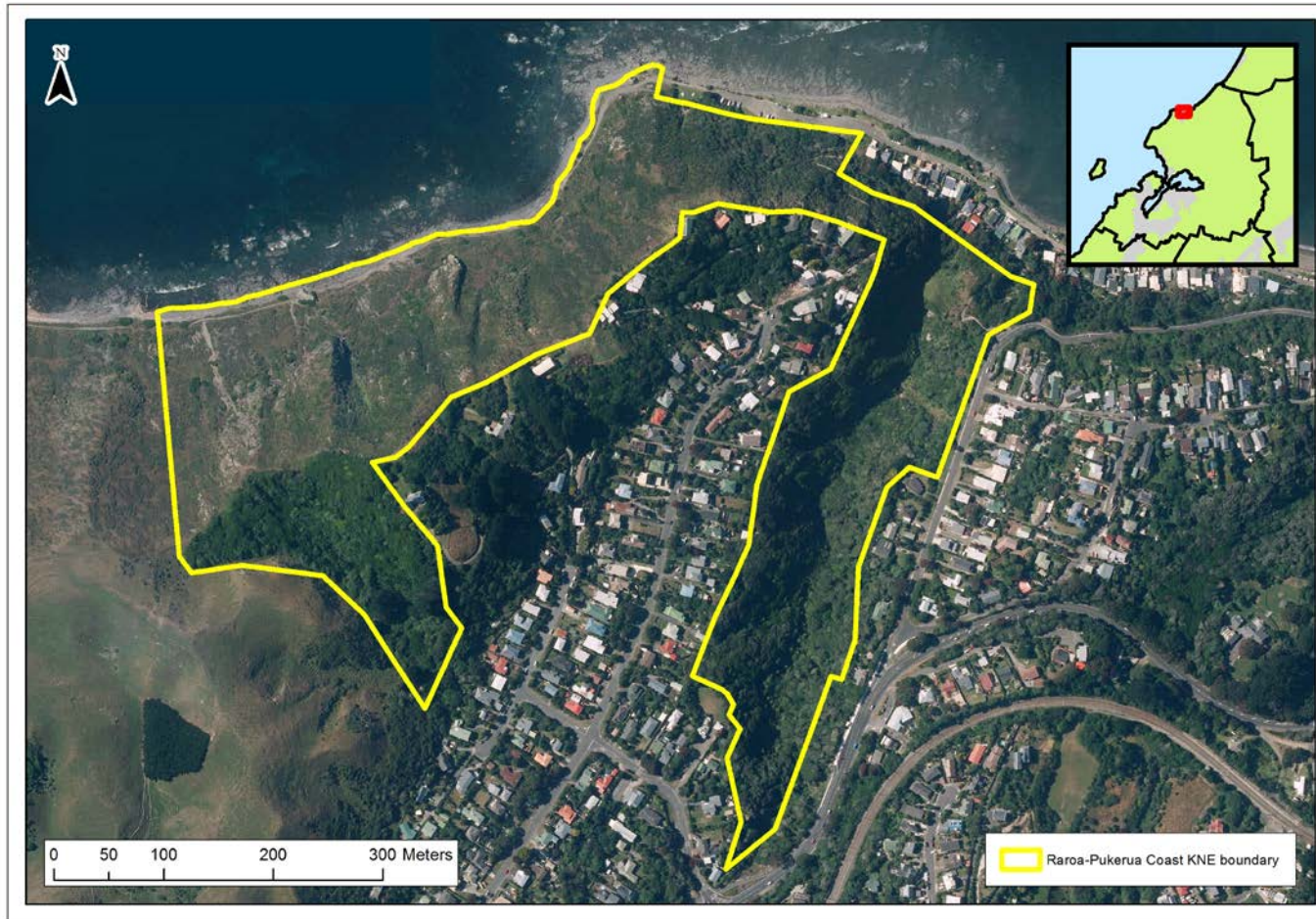
PCC budget

The budget is subject to confirmation through the PCC long term planning process.

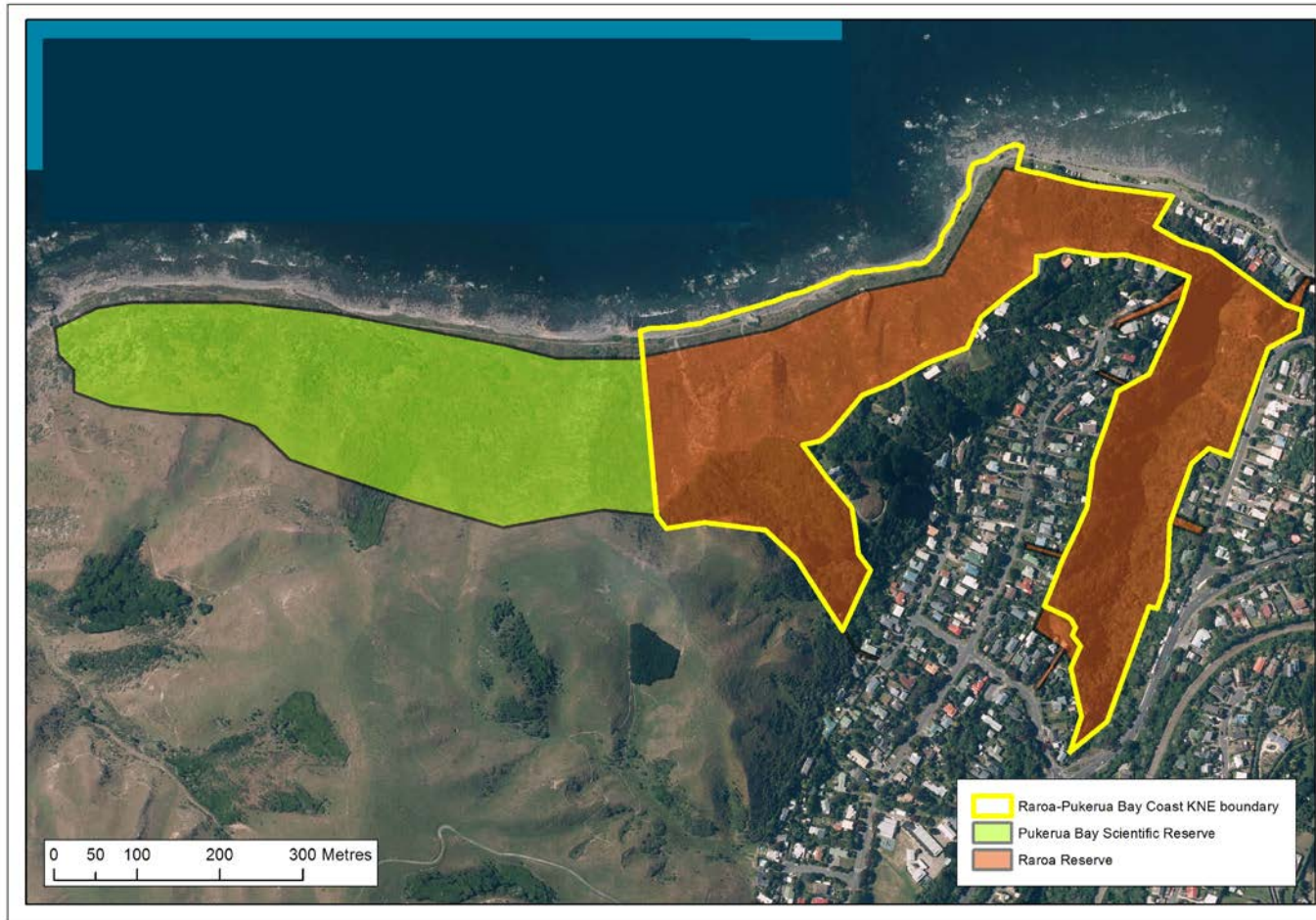
Table 4: PCC allocated budget for the Raroa - Pukerua Coast KNE site

Management activity	Timetable & resourcing		
	2018/19 (\$)	2019/20 (\$)	2020/21 (\$)
Ecological weed control	2,000	4,000	4,000
Pest animal control	3,450	1,450	1,450
Total	5,450	5,450	5,450

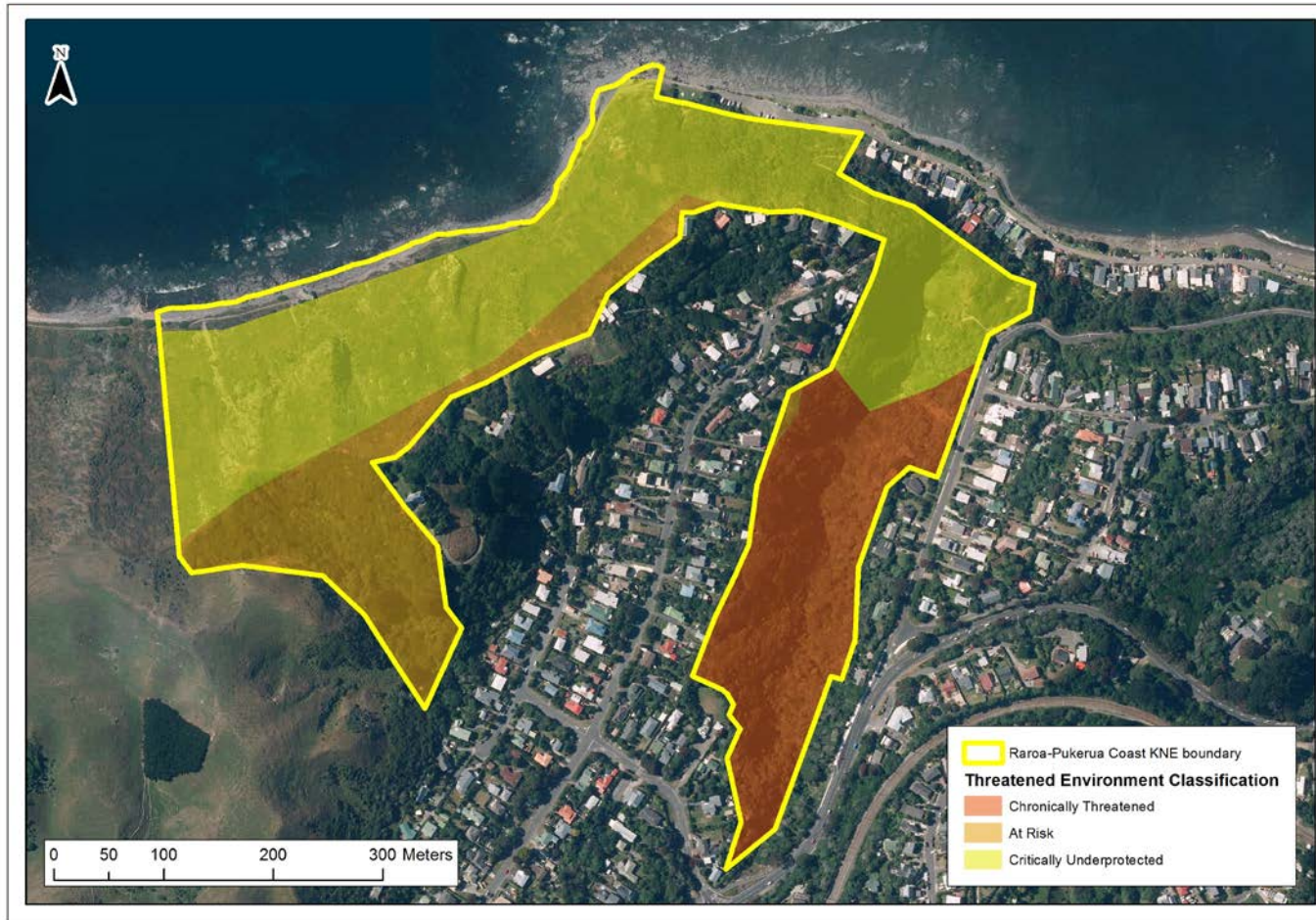
Appendix 1: Site maps



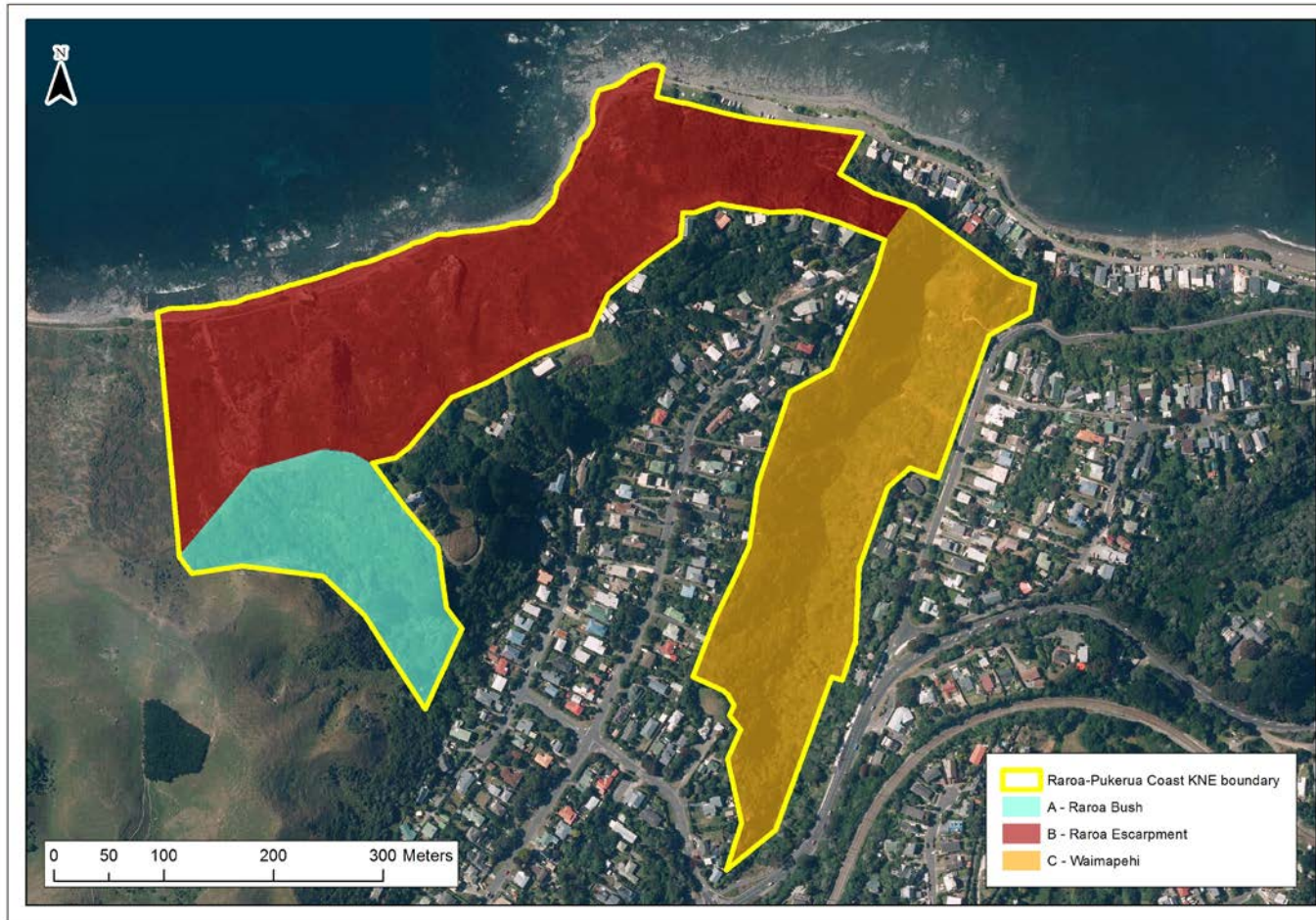
Map 1: The Raroa - Pukerua Coast KNE site boundary



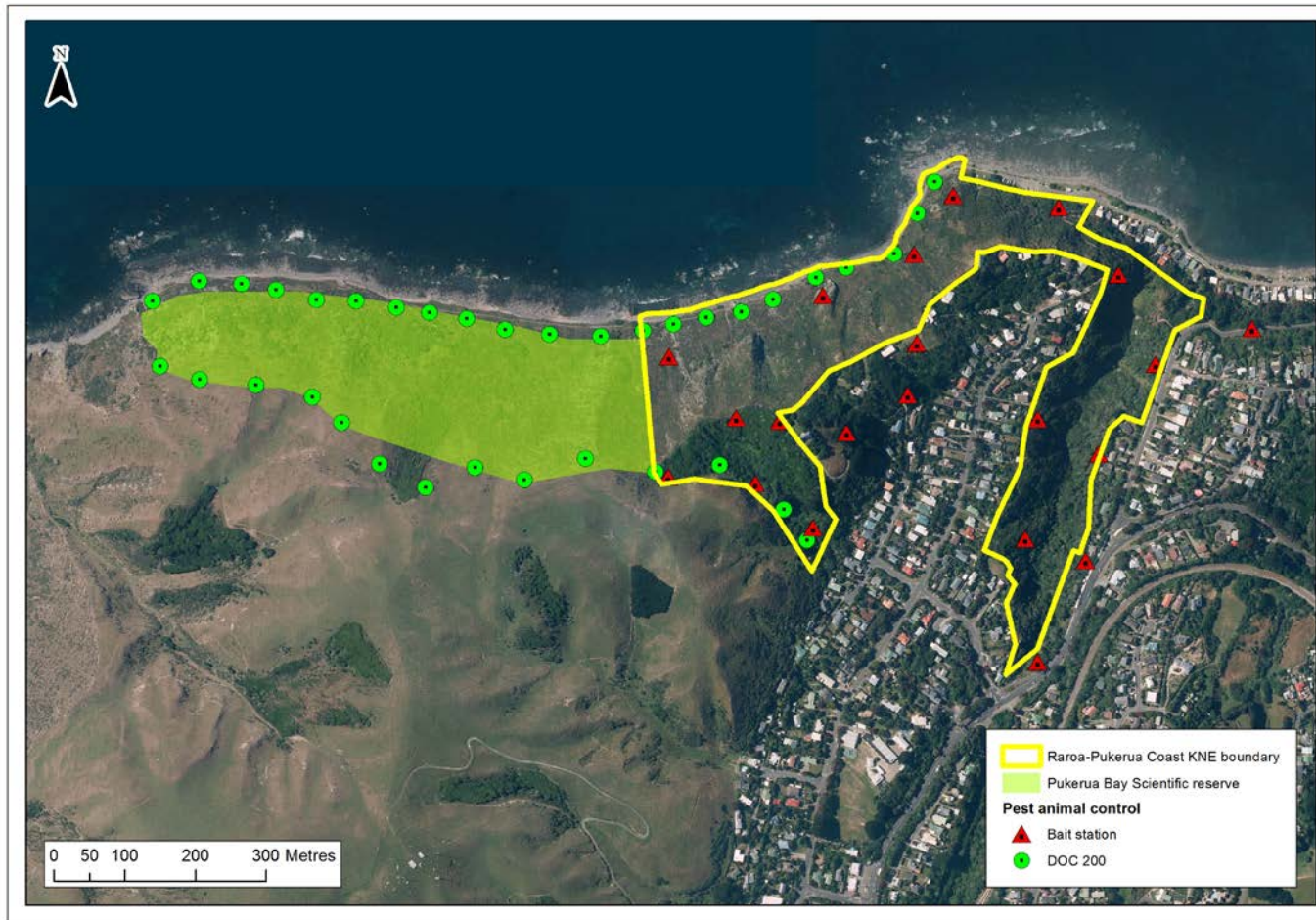
Map 2: The Raroa - Pukerua Coast KNE site boundary with adjacent Pukerua Bay Scientific Reserve



Map 3: Land Environment New Zealand threat classification map for the Raroa - Pukerua Coast KNE site



Map 4: Operational areas in the Raroa - Pukerua Coast KNE site



Map 5: Pest animal control in the Raroa - Pukerua Coast KNE site. The Friends of Mana Island service the DOC200 traps in both the KNE site and the Pukerua Bay Scientific Reserve. Predator Free Pukerua Bay also service the DOC200 traps in the KNE site. DOC provides bait to the Friends of Mana Island

Appendix 2: 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 cycle. 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 Raroa - Pukerua Coast KNE site.

Table 5: Nationally Threatened and At Risk species at the Raroa - Pukerua Coast KNE site

Scientific name	Common name	Threat status	Observation
Plants(vascular)³⁸			
<i>Craspedia uniflora</i> <i>var. maritima</i>	Woollyhead	At Risk - Declining	Ogle 1980
<i>Drymoanthus flavus</i>	Little spotted moa, epiphytic orchid	At risk - Naturally Uncommon	NZPCN website ³⁹
<i>Euphorbia glauca</i>	Shore spurge, sea spurge, waiū atua	At Risk - Declining	NZPCN website ⁴⁰
<i>Melicytus crassifolius</i>	Thick-leaved māhoe	At Risk - Declining	Planted from seed sourced from Titahi Bay, Ogle 1987 ⁴¹
<i>Sonchus kirkii</i>	Shore pūhā, New Zealand sow thistle	At Risk - Declining	Ogle 1980 ⁴²
<i>Streblus banksii</i>	Large-leaved milk tree, tūrepo	At Risk - Relict	DOC ecological site inventory 2013
<i>Trisetum antarcticum</i>	Coastal grass species	At Risk - Declining	Ogle 1980
Birds⁴³			
<i>Anthus novaeseelandiae</i>	New Zealand pipit	At Risk - declining	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Egretta sacra sacra</i>	Reef heron	Nationally Endangered	http://ebird.org/content/newzealand/ (accessed 22/01/2014). Known to nest here ⁴⁴
<i>Falco novaeseelandiae sensu stricto</i>	New Zealand bush falcon, kārearea	Recovering	Bell 2014 ⁴⁵
<i>Haematopus unicolor</i>	Variable oystercatcher	Recovering	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Hydroprogne caspia</i>	Caspian tern	Nationally Vulnerable	http://ebird.org/content/newzealand/ (accessed 15/05/2015)

Scientific name	Common name	Threat status	Observation
<i>Larus novaehollandiae scopulinus</i>	Red-billed gull	At Risk	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Nestor meridionalis</i>	North Island Kākā	Threatened - Nationally Vulnerable	Olivia Dovey, PCC, pers. obs 2018
<i>Phalacrocorax carbo</i>	Black shag	Naturally Uncommon	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Phalacrocorax varius</i>	Pied shag	Recovering	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Sterna striata</i>	White-fronted tern	At Risk – Declining	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
Reptiles⁴⁶			
<i>Oligosoma zelandicum</i>	Glossy brown skink	At Risk - Declining	Department of Conservation 2014
Invertebrates: (Araneae – spiders)⁴⁷			
<i>Latrodectus katipo</i>	Katipō spider	At Risk - Declining	Pukerua Bay Management Plan 2003 ⁴⁸

Appendix 3: Regionally threatened plant species list

The following table lists regionally threatened plant species that have been recorded in the Raroa - Pukerua Coast KNE site. The regional threat status of plant species is listed in the Plant Conservation Strategy for Wellington Conservancy 2004-2010⁴⁹.

Table 6: Regionally threatened plant species recorded in the Raroa - Pukerua Coast KNE site

Scientific name	Common name	Threat status	Source
Plants			
<i>Aciphylla squarrosa</i> var. <i>squarrosa</i>	Taramea, speargrass	Regionally vulnerable	Ogle 1980 ⁵⁰
<i>Carex</i> "raotest"	none	Regionally uncommon	Robyn Smith, GWRC, pers. obs 2014
<i>Cheilanthes distans</i>	Woolly cloak fern	Regionally Sparse	Ogle 1980
<i>Hypolepis distans</i>	none	Regionally Sparse	Ogle 1980
<i>Pellaea calidirupium</i>	none	Regionally Sparse	Ogle 1980
<i>Raoulia hookeri</i> var. <i>hookeri</i>	Scabweed, scabweed mat daisy	Regionally Gradual Decline	Ogle 1980
<i>Vittadinia australis</i>	White fuzzweed	Regionally endangered	Ogle 1980

Appendix 4: Ecological Weeds

The following tables list ecological weed species that have been recorded in Raroa/Pukerua Coast KNE site in order of priority for control. Species have been prioritised for control according to their impact to the site and the practicality of their control⁵¹. The distribution and density of individual species is described for operational areas A, B and C. Three levels of distribution (localised, patchy and widespread) and density (sparse, abundant and dense) are used to describe these aspects of infestations of each species.

Area A: Raroa Bush

Area B: Raroa Escarpment

Area C: Waimapehi

Table 7: Environmental weeds within Operational Area A (Raroa Bush)

Scientific name	Common name	Priority	Level of distribution
<i>Corynocarpus laevigatus</i>	Karaka	Severe	Widespread and abundant
<i>Crocsmia x crocosmooflora</i>	Montbretia	Severe	Localised and sparse
<i>Lonicera japonica</i>	Japanese honeysuckle	Severe	Localised and sparse
<i>Paraserianthes lophantha</i>	Brush wattle	Severe	Patchy and abundant
<i>Clematis vitalba</i>	Old man's beard	High	Localised, sparse
<i>Parietaria judaica</i>	Pellitory of the wall	High	TBD*
<i>Pittosporum crassifolium</i>	Karo	High	Widespread and abundant
<i>Senecio glastifolius</i>	Purple ragwort	High	Patchy and sparse
<i>Zantedeschia aethiopica</i>	Arum lily	High	Localised and sparse
<i>Cytisus scoparius</i>	Broom	Moderate	Localised and sparse
<i>Hydrangea macrophylla</i>	Hydrangea	Moderate	Localised and sparse
<i>Allium triquetrum</i>	Onion weed	Low	TBD*
<i>Calystegia silvatica</i>	Greater bindweed	Low	TBD*
<i>Ulex europaeus</i>	Gorse	Low	Patchy and sparse

*TBD = To Be Determined

Table 8: Environmental weeds within Operational Area B (Raroa Escarpment)

Scientific name	Common name	Priority	Level of distribution
<i>Chrysanthemoides monilifera</i>	Boneseed	Severe	Patchy and abundant
<i>Delairea odorata</i>	German ivy	Severe	Patchy and sparse
<i>Genista monspessulana</i>	Montpellier broom	Severe	Patchy and dense
<i>Lathyrus latifolius</i>	Everlasting Pea	Severe	Widespread and abundant
<i>Passiflora tripartite</i> var. <i>mollissima</i>	Banana passionfruit	Severe	Patchy and sparse
<i>Phytolacca octandra</i>	Ink weed	Severe	Patchy and abundant
<i>Rumex sagittatus</i>	Climbing dock	Severe	Patchy and abundant
<i>Senecio glastifolius</i>	Purple ragwort	Severe	Widespread and abundant
<i>Corynocarpus laevigatus</i>	Karaka	High	Localised and sparse
<i>Paraserianthes lophantha</i>	Brush wattle	High	Patchy and abundant
<i>Parietaria judaica</i>	Pellitory of the wall	High	Localised and sparse None at this time due to high surf
<i>Pittosporum crassifolium</i>	Karo	High	Patchy and sparse
<i>Polygala myrtifolia</i>	Sweet pea shrub	High	Localised and sparse
<i>Aeonium haworthii</i> *	Pinwheel Aeonium	Moderate	Patchy and abundant
<i>Agapanthus praecox</i>	Agapanthus	Moderate	TBD*
<i>Carpobrotus edulis</i>	Ice plant	Moderate	TBD*
<i>Cotoneaster</i> sp.	Cotoneaster	Moderate	TBD*
<i>Cortaderia selloana</i>	Pampas	Moderate	Localised and sparse
<i>Crassula multicava</i> subsp. <i>Multicava</i> *	Fairy crassula	Moderate	Patchy and abundant
<i>Cytisus scoparius</i>	Broom	Moderate	Localised and sparse
<i>Ehrharta erecta</i>	Veldt grass	Moderate	TBD*
<i>Fumaria muralis</i> subsp. <i>muralis</i>	Scrambling fumitory	Moderate	Patchy and abundant
<i>Gazania rigens</i>	Gazania	Moderate	TBD*
<i>Hedera helix</i>	Ivy	Moderate	Localised and sparse
<i>Kniphofia uvaria</i>	Red hot poker	Moderate	Patchy and sparse
<i>Pennisetum clandestinum</i>	Kikuyu grass	Moderate	Widespread and abundant

Scientific name	Common name	Priority	Level of distribution
<i>Tecoma capensis</i>	Cape honey flower	Moderate	Localised and sparse
<i>Tropaeolum majus</i>	Nasturtium	Moderate	Localised and abundant
<i>Sambucus nigra</i>	Elderberry	Moderate	TBD*
<i>Allium triquetrum</i>	Onion weed	Low	Trackside: localised and abundant
<i>Artemisia absinthium</i>	Wormwood	Low	TBD*
<i>Calystegia silvatica</i>	Greater bindweed	Low	TBD*
<i>Brassica rapa sylvestris</i>	Wild turnip	Low	Trackside: localised and abundant
<i>Foeniculum vulgare</i>	Fennel	Low	Trackside: localised and sparse
<i>Opuntia monacantha</i>	Drooping prickly pear	Low	Localised and sparse
<i>Rhaphiolepis umbellata</i>	Sextons bride	Low	TBD*
<i>Ulex europaeus</i>	Gorse	Low	TBD*

*TBD = To Be Determined

Table 9: Environmental weeds within Operational Area C (Waimapehi)

Scientific name	Common name	Priority	Level of distribution
<i>Asparagus scandens</i>	Climbing asparagus	High	Localised and sparse
<i>Chrysanthemoides monilifera</i>	Boneseed	Severe	TBD*
<i>Dipogon lignosus</i>	Mile a minute vine	Severe	Localised and sparse
<i>Hedera helix</i>	Ivy	Severe	TBD*
<i>Lathyrus latifolius</i>	Everlasting Pea	Severe	TBD*
<i>Lonicera japonica</i>	Japanese honeysuckle	Severe	TBD*
<i>Passiflora tripartite</i> var. <i>mollissima</i>	Banana passionfruit	Severe	TBD*
<i>Polygala myrtifolia</i>	Sweet pea shrub	Severe	TBD*
<i>Senecio angulatus</i>	Cape ivy	Severe	TBD*
<i>Cotoneaster</i> sp.	Cotoneaster	High	TBD*
<i>Metrosideros excelsa</i>	Pohutukawa	High	Patchy and sparse
<i>Myoporum</i> aff. <i>insulare</i>	Tasmanian ngaio	High	TBD*
<i>Paraserianthes lophantha</i>	Brush wattle	High	Patchy and abundant
<i>Parietaria judaica</i>	Pellitory of the wall	High	TBD*
<i>Pittosporum crassifolium</i>	Karo	High	TBD*
<i>Plectranthus ciliatus</i>	Blue spur flower	High	TBD*
<i>Acanthus mollis</i>	Bear's breaches	Moderate	TBD*
<i>Agapanthus praecox</i>	Agapanthus	Moderate	TBD*
<i>Cortaderia selloana</i>	Pampas	Moderate	TBD*
<i>Crocsmia x crocosmooflora</i>	Montbretia	Moderate	TBD*
<i>Cytisus scoparius</i>	Broom	Moderate	TBD*
<i>Hydrangea macrophylla</i>	Hydrangea	Moderate	TBD*
<i>Pennisetum clandestinum</i>	Kikuyu grass	Moderate	TBD*
<i>Rubus</i> sp. (<i>R. fruticosus</i> agg.)	Blackberry	Moderate	TBD*
<i>Selaginella kraussiana</i>	Creeping clubmoss	Moderate	TBD*
<i>Senecio glastifolius</i>	Purple ragwort	Moderate	TBD*
<i>Tradescantia fluminensis</i>	Tradescantia	Moderate	Patchy and abundant

Scientific name	Common name	Priority	Level of distribution
<i>Zantedeschia aethiopica</i>	Arum lily	Moderate	TBD*
<i>Aeonium haworthii</i> *	Pinwheel Aeonium	Low	TBD*
<i>Allium triquetrum</i>	Onion weed	Low	TBD*
<i>Calystegia silvatica</i>	Greater bindweed	Low	TBD*
<i>Carpobrotus edulis</i>	Ice plant	Low	TBD*
<i>Cotyledon orbiculata</i> var. <i>orbiculata</i>	Pigs ear	Low	TBD*
<i>Crassula multicava</i> subsp. <i>multicava</i>	Fairy crassula	Low	TBD*
<i>Echeveria secunda</i>	Mexican gem	Low	TBD*
<i>Phytolacca octandra</i>	Ink weed	Low	TBD*
<i>Solanum nigrum</i>	Black nightshade	Low	TBD*
<i>Tropaeolum majus</i>	Nasturtium	Low	TBD*
<i>Ulex europaeus</i>	Gorse	Low	TBD*
<i>Bambusa</i> spp.	Bamboo	Low	Localised and sparse

*TBD = To Be Determined

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