

# Key Native Ecosystem Operational Plan for Paekākāriki Escarpment

2021-2026





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## 1. Purpose

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

- Identify the parties involved
- Summarise the ecological values and identify the threats to those values
- Outline the vision and objectives to guide management decision-making
- Describe operational activities to improve ecological condition (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)<sup>1</sup>.

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

### **Greater Wellington Long Term Plan**

The Long Term Plan (2018-2028)<sup>2</sup> 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 for the Wellington Region (PNRP)<sup>3</sup> 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 Regional Pest Management Plan<sup>4</sup> 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.

### **Greater Wellington Biodiversity Strategy**

The Greater Wellington Biodiversity Strategy<sup>5</sup> (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

**Principles**  
Use best practice   work with others   Lead by example   partner with mana whenua

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 non-regulatory programme. The programme seeks to protect some of the best examples of original (pre-human) ecosystem types in the Wellington region. Sites with the highest biodiversity values have been identified and prioritised for management.

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.

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

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.

#### 4. Paekākāriki Escarpment Key Native Ecosystem site

The Paekākāriki Escarpment KNE site (113 ha) is located between Paekākāriki and Pukerua Bay (see Appendix 1, Map 1). The KNE site comprises an exposed, steep coastal escarpment and contains remnant and regenerating coastal forests, grey scrub and flaxland. The KNE site contains ecosystems, plants, birds and lizards that are nationally or regionally Threatened or At Risk. The KNE site straddles the boundary between the Kāpiti Coast District and Porirua City councils’ jurisdictions. The majority of the KNE site is legally protected, either through agreement between KiwiRail and the Queen Elizabeth II National Trust (QEII), or through being within a recreation reserve designation.

## 5. Parties involved

There are several organisations that play important roles in the care of the KNE site.

### 5.1. Landowners

Land within the KNE site is owned by the following three landowners (see Appendix 1, Map 2 for locations of land parcels):

- KiwiRail; owns 104 ha. This include 17 ha of unidentified crown land assumed to be managed by KiwiRail,
- New Zealand Transport Agency; owns 2.7 ha in the northern part of the KNE site,

Kāpiti Coast District Council (KCDC); owns 6 ha at the north of the KNE site. This consists of recreation reserve (A.T. Clarke Reserve) and small areas of road reserve.

### 5.2. Operational delivery

There are four organisations that have a role in the management of the biodiversity values of the KNE site. These are QEII, Ngā Uruora - Kāpiti Project Incorporated (NUKP), KCDC and Greater Wellington.

KiwiRail has granted QEII a 'license to occupy', which allows QEII to manage the KiwiRail owned land within the KNE site for biodiversity purposes. In turn, QEII has a formal management agreement with NUKP which allows for NUKP to undertake biodiversity work within the KiwiRail owned land. NUKP also operates on the KCDC owned land within the KNE site. NUKP's management of the land is guided by the Ngā Uruora - Kāpiti Project Incorporated Strategic Plan<sup>6</sup>. Under this plan they undertake ecological weed and pest animal control, restoration planting, lizard surveys and bird monitoring.

KCDC provides on the ground support for NUKP's work on its land and within an area of the KiwiRail owned land identified as an Ecological Site of Significance in the proposed Kāpiti Coast District Plan<sup>7</sup>. Greater Wellington provides funding and strategic support for NUKP's work throughout the KNE site and undertakes additional ecological weed control.

While NUKP's work within the KNE site delivers a large component of the KNE operational plan, two Greater Wellington departments are responsible for delivering other components:

- The Biodiversity department is the overarching lead department for Greater Wellington on the longer term planning and coordination of biodiversity management activities and advice within the KNE site. The Biodiversity department's KNE budget funds the Biosecurity department to coordinate and carry out pest control activities.
- The Biosecurity department coordinates and implements pest controls measures at the KNE site.



### 5.3. Mana whenua partners

The Paekākāriki Escarpment KNE site contains sites of significance to Ngāti Toa Rangatira. Kapukapuariki rocks which are located on the coastal edge of the KNE site are of cultural, historical, spiritual and traditional significance to Ngāti Toa Rangatira and Pariipari Pa was located on the steep slopes above the rocks. Both sites are identified within the Statutory Acknowledgement from the Ngāti Toa Rangatira Claims Settlement Act 2014<sup>8</sup>.

### 5.4. Stakeholders

The following are considered stakeholders at the KNE site as they are interested in or impacted by biodiversity management activities undertaken at the KNE site.

- Te Araroa Wellington Trust are responsible for the maintenance and administration of the section of Te Araroa – New Zealand’s Trail that passes through the KNE site.
- The neighbouring farmers share responsibility for maintenance of farm fences bounding the KNE site.
- Guardians of Whareroa Farm, Friends of Queen Elizabeth Park and Kāpiti Coast Biodiversity Project are all strong advocates for sound biodiversity management at the KNE site in the interest of landscape scale biodiversity benefits.

## 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 1, below, lists ecological designations at all or part of the Paekākāriki Escarpment KNE site.

**Table 1: Designations at the Paekākāriki Escarpment KNE site**

Designation level	Type of designation
District	<p>Most of the KNE site has been classified as part of either an Ecological Site in the Kāpiti Coast District Plan or a Significant Natural Area in the Porirua City Council Proposed District Plan:</p> <ul style="list-style-type: none"> <li>• K135: Pukerua Bay Coastal Scarp<sup>9</sup></li> <li>• SNA002: Pukerua Bay – Paekākāriki Coastal Scarp<sup>10</sup></li> </ul> <p>All of the KNE site lies within two Department of Conservation Designated Ecological Sites:</p> <ul style="list-style-type: none"> <li>• Pukerua Bay Paekākāriki Coastal Scarp</li> <li>• Pukerua Bay Coastal Scarp Forest</li> </ul>

### 6.2. Ecological significance

The Paekākāriki Escarpment KNE site is considered to be of regional importance because:

- It contains **representative** ecosystems that were once typical or commonplace in the region
- It contains ecological features that are **rare or distinctive** in the region
- Its **ecological context** is valuable at the landscape scale as it contains a relatively large area of coastal escarpment habitat, is connected to other areas of native habitat, and provides core habitat for threatened indigenous plant, bird and lizard species.

#### *Representativeness*

The Singers and Rogers<sup>11</sup> classification of pre-human forest vegetation indicates the KNE site would likely have been comprised of two ecosystem types. Coprosma and muehlenbeckia shrubland/herbfield/rockland (CL3) was likely to have dominated the steeper slopes, while kohekohe-tawa forest (MF6) was likely to have clothed the more gentle and protected slopes (see Appendix 1, Map 3). Today there are only patches of habitat that resemble these original ecosystems and even these are highly modified. In the Wellington region there is only 16% of the original extent of kohekohe-tawa forest remaining. This makes it a regionally endangered forest type<sup>12</sup>.

The Threatened Environment Classification system<sup>13</sup> indicates that the lower parts of the escarpment are environment types that are At Risk (2.5 ha) or Critically Under-protected (36 ha). Nationally the At Risk environment type has only 20% - 30% of its

indigenous vegetation remaining. The Critically Under-protected environment type has more indigenous vegetation remaining but less than 10% of it is protected. The remainder of the KNE site is classified as less threatened (see Appendix 1, Map 4).

#### *Rarity/distinctiveness*

New Zealand's national threat classification system<sup>14</sup> lists eleven plant, three bird and one lizard species within the KNE site as nationally Threatened or At Risk. Fifteen plant, four bird and two lizard species present have also been listed as regionally Threatened. However many of the Threatened and At Risk plant species have been planted in the KNE site within the last two decades. Nationally threatened species are listed in Appendix 2 and regionally threatened species in Appendix 3.

#### *Ecological context*

The KNE site contains a large area of coastal escarpment that is not farmed. It contributes to ecological links across the landscape for indigenous bird and plant species, forming connections with areas of similar coastal habitat to the north and south.

### **6.3. Ecological features**

The KNE site lies within the Cook Strait Ecological District<sup>15</sup>, characterised by a maritime climate with frequent gales and annual rainfall of c.1200 mm.

#### **Vegetation communities and plants**

The KNE site has been described as containing the following vegetation types<sup>16,17</sup>:

- Kohekohe-māhoe forest: Located in A.T. Clarke Reserve at the northern end of the KNE site
- Kohekohe-māhoe-akiraho-nīkau forest: Located in the central part of the KNE site
- Kānuka forest: Wind-shorn kānuka (*Kunzea robusta*) forest is present in the central part of the KNE site
- Mingimingi-wharariki scrub-flaxland: This exposed scrub-flaxland of mingimingi (*Coprosma propinqua*) and wharariki (*Phormium cookianum*) with emergent cabbage trees (*Cordyline australis*) is spread throughout central and southern parts of the KNE site
- Ngaio-māhoe-karaka forest: Isolated patches are present at the southern end of the KNE site
- Grey scrub: This ecosystem type dominated by *Coprosma propinqua*, with shrubby pōhuehue (*Muehlenbeckia complexa*), coastal tree daisy (*Olearia solandri*), tauhinu (*Ozothamnus leptophyllus*) and the odd thick-leaved māhoe (*Melicytus crassifolius*) is scattered throughout the KNE site.

Over 100 indigenous plant species have been recorded in the KNE site<sup>18</sup>. Canopy species include kohekohe (*Dysoxylum spectabile*), māhoe (*Melicytus ramiflorus*), akiraho (*Olearia paniculata*) and nīkau (*Rhopalostylis sapida*). Other less common species present include pigeonwood (*Hedycarya arborea*), tītoki (*Alectryon excelsus*), māpou (*Myrsine australis*), ngaio (*Myoporum laetum*) and the non-local native species karaka (*Corynocarpus laevigatus*). Uncommon native plant species found growing naturally in

the KNE site include thick leaved mahoe (*Melicytus crassifolius*), turepo/large-leaved milk tree (*Streblus banksii*) and puha/New Zealand sow thistle (*Sonchus kirkii*).

## Species

### Birds

The KNE site is known to support fourteen native bird species. These are riroriro/grey warbler (*Gerygone igata*); tauhou/silvereye (*Zosterops lateralis*); pīwakawaka/New Zealand fantail (*Rhipidura fuliginosa*); korimako/bellbird (*Anthornis melanora*); warou/welcome swallow (*Hirundo neoxena*); pīpīwharau/shining cuckoo (*Chrysococcyx lucidus*); kotare/New Zealand kingfisher (*Todiramphus sanctus*); tūī (*Prothemadera novaeseelandiae*); kererū/New Zealand pigeon (*Hemiphaga novaeseelandiae*); kārerea/New Zealand falcon (*Falco novaeseelandiae*); kāhu/swamp harrier (*Circus approximans*); tōrea pango/variable oystercatcher (*Haematopus unicolor*); kāruhiruhi/pied shag (*Phalacrocorax varius*); karoro/black backed gull (*Larus dominicanus*)<sup>19</sup>.

### Reptiles

Four species of lizard have been recorded in the KNE site. These are glossy brown skink (*Oligosoma zelandicum*), northern grass skink (*O. polychroma*), copper skink (*O. aeneum*) and Raukawa gecko (*Woodworthia maculata*)<sup>20</sup>. Barking gecko (*Nautinus punctatus*) have been recorded within a few hundred metres of the KNE site so may also be present within it<sup>21</sup>.

## 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.

While the key threats discussed in this section are recognised as the most significant, it is important to note that not all threats can be adequately addressed. This can be for a number of reasons including financial, legal, or capacity restrictions. A number of other threats to the KNE site's values have also been identified. Appendix 4 presents a summary of all known threats to the Paekākāriki Escarpment KNE site (including those discussed below), detailing which operational areas they affect, how each threat impacts on ecological values, and whether they will be addressed by operational activities.

### 7.1. Key threats

Ecological weeds are considered the biggest threat to biodiversity values within the KNE site. Ecological weeds are widespread across the entire KNE site (see Appendix 5 for more information) and are known to consistently reinvade the KNE site due to its disturbed and largely open habitat, and as a result of garden dumping.

Pest animals also pose threats to biodiversity values at the site. Of all the pest animals present, sheep are probably having the greatest impact. Sheep regularly access the KNE site from neighbouring farms through degraded fences. Sheep damage plantings done by volunteers and naturally regenerating plants through their browsing and trampling. Rats (*Rattus spp.*), mustelids (*Mustela spp.*) and feral cats (*Felis catus*) are also present and are likely to be preying on indigenous fauna in the KNE site. Possums (*Trichosurus vulpecula*) now appear to be present in very low numbers due to control in the KNE site and the wider landscape but might still be affecting the condition and composition of indigenous vegetation by browsing foliage and flowers.

## 8. Vision and objectives

### 8.1. Vision

***'The Paekākāriki Escarpment KNE site comprises a healthy and resilient coastal ecosystem. The vegetation communities are dominated by native species and support thriving native fauna populations'***

### 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 guide the operational activities at the Paekākāriki Escarpment KNE site.

- 1. Improve the condition and dominance of the native plant communities***
- 2. Enhance the potential for natural regeneration of native coastal habitat across the KNE site***
- 3. Protect and increase populations of rare and threatened native plant species***
- 4. Protect native birds, lizards and invertebrates***
- 5. Support Ngā Uruora Kāpiti Project in its management of the KNE site***

## 9. Operational activities

Operational activities are targeted to work towards the objectives above (Section 8). 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).

The main management activities undertaken within the KNE site are ecological weed control, pest animal control, monitoring and revegetation.

### 9.1. Ecological weed control

The aim of ecological weed control is to improve the condition and dominance of the plant communities present and to enhance the potential for natural regeneration to occur across the KNE site by removing pressure and competition imposed by ecological weeds.

NUKP volunteers undertake ecological weed control work in various areas within the KNE site, although most of their focus is in operational area A. KCDC and Greater Wellington work collaboratively with NUKP to plan actions and responsibilities, and ensure each organisations activities don't conflict with another.

Greater Wellington and KCDC independently undertake control of ecological weeds, mostly in separate areas of the KNE site. KCDC controls ecological weeds in operational area A (see Appendix 1, Map 5). This is the northern part of the KNE site and includes AT Clarke Reserve. KCDC uses a combination of contractors and their own staff to undertake this control work. Greater Wellington manages ecological weed control within the remainder of the KNE site (operational area B) but also in southern parts of operational area A when extra support is needed. Greater Wellington usually engages contractors to undertake this work.

There is a high presence of ecological weeds throughout much of the KNE site, meaning a very strategic approach to control must be taken. Control activities are determined annually with the following aims at the forefront of planning:

- Protection of areas of remnant forest and established regenerating bush patches
- Prevention of woody weeds becoming dominant across the landscape
- Prevention of highly invasive weed species becoming established.

While seeking these aims a level of pragmatism must also be applied to ensure control work is only undertaken where ecological benefits can be achieved within the resources available. This means that some large and entrenched infestations of exotic ground-covers cannot be controlled. It also means that patches of boneseed (*Chrysanthemoides monilifera*), boxthorn (*Lycium ferocissimum*) and karo (*Pittosporum crassifolium*) located on steep faces above the adjacent state highway and the rail line can't be worked on at present. This is mainly due to Greater Wellington not being able to gain agreement from Waka Kotahi NZ Transport Agency (NZTA) to undertake control in these areas using either abseiling or drones. This situation might ease once the state highway is downgraded to a local road and responsibility for it is handed to the local councils following the opening of the Transmission Gully road.

Species that are controlled regularly in the KNE site include English ivy (*Hedera helix*), Cape ivy (*Senecio angulatus*), banana passionfruit (*Passiflora* spp), climbing asparagus (*Asparagus scandens*), briar rose (*Rosa rubiginosa*), boneseed, karo, boxthorn, pampas (*Cortaderia selloana*) and tradescantia (*Tradescantia fluminensis*). A full list of ecological weed species found in the KNE site, along with the current management approach for each is contained in Appendix 5.

KiwiRail contractors control weeds within 5 m of the rail track centre line to provide a clear transport corridor. In the course of this work they control ecological weed species such as English ivy, Cape ivy, boxthorn, and periwinkle (*Vinca major*) which supports biodiversity work within the KNE site. Unfortunately neither KiwiRail nor NZTA control pampas plants located beside the rail line or the state highway. NUKP volunteers undertake some control of pampas alongside the state highway. But some support from the agencies in controlling this species would help protect the KNE site further.

## 9.2. Pest animal control

The aim of pest animal control at the KNE site is to improve the condition of the native plant communities present, protect and increase rare and threatened native plants and to enhance the potential for natural regeneration to occur across the KNE site by reducing the browsing of pest animals; and to protect native birds, lizards and invertebrates from being preyed on by pest animals. A further aim for Greater Wellington and KCDC is to support NUKP in its efforts to manage pest animals in the KNE site.

NUKP has developed a comprehensive pest animal control programme within and beyond the bounds of the KNE site. NUKP's 2018-21 pest animal control plan<sup>22</sup> describes in detail its current objectives and approaches to pest animal control. The pest animal control that is undertaken under that plan works towards all of the aims and objectives of this KNE operational plan.

Following is a brief summary of the pest control undertaken by NUKP under its pest animal control plan<sup>23</sup>.

Possoms are controlled in most of the forested areas of the KNE site (the forest remnants and patches of established regenerating bush) through trapping using Timms and AT220 traps and annual baiting using bait stations. Rats are controlled through networks of closely spaced traps and bait stations within two priority sections of this area; the advanced regenerating bush of A T Clarke Reserve and adjacent areas, and the forest remnant known as "the ecosite", (operational areas C and D in Map 6, Appendix 1). More intensive control of rats and mice is undertaken using traps and bait stations within two other areas (operational areas E and F). This control is aimed at protecting populations of lizards that research has shown are present in these locations. Mustelids are controlled across the whole KNE site through the use of a range of traps.

Greater Wellington support NUKP's pest animal control activities by undertaking an annual audit of the trap and bait station networks and by providing training to new volunteers. The aim of the audit and training is to check that the traps and bait stations are working effectively and are safe to operate, and that volunteers are operating them using best practice methods.



Greater Wellington also provides the bait required for NUKP pest control activities.

Under Greater Wellington's Regional Possum Predator Control Programme (RPPCP), approximately 300 poison bait stations are operated on farmland adjacent to the KNE site. This programme aims to reduce the numbers of pest animals to a residual trap catch of 5% or lower in the wider landscape. This programme provides benefits to the KNE site by preventing possum reinvasion. NUKP also operates traps and bait stations in adjacent areas to the north and west of the KNE site which will also be reducing reinvasion of possums into the KNE site.

### 9.3. Monitoring

The aim of monitoring at the KNE site is to assess the effectiveness of pest animal control actions and to gain better knowledge of the native and exotic species present in the KNE site. NUKP has been undertaking monitoring of rodent populations within operational areas C and D since November 2015. Currently monitoring is undertaken twice yearly but this is likely to be reduced in time.

NUKP undertakes other ecological monitoring from time to time, including:

- Annual bird monitoring
- Lizard surveys
- Casual monitoring of wētā houses
- Motion camera sensing

More detail of monitoring undertaken by NUKP can be found in NUKP's pest control plan<sup>24</sup>.

### 9.4. Revegetation

The aim of revegetation work at the KNE site is to enhance the natural regeneration of native plant communities, improve native plant dominance and increase populations of rare or threatened native plant species that would have historically been present in the KNE site.

All revegetation activities within the KNE site are undertaken by NUKP volunteers. Since 1997, Ngā Uruora has grown well over 50,000 plants and planted them in many different locations on Paekākāriki Escarpment. During this time NUKP members have built up considerable knowledge of which native species grow best in the severe coastal conditions and how to successfully establish trees on the escarpment, including managing factors such as selection of planting sites, supply of ground water, exposure to sun and wind, soil characteristics, steepness of slope, planting methods and follow-up<sup>25</sup>.

NUKP volunteers currently plant about one thousand native plants annually, using only eco-sourced plants. They use the following strategic approaches to guide revegetation activities:

- Plant along the stream corridor to shade the stream and improve the native riparian habitat
- Plant around the quarry to improve habitat for native species including lizards

- Undertake “enrichment planting” in carefully selected sites using secondary species
- Plant appropriate rare or threatened species
- For ease of access and management, plant in the vicinity of the walking track and within about a kilometre of the main access points at each end of the KNE site.

## 9.5. Fencing

The aim of maintaining secure boundary fences of the KNE site is to improve the condition and dominance of the native plant communities, enhance the potential for natural regeneration of native coastal habitat across the landscape, and protect and increase populations of rare and threatened native plant species by preventing stock from accessing the KNE site.

There are sections of the boundary fence that separates the KNE site from adjacent farm land that are degraded and are therefore allowing sheep to enter the KNE site on a regular basis. The neighbouring farmer occasionally musters sheep out of the site, however it is clear from the condition of them that some sheep remain resident for prolonged periods.

NUKP, QEII Trust, Greater Wellington, KiwiRail and the neighbouring farmer will work together to find solutions to sheep accessing and residing in the KNE site. Currently weak sections of fence are being progressively repaired. However a more comprehensive approach to fence renewal and maintenance is required to provide adequate security.

## 10. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Paekākāriki Escarpment KNE site, and their timing and cost over the five-year period from 1 July 2021 to 30 June 2026. The budget for years 2022/23 to 2025/26 are indicative only and subject to change. Maps of operational areas can be found in Appendix 1 (see Maps 5 and 6).

**Table 2: Five-year operational plan for the Paekākāriki Escarpment KNE site**

Objective	Activity / Actions	Operational area	Intended outcome	Implementing party	Timetable and resourcing where allocated				
					2021/22	2022/23	2023/24	2024/25	2025/26
1, 2, 5	Control highly invasive ecological weeds focusing on protecting mature forest	A	Remnant forest and regenerating bush are protected	KCDC	\$3,000	\$3,060	\$3,120	\$3,180	\$3,240
1, 2, 5	Control ecological weeds, focusing on: <ul style="list-style-type: none"> <li>Controlling climbers</li> <li>Controlling woody weeds that could transform the habitat</li> <li>Controlling highly invasive climbers and ground covers</li> </ul>	<p>Within and on the edges of blocks of forest and bush in B</p> <p>Primarily B, plus southern parts of A at times</p> <p>Primarily B, plus southern parts of A at times</p>	<p>Remnant forest and regenerating bush are protected</p> <p>The habitat is not dominated by woody weeds</p> <p>Highly invasive climbers and ground covers don't become established or more dominant than they currently are</p>	Greater Wellington Biosecurity department	\$10,000	\$10,160	\$10,320	\$10,480	\$10,640

Objective	Activity / Actions	Operational area	Intended outcome	Implementing party	Timetable and resourcing where allocated				
					2021/22	2022/23	2023/24	2024/25	2025/26
1, 2	Control ecological weeds focusing on the most invasive species and protecting the most valuable areas of habitat such as bush blocks and lizard habitat.	A, B	Higher valued habitat is protected from transformation by ecological weeds	NUKP (volunteer labour and contractors)	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500
1, 2, 3, 4, 5	Control possums, mustelids, rats and mice by regularly servicing traps and bait stations	A, B	Low levels of pest animals in targeted areas (see NUKP Animal Pest Control Operational Plan <sup>26</sup> for details of targets)	NUKP	Nil (volunteer labour)	Nil (volunteer labour)	Nil (volunteer labour)	Nil (volunteer labour)	Nil (volunteer labour)
1, 2, 3, 4, 5	Provide bait for pest animal control activities	A, B	As above. NUKP's volunteer efforts are supported.	Greater Wellington Biosecurity department	\$1,650	\$1,680	\$1,720	\$1,750	\$1,780
1, 2, 3, 4, 5	Undertake annual safety audit of the pest animal control network and provide volunteer training when required	A, B	No injuries occur as a result of operating traps or bait stations, and the control remains effective	Greater Wellington Biosecurity department	\$1,500	\$1,530	\$1,560	\$1,590	\$1,620
1, 2, 4	Undertake various ecological monitoring activities as capacity and resources allow, including rodent monitoring, bird counts and lizard surveys	A, B	Information is gained that can help inform management decision making	NUKP (volunteer labour)	*	*	*	*	*
2, 3	Grow and plant about 1,000 native plants per year	A	Accelerated regeneration and dominance of native habitat and increased abundance of rare and threatened plant species	NUKP (volunteer labour)	*	*	*	*	*

Objective	Activity / Actions	Operational area	Intended outcome	Implementing party	Timetable and resourcing where allocated				
					2021/22	2022/23	2023/24	2024/25	2025/26
1, 2, 3, 4, 5	Repair weak sections of boundary fences. Find comprehensive long term solution to preventing sheep from accessing KNE site.	A, B	Stock are excluded from the KNE site	NUKP, QEII Trust, KiwiRail & the neighbouring farmer, with support from Greater Wellington Biodiversity department	*	*	*	*	*
<b>Total annual funding</b>					<b>\$18,650</b>	<b>\$18,930</b>	<b>\$19,220</b>	<b>\$19,500</b>	<b>\$19,780</b>

\*The cost of materials for these activities cannot be quantified at this time

## 11. Funding contributions

### 11.1. Budget allocated by Greater Wellington

The budget for the years 2022/23 to 2025/26 are indicative only and subject to change.

**Table 3: Greater Wellington allocated budget for the Paekākāriki Escarpment KNE site**

Management activity	Timetable and resourcing				
	2021/2022	2022/23	2023/24	2024/25	2025/26
Ecological weed control	\$10,000	\$10,160	\$10,320	\$10,480	\$10,640
Pest animal control	\$2,600	\$2,650	\$2,710	\$2,760	\$2,810
<b>Total</b>	<b>\$12,600</b>	<b>\$12,810</b>	<b>\$13,030</b>	<b>\$13,240</b>	<b>\$13,450</b>

### 11.2. Budget allocated by Kāpiti Coast District Council

The budget is subject to confirmation through Kāpiti Coast District Council's ten-year planning process.

**Table 4: Kāpiti Coast District Council allocated budget for the Paekākāriki Escarpment KNE site**

Management activity	Timetable and resourcing				
	2021/2022	2022/23	2023/24	2024/25	2025/26
Ecological weed control	\$3,000	\$3,060	\$3,120	\$3,180	\$3,240
Pest animal control	\$550	\$560	\$570	\$580	\$590
<b>Total</b>	<b>\$3,550</b>	<b>\$3,620</b>	<b>\$3,690</b>	<b>\$3,760</b>	<b>\$3,830</b>

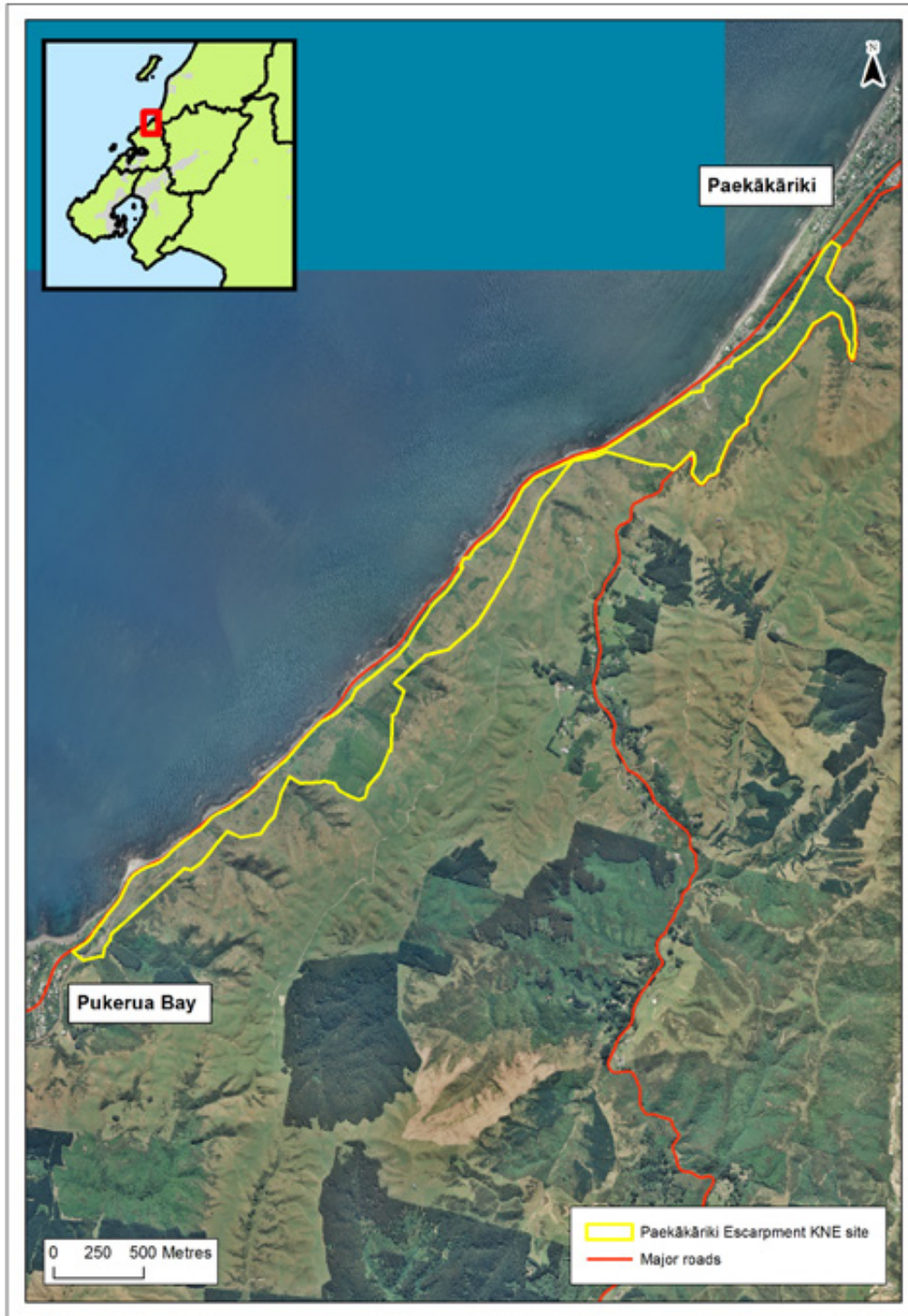
### 11.3 Budget allocated by Ngā Uruora Kāpiti Project

The budget is subject to successful applications to funding bodies.

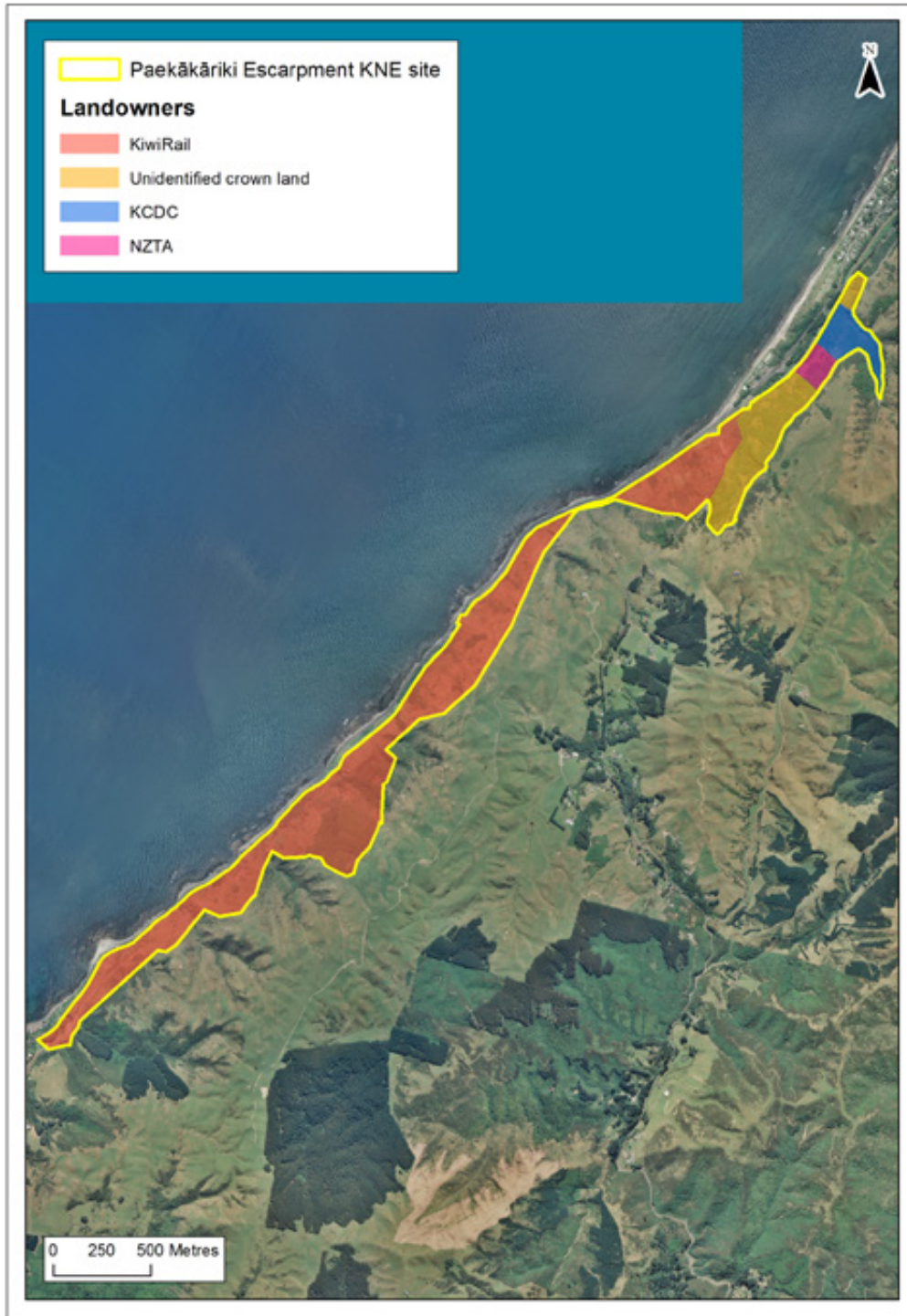
**Table 5: Ngā Uruora Kāpiti Project allocated budget for the Paekākāriki Escarpment KNE site**

Management activity	Timetable and resourcing				
	2021/2022	2022/23	2023/24	2024/25	2025/26
Ecological weed control	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500
<b>Total</b>	<b>\$2,500</b>	<b>\$2,500</b>	<b>\$2,500</b>	<b>\$2,500</b>	<b>\$2,500</b>

## Appendix 1: Site maps



Map 1: The Paekākāriki Escarpment KNE site boundary



Map 2: Land ownership in the Paekākāriki Escarpment KNE site





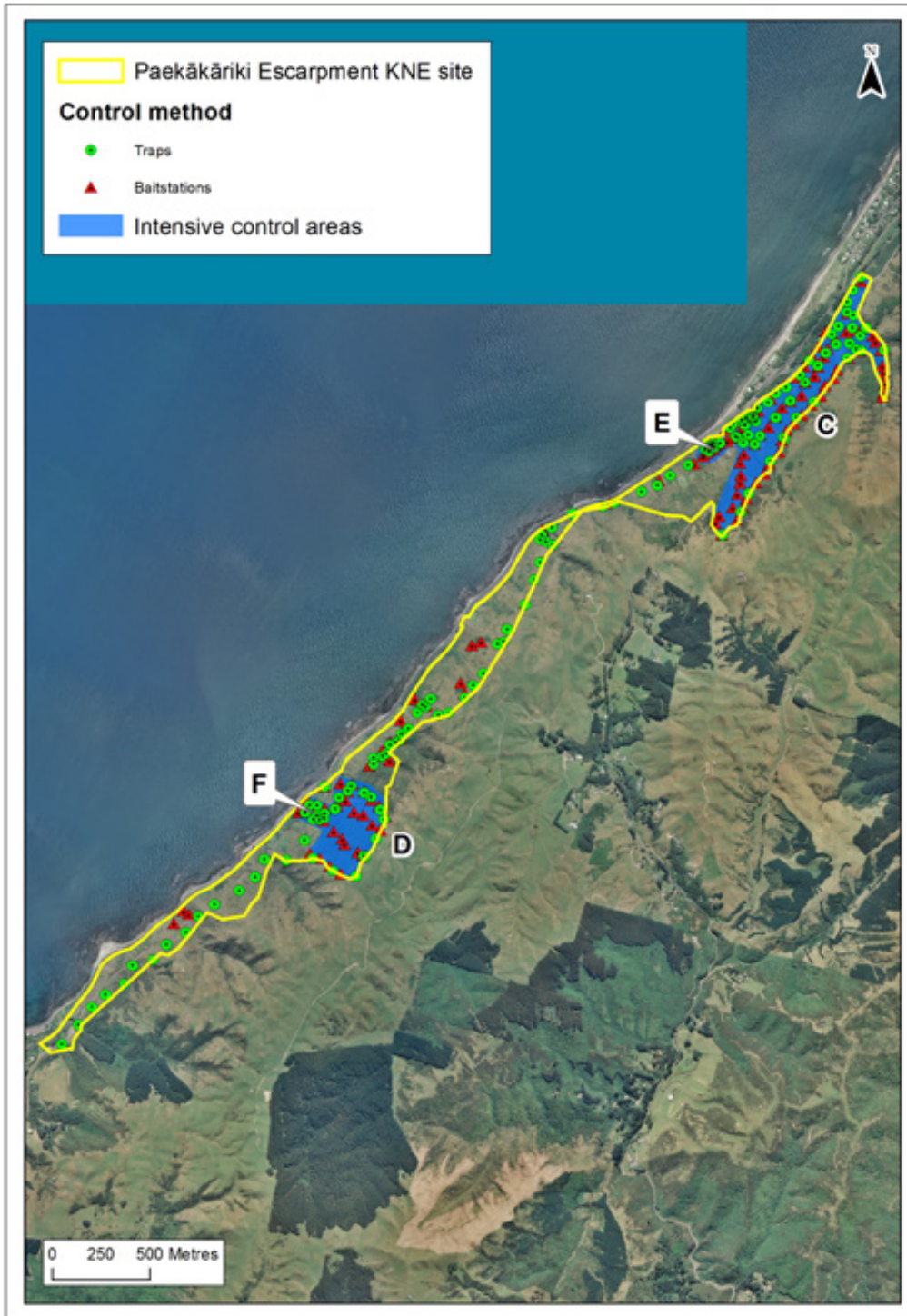
Map 3: Singers and Rogers classification of pre-human vegetation types for the Paekākāriki Escarpment KNE site



Map 4: Land Environment New Zealand threat classifications for the Paekākāriki Escarpment KNE site



Map 5: Operational areas in the Paekākāriki Escarpment KNE site



Map 6: Pest animal control in the Paekākāriki Escarpment 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 cycle<sup>27</sup>. Species are regarded as Threatened if they are classified as Nationally Critical, Nationally Endangered or Nationally Vulnerable. They are regarded as At Risk if they are classified as Declining, Recovering, Relict or Naturally Uncommon. The following table lists Threatened and At Risk species that are resident in, or regular visitors to, the Paekākāriki Escarpment KNE site.

**Table 6: Threatened and At Risk species at the Paekākāriki Escarpment KNE site**

Scientific name	Common name	Threat status	Observation
Plants (vascular) <sup>28</sup>			
<i>Aciphylla squarrosa</i>	Spaniard/speargrass	At Risk - Declining	Paul Callister <sup>29</sup> (P)
<i>Anemanthele lessoniana</i>	Gossamer grass	At Risk - Relict	Paul Callister (P)
<i>Atriplex cinerea</i>	Grey salt bush	Threatened – Nationally Critical	Paul Callister (P)
<i>Coprosma acerosa</i>	Sand coprosma	At Risk - Declining	Paul Callister (P)
<i>Discaria toumatou</i>	Matagouri	At Risk - Declining	Paul Callister (P)
<i>Geranium solanderi</i>	Solander's geranium	At Risk - Declining	Wellington Botanical Society and Ngā Uruora, 2015 <sup>30</sup>
<i>Melicytus crassifolius</i>	Thick-leaved mahoe	At Risk - Declining	Wellington Botanical Society and Ngā Uruora, 2011 <sup>31</sup>
<i>Melicytus orarius</i>		At Risk - Declining	Paul Callister (P)
<i>Sonchus kirkii</i>	Puha/New Zealand sow thistle	At Risk - Declining	Wellington Botanical Society and Ngā Uruora, 2011
<i>Sophora molloyi</i>	Cook Strait kowhai	At Risk – Naturally Uncommon	Paul Callister (P)
<i>Streblus banksia</i>	Turepo/large-leaved milk tree	At Risk - Relict	Matt Ward <sup>32</sup>
Birds <sup>33</sup>			
<i>Falco novaeseelandiae ferox</i>	New Zealand falcon	At Risk - Recovering	McArthur 2021 <sup>34</sup>
<i>Haematopus unicolor</i>	Variable oystercatcher	At Risk - Recovering	McArthur 2021
<i>Phalacrocorax varius varius</i>	Pied shag	At Risk - Recovering	McArthur 2021

Scientific name	Common name	Threat status	Observation
Reptiles <sup>35</sup>			
<i>Oligosoma zelandicum</i>	Glossy brown skink	At Risk - Declining	Ngā Uruora, 2018 <sup>36</sup>

(P) = species planted as part of restoration planting

### Appendix 3: Regionally threatened plant species list

The following table lists regionally threatened species that have been recorded in the Paekākāriki Escarpment KNE site.

**Table 7: Regionally threatened species recorded in the Paekākāriki Escarpment KNE site**

Scientific name	Common name	Regional threat status	Observation
Plants <sup>37</sup>			
<i>Aciphylla squarrosa</i>		Vulnerable	Paul Callister <sup>38</sup> (P)
<i>Anemanthele lessoniana</i>	Gossamer grass	Endangered	Paul Callister (P)
<i>Anthrosachne solandri</i>	Native wheatgrass	Endangered	Paul Callister (P)
<i>Atriplex cinerea</i>	Grey salt bush		Paul Callister (P)
<i>Clematis afoliata</i>	Leafless clematis	Naturally Uncommon	Paul Callister (P)
<i>Coprosma acerosa</i>	Sand coprosma	Declining	Paul Callister (P)
<i>Discaria toumatou</i>	Matagouri	Endangered	Paul Callister (P)
<i>Geranium solanderi</i>	Solander's geranium	Data Deficient	Wellington Botanical Society and Ngā Uruora, 2015 <sup>39</sup>
<i>Melicytus crassifolius</i>	Thick-leaved mahoe	Declining	Wellington Botanical Society and Ngā Uruora, 2011 <sup>40</sup>
<i>Melicytus orarius</i>		Critical	Paul Callister (P)
<i>Scandia geniculata</i>	Scandia	Naturally Uncommon	Paul Callister (P)
<i>Sonchus kirkii</i>	Puha/New Zealand sow thistle	Declining	Wellington Botanical Society and Ngā Uruora, 2011
<i>Sophora molloyi</i>	Cook Strait kowhai	Critical	Paul Callister (P)
<i>Streblus banksia</i>	Turepo/large-leaved milk tree	Relict	Matt Ward <sup>41</sup>
<i>Veronica elliptica</i>	Kokomuka/shore hebe	Naturally Uncommon	Paul Callister (P)
Birds <sup>42</sup>			
<i>Falco novaeseelandiae ferox</i>	New Zealand falcon	Regionally Critical	McArthur 2021 <sup>43</sup>
<i>Haematopus unicolor</i>	Variable oystercatcher	Regionally Vulnerable	McArthur 2021
<i>Hemiphaga novaeseelandiae</i>	New Zealand pigeon	At Risk - Recovering	McArthur 2021
<i>Phalacrocorax varius varius</i>	Pied shag	Regionally Vulnerable	McArthur 2021

Scientific name	Common name	Regional threat status	Observation
Lizards <sup>44</sup>			
<i>Oligosoma aeneum</i>	Copper skink	Threatened - Critical	Ngā Uruora, 2018 <sup>45</sup>
<i>Oligosoma zelandicum</i>	Glossy brown skink	At Risk - Declining	Ngā Uruora, 2018

(P) = species planted as part of restoration planting



## Appendix 4: Threat table

The following table lists all known threats to the Queen Elizabeth Park KNE site, detailing which operational areas they affect, how each threat impacts on ecological values, and whether they will be addressed by operational activities.

**Table 8: Summary of all threats to ecological values present in the Paekākāriki Escarpment 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 ground covering ecological weed species at the KNE site include periwinkle ( <i>Vinca major</i> ) and tradescantia ( <i>Tradescantia fluminensis</i> ) (see full list in Appendix 4)	Patches throughout
EW-2	Woody ecological weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species at the KNE site include boneseed ( <i>Chrysanthemoides monilifera</i> ), boxthorn ( <i>Lycium ferocissimum</i> ), brush wattle ( <i>Paraserianthes lophantha</i> ) and the non-local native species karo ( <i>Pittosporum crassifolium</i> ) (see full list in Appendix 4)	Widespread
EW-3	Climbing ecological weeds smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition. Key climbing ecological weed species at the KNE site include English ivy ( <i>Hedera helix</i> ), German ivy ( <i>Senecio mikanooides</i> ), cape ivy ( <i>Senecio angulatus</i> ), banana passionfruit ( <i>Passiflora</i> spp), and climbing asparagus ( <i>Asparagus scandens</i> ) (see full list in Appendix 4)	Widespread
Pest animals		
PA-1	Possums ( <i>Trichosurus vulpecula</i> ) browse palatable canopy vegetation until it can no longer recover <sup>46,47</sup> . This destroys the forest's structure, diversity and function. Possums may also prey on native birds and invertebrates <sup>48</sup>	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 <sup>49,50</sup>	Entire KNE site
PA-3	Mustelids (stoats <sup>51,52</sup> ( <i>Mustela erminea</i> ), ferrets <sup>53,54</sup> ( <i>M. furo</i> ) and weasels <sup>55,56</sup> ( <i>M. nivalis</i> )) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions	Entire KNE site
PA-4	Hedgehogs ( <i>Erinaceus europaeus</i> ) prey on native invertebrates <sup>57</sup> , lizards <sup>58</sup> and the eggs <sup>59</sup> and chicks of ground-nesting birds <sup>60</sup>	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
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 <sup>61,62</sup>	Entire KNE site
PA-6*	Pest and domestic cats ( <i>Felis catus</i> ) prey on native birds <sup>63</sup> , lizards <sup>64</sup> and invertebrates <sup>65</sup> , reducing native fauna breeding success and potentially causing local extinctions <sup>66</sup>	Entire KNE site
PA-7*	Rabbits ( <i>Oryctolagus cuniculus</i> ) and hares ( <i>Lepus europaeus</i> ) graze on palatable native vegetation and prevent natural regeneration in some environments <sup>67</sup> .	Entire KNE site
PA-8*	Wasps ( <i>Vespula</i> spp.) adversely impact native invertebrates and birds through predation and competition for food resources. They also affect nutrient cycles in beech forests <sup>68</sup>	Entire KNE site
PA-9*	Eastern rosella ( <i>Platycercus eximius</i> ) parakeets are known to out-compete native red-crowned parakeets for nest-sites and are a vector of avian diseases. The continued presence of eastern rosella in the KNE site could limit the ability of red crowned parakeets to establish functional populations <sup>69,70</sup>	Entire KNE site
Human activities		
HA-1*	Garden waste dumping often leads to ecological weed invasions into natural areas. Common weed species introduced at this KNE site include <i>Pelargonium</i> sp.	Northern edges adjacent to Paekākāriki Hill Road
HA-2	Agricultural practices, particularly sheep incursions from neighbouring farms through weak points in boundary fences, can result in grazing of native vegetation inhibiting regeneration, wildlife disturbance and increasing nutrient content of soils and watercourses <sup>71</sup>	Entire KNE site
HA-3*	Slipping of walking track formations can cause damage to plant communities and habitats, and sediment run off	Te Araroa Walkway
Other threats		
OT-1	Small forest remnants such as those in the KNE site are effected by environmental impacts on their edges such as changing environmental conditions (eg. soil moisture or temperature levels), changing physical environment (eg. different plant assemblages compared to the interior) and changing species interactions (eg. increased predation by invasive species) <sup>72,73</sup>	Isolated forest remnants

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

## Appendix 5: Ecological weed species

The following table lists key ecological weed species that have been recorded in the Paekākāriki Escarpment KNE site. The distribution and density of individual species within the KNE site is recorded. 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.

**Table 9: Ecological weed species recorded in the Paekākāriki Escarpment KNE site**

Scientific Name	Common Name	Distribution and density	Current management
<i>Acacia mearnsii</i>	Black wattle	Localised and sparse	Suppression
<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	Agapanthus	Localised and sparse	Suppression
<i>Allium triquetrum</i>	Onion weed	Patchy and abundant	No action
<i>Alnus glutinosa</i>	Alder	Localised and sparse	Total control
<i>Asparagus scandens</i>	Climbing asparagus	Localised and sparse	Suppression
<i>Calystegia silvatica</i>	Convolvulus	Patchy and abundant	No action
<i>Carpobrotus edulis</i>	Ice plant	Localised and sparse	No action
<i>Chamaecytisus prolifer</i>	Tree lucerne	Patchy and abundant	No action
<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	Boneseed	Widespread and sparse	Suppression
<i>Clematis vitalba</i>	Old man's beard	Localised and sparse	Total control
<i>Cortaderia selloana</i>	Pampas	Localised and sparse	Total control
<i>Corynocarpus laevigatus</i> *	Karaka	Patchy and dense	Suppression (mature trees not controlled as these might be taonga)
<i>Crocosmia</i> × <i>crocosmiiflora</i>	Montbretia	Localised and abundant	No action
<i>Cyperus eragrostis</i>	Umbrella sedge	Localised and sparse	Total control
<i>Cytisus scoparius</i>	Broom	Patchy and sparse	No action
<i>Hedera helix</i>	English Ivy	Patchy and dense	Suppression
<i>Ipomoea indica</i>	Morning glory	Localised and sparse	Total control
<i>Lathyrus latifolius</i>	Everlasting pea	Patchy and sparse	No action
<i>Lilium formanosum</i>	Formosan lily	Localised and sparse	No action

Scientific Name	Common Name	Distribution and density	Current management
<i>Lonicera japonica</i>	Japanese Honeysuckle	Localised and sparse	Total control
<i>Lupinus arboreus</i>	Tree lupin	Localised and sparse	No action
<i>Lycium ferocissimum</i>	Boxthorn	Patchy and abundant	Suppression
<i>Metrosideros excels</i> *	Pōhutukawa	Patchy and abundant	Suppression
<i>Paraserianthes lophantha</i>	Brush wattle	Patchy and sparse	Suppression
<i>Passiflora</i> sp.	Banana passionfruit	Localised and sparse	Total control
<i>Pelargonium</i> sp.	Geranium	Patchy and dense	Suppression
<i>Pennisetum clandestinium</i>	Kikuyu grass	Patchy and dense	No action
<i>Pinus</i> spp.	Pine	Localised and sparse	Total control
<i>Pittosporum crassifolium</i> *	Karo	Widespread and abundant	Suppression
<i>Rosa rubiginosa</i>	Briar rose	Patchy and dense	Suppression
<i>Rubus fruticosus</i> agg.	Blackberry	Patchy and abundant	Suppression
<i>Rumex sagittatus</i>	Climbing dock	Widespread and abundant	No action
<i>Senecio angulatus</i>	Cape ivy	Localised and sparse	Total control
<i>Senecio mikanioides</i>	German ivy	Patchy and abundant	Suppression
<i>Tradescantia fluminensis</i>	Tradescantia	Patchy and dense	Suppression
<i>Tropaeolum majus</i>	Nasturtium	Localised and dense	No action
<i>Ulex europaeus</i>	Gorse	Widespread and abundant	No action
<i>Vinca major</i>	Periwinkle	Patchy and dense	No action

\* Denotes a New Zealand native plant that is not local to the KNE site

## References

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- <sup>1</sup> New Zealand legislation. 1991. Resource Management Act 1991.
- <sup>2</sup> Greater Wellington Regional Council. Greater Wellington Regional Council Long Term Plan: 2018 – 2028.
- <sup>3</sup> Greater Wellington Regional Council. 2019. Proposed Natural Resources Plan for the Wellington Region.
- <sup>4</sup> Greater Wellington Regional Council. 2019. Greater Wellington Regional Pest Management Plan 2019–2039. GW/BIO-G-2019/74
- <sup>5</sup> Greater Wellington Regional Council. 2016. Greater Wellington Regional Council Biodiversity Strategy. <http://www.gw.govt.nz/assets/council-publications/Biodiversity-Strategy-2016.pdf>
- <sup>6</sup> Ngā Uruora Trust. 2011. Ngā Uruora-Kāpiti Project Trust Strategic Plan.
- <sup>7</sup> Kāpiti Coast District Council. 1999. Kāpiti Coast District Plan Heritage Register E: Ecological Sites (areas of significant indigenous vegetation and significant habitats of indigenous flora).
- <sup>8</sup> Greater Wellington Regional Council. 2019. Proposed Natural Resources Plan for the Wellington Region. Te Tikanga Taiao o Te Upoko o te Ika a Maui. P. 369.
- <sup>9</sup> Kāpiti Coast District Council. 1999. Kāpiti Coast District Plan. Part I. Heritage Register. E. Ecological Sites.
- <sup>10</sup> Porirua City Council. 2020. Proposed District Plan. Part 4. Schedule 7 – Significant Natural Areas.
- <sup>11</sup> Singers NJD, Rogers GM. 2014. A classification of New Zealand's terrestrial ecosystems. Science for Conservation No. 325. Department of Conservation, Wellington. 87 p.
- <sup>12</sup> Singers N, Crisp P, Spearpoint O. 2018. Forest ecosystems of the Wellington Region.
- <sup>13</sup> Walker S, Cieraad E, Grove P, Lloyd K, Myers S, Park T, Porteous T. 2007. Guide for users of the threatened environment classification, Version 11, August 2007. Landcare Research New Zealand. 34p plus appendix.
- <sup>14</sup> New Zealand Threat Classification System (NZTCS) <http://www.doc.govt.nz/about-us/science-publications/conservation-publications/nz-threat-classification-system/>
- <sup>15</sup> McEwen MW (compiler) 1987. Ecological Regions and Districts of New Zealand. *New Zealand Biological Resources Centre Publication No. 5*. Department of Conservation, Wellington.
- <sup>16</sup> Wassilieff M. 2010. Vegetation of Paekākāriki – Pukerua Escarpment Ecoforest. Report for Ngā Uruora. 25p.
- <sup>17</sup> Ngā Uruora Trust. 2011. Ngā Uruora-Kāpiti Project Trust Strategic Plan.
- <sup>18</sup> Wellington Botanical Society and Ngā Uruora. 2011. Paekākāriki-Pukerua Escarpment, Kāpiti Coast – “Ecoforest” and Wellington Botanical Society and Ngā Uruora. 2015. Kohekohe Loop Track, Paekākāriki-Pukerua Bay Escarpment, Kāpiti Coast.
- <sup>19</sup> McArthur N. 2021. Threatened bird species in the KNE programme. Unpublished report for Greater Wellington Regional Council.
- <sup>20</sup> Ngā Uruora. 2018. Lizard Survey of the Paekākāriki-Pukerua Bay Escarpment, Year Two (2018).
- <sup>21</sup> Department of Conservation. 2020. Herpetofauna Database.
- <sup>22</sup> Ngā Uruora Kāpiti Project. 2018. Ngā Uruora animal pest control operational plan 2018-2021.
- <sup>23</sup> Ngā Uruora Kāpiti Project. 2018. Ngā Uruora animal pest control operational plan 2018-2021.
- <sup>24</sup> Ngā Uruora Kāpiti Project. 2018. Ngā Uruora animal pest control operational plan 2018-2021.
- <sup>25</sup> Ngā Uruora Committee. 2013. Perkins farm Escarpment Revegetation, Ngā Uruora Concept Plan.
- <sup>26</sup> Ngā Uruora Kāpiti Project. 2018. Ngā Uruora animal pest control operational plan 2018-2021.
- <sup>27</sup> Department of Conservation. 2008. New Zealand Threat Classification System manual.
- <sup>28</sup> de Lange PJ, Rolfe JR, Barkla JW, Courtney SP, Champion PD, Perrie LR, Beadel SM, Ford KA, Breitwieser I, Schönberger I, Hindmarsh-Walls R, Heenan PB and Ladley K. 2017. Conservation status of New Zealand indigenous vascular plants, New Zealand Threat Classification Series 22. 82 p.
- <sup>29</sup> Callister P, Nga Uruora, pers comm, 2021.
- <sup>30</sup> Wellington Botanical Society and Ngā Uruora. 2015. Kohekohe Loop Track, Paekākāriki-Pukerua Bay Escarpment, Kāpiti Coast.
- <sup>31</sup> Wellington Botanical Society and Ngā Uruora. 2011. Paekākāriki-Pukerua Escarpment, Kāpiti Coast – “Ecoforest”.
- <sup>32</sup> Ward M, pers comm 2011

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- <sup>33</sup> Robertson HA, Baird K, Dowding JE, Elliot GP, Hitchmough RA, Miskelly CM, McArthur N, O'Donnell CFJ, Sagar PM, Scofield P, Taylor GA. 2017. Conservation status of New Zealand birds, 2016. New Zealand Threat Classification Series 19.
- <sup>34</sup> McArthur N. 2021. Threatened birds species in the KNE programme. Unpublished report for Greater Wellington Regional Council.
- <sup>35</sup> Hitchmough R, Barr B, Lettink M, Monks J, Reardon J, Tocher M, Van Winkel D, Rolfe J. 2016. Conservation status of New Zealand reptiles, 2015. New Zealand Threat Classification Series 17. 14 p.
- <sup>36</sup> Ngā Uruora. 2018. Lizard Survey of the Paekākāriki-Pukerua Bay Escarpment, Year Two (2018).
- <sup>37</sup> Crisp P. 2020. Conservation status of indigenous vascular plant species in the Wellington region. Greater Wellington Region Council. GW/ESCI-G-20/20.
- <sup>38</sup> Callister P, Nga Uruora, pers comm 2021.
- <sup>39</sup> Wellington Botanical Society and Ngā Uruora. 2015. Kohekohe Loop Track, Paekākāriki-Pukerua Bay Escarpment, Kāpiti Coast.
- <sup>40</sup> Wellington Botanical Society and Ngā Uruora. 2011. Paekākāriki-Pukerua Escarpment, Kāpiti Coast – “Ecoforest”.
- <sup>41</sup> Ward M, pers comm 2011.
- <sup>42</sup> Crisp P. 2020. Conservation status of native bird species in the Wellington region. Greater Wellington Regional Council, Publication No. GW/ESCI-G-20/75, Wellington.
- <sup>43</sup> McArthur N. 2021. Threatened bird species in the KNE programme. Unpublished report for Greater Wellington Regional Council.
- <sup>44</sup> Crisp P. 2020. Conservation status of lizard species in the Wellington region. Greater Wellington Regional Council, Publication No. WRC/ESCI-G-20/2, Wellington.
- <sup>45</sup> Ngā Uruora. 2018. Lizard Survey of the Paekākāriki-Pukerua Bay Escarpment, Year Two (2018).
- <sup>46</sup> Pekelharing CJ, Parkes JP, Barker RJ. 1998. Possum (*Trichosurus vulpecula*) densities and impacts on fuchsia (*Fuchsia excorticata*) in South Westland, New Zealand. *New Zealand Journal of Ecology* 22(2): 197–203.
- <sup>47</sup> Nugent G, Sweetapple P, Coleman J, Suisted P. 2000. Possum feeding patterns. Dietary tactics of a reluctant folivore. In: Montague TL ed. *The brushtail possum: Biology, impact and management of an introduced marsupial*. Lincoln, Manaaki Whenua Press. Pp. 10–19.
- <sup>48</sup> Sweetapple PJ, Fraser KW, Knightbridge PI. 2004. Diet and impacts of brushtail possum populations across the invasion front in South Westland, New Zealand. *New Zealand Journal of Ecology* 28(1): 19–33.
- <sup>49</sup> Daniel MJ. 1973. Seasonal diet of the ship rat (*Rattus r. rattus*) in lowland forest in New Zealand. *Proceedings of the New Zealand Ecological Society* 20: 21–30.
- <sup>50</sup> Innes JG. 2005. Ship rat. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 187–203.
- <sup>51</sup> Murphy E, Maddigan F, Edwards B, Clapperton K. 2008. Diet of stoats at Okarito Kiwi Sanctuary, South Westland, New Zealand. *New Zealand Journal of Ecology* 32(1): 41–45.
- <sup>52</sup> King CM and Murphy EC. 2005. Stoat. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 261–287.
- <sup>53</sup> Ragg JR. 1998. Intraspecific and seasonal differences in the diet of feral ferrets (*Mustela furo*) in a pastoral habitat, east Otago, New Zealand. *New Zealand Journal of Ecology* 22(2): 113–119.
- <sup>54</sup> Clapperton BK, Byron A. 2005. Feral ferret. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 294–307.
- <sup>55</sup> King CM. 2005. Weasel. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 287–294.
- <sup>56</sup> King CM, Flux M, Innes JG, Fitzgerald BM. 1996. Population biology of small mammals in Pureora Forest Park: 1. Carnivores (*Mustela erminea*, *M. furo*, *M. nivalis* and *Felis catus*). *New Zealand Journal of Ecology* 20(2): 241–251.
- <sup>57</sup> Jones C, Sanders MD. 2005. European hedgehog. In: King CM ed. *The handbook of New Zealand mammals*. 2nd edition. Melbourne, Oxford University Press. Pp. 81–94.
- <sup>58</sup> Spitzen-van der Sluijs AM, Spitzen J, Houston D, Stumpel AHP. 2009. Skink predation by hedgehogs at Macraes Flat, Otago, New Zealand. *New Zealand Journal of Ecology* 33(2): 205–207.
- <sup>59</sup> Jones C, Moss K, Sanders M. 2005. Diet of hedgehogs (*Erinaceus europaeus*) in the upper Waitaki Basin, New Zealand. Implications for conservation. *New Zealand Journal of Ecology* 29(1): 29–35.
- <sup>60</sup> Jones C, Sanders MD. 2005. European hedgehog. In: King CM ed. *The handbook of New Zealand mammals*. 2nd edition. Melbourne, Oxford University Press. Pp. 81–94.

- 
- <sup>61</sup> Ruscoe WA, Murphy EC. 2005. House mouse. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 204–221.
- <sup>62</sup> Newman DG. 1994. Effect of a mouse *Mus musculus* eradication programme and habitat change on lizard populations on Mana Island, New Zealand, with special reference to McGregor's skink, *Cyclodina macgregori*. New Zealand Journal of Ecology 21: 443–456.
- <sup>63</sup> King CM, Flux M, Innes JG, Fitzgerald BM. 1996. Population biology of small mammals in Pureora Forest Park: 1. Carnivores (*Mustela erminea*, *M.furo*, *M.nivalis* and *Felis catus*). New Zealand Journal of Ecology 20(2): 241–251.
- <sup>64</sup> Reardon JT, Whitmore N, Holmes KM, Judd LM, Hutcheon AD, Norbury G, Mackenzie DI. 2012. Predator control allows critically endangered lizards to recover on mainland New Zealand. New Zealand Journal of Ecology 36(2): 141–150.
- <sup>65</sup> King CM, Flux M, Innes JG, Fitzgerald BM. 1996. Population biology of small mammals in Pureora Forest Park: 1. Carnivores (*Mustela erminea*, *M.furo*, *M.nivalis* and *Felis catus*). New Zealand Journal of Ecology 20(2): 241–251.
- <sup>66</sup> Gillies C, Fitzgerald BM. 2005. Feral cat. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 308–326.
- <sup>67</sup> Norbury G, Flux JEC. 2005. Brown hare. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 151–158.
- <sup>68</sup> Beggs JR. 2001. The ecological consequences of social wasps (*Vespula* spp.) invading an ecosystem that has an abundant carbohydrate resource. Biological Conservation 99: 17–28.
- <sup>69</sup> Wright D, Clout M 2001. The eastern rosella (*Platycercus eximius*) in New Zealand. DOC Science Internal Series 18.
- <sup>70</sup> Galbraith JA. 2013. Eastern rosella. In Miskelly, C.M. (ed.) New Zealand Birds Online. [www.nzbirdsonline.org.nz](http://www.nzbirdsonline.org.nz)
- <sup>71</sup> Smale MC, Dodd MB, Burns BR, Power IL. 2008. Long-term impacts of grazing on indigenous forest remnants on North Island hill country, New Zealand. New Zealand Journal of Ecology 32(1): 57–66.
- <sup>72</sup> Young A, Mitchell N. 1994. Microclimate and vegetation edge effects in a fragmented podocarp-broadleaf forest in New Zealand. Biological Conservation 67: 63–72.
- <sup>73</sup> Norton DA. 2002. Edge effects in a lowland temperate New Zealand rainforest. DOC Science Internal Series 27. Department of Conservation, Wellington.

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