

Key Native Ecosystem Operational Plan for Wi Tako Ngātata

2023-2028



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1. Purpose

The purpose of the five-year Key Native Ecosystem (KNE) Operational Plan for Wi Tako Ngātata 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 that will be undertaken (e.g., ecological weed control), and 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

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

The KNE programme funding is allocated for under the Greater Wellington Long Term Plan (2021-2031)², and it is managed in accordance with the Greater Wellington Biodiversity Strategy³ that sets a framework for how Greater Wellington protects and manages biodiversity in the Wellington region. Goal One of the Biodiversity Strategy - *Areas of high biodiversity value are protected or restored* - drives the delivery of the KNE Programme.

Other important drivers for the KNE programme include the Proposed Natural Resources Plan⁴ and the Regional Pest Management Plan 2019-2039⁵.

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 prioritized for management.

KNE sites are managed in accordance with five-year KNE plans prepared by Greater Wellington’s Environment Restoration team. 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 in table 1 below.

Table 1: Ecological significance criteria

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, i.e., 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 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 the resilience of the ecosystem is likely under some realistic level of management

4. Wi Tako Ngātata Key Native Ecosystem site

The Wi Tako Ngātata KNE site (153.5 ha) is comprised of a mix of mature lowland beech forest, regenerating mānuka-kamahi lowland scrub and a fen. The KNE site is located on a ridgeline spur off the Eastern Hills in Upper Hutt (see Appendix 1, Map 1).

There are two scenic reserves found within the site. These are Wi Tako Ngātata Scenic Reserve and Ecclesfield Scenic Reserve. Fendalton Recreation Reserve is also present within the site as well as Crown land administered by the Department of Corrections. The KNE site is boarded by suburban residential properties of Pinehaven on its western and northern boundaries and by Rimutuka prison in Trentham to the immediate east.

This KNE site is located within the Hutt valley's eastern hills which provide wildlife linkages between the KNE site and large forest blocks to the north (Akatarawa Forest), east (Pakuratahi Forest), and south (Wainuiomata/Orongorongo water collection area and East Harbour Northern Forest). The Wi Tako ridgeline is known to be of high ecological, scenic, and recreational value to the local area⁶.

Wi Tako Ngātata Scenic Reserve is named after the prominent Te Āti Awa leader, peacemaker and politician Wiremu (Wi) Tako Ngātata. Wi Tako Ngātata, once the Rangatira (chief) at Kumutoto pā in Wellington, also lived at pā sites in the Hutt Valley, Waikanae, and Ngauranga. Wi Tako Ngātata is recognized for playing a key role in the settlement of Wellington city and the wider region, including having a long and complicated involvement in negotiations between Māori and Pākehā in the 1800's⁷.

The scenic reserve was included as part of the cultural redress within the Treaty of Waitangi settlement process for Wellington-based iwi. Under the settlement legislation, the existing (scenic) reserve status was maintained, and the sites' natural values are to be protected, and public access to the site (as currently provided) should be retained, as well as existing third-party rights⁸.

Miss Isabel Ecclesfield bought the regenerating bush property now known as Ecclesfield reserve in 1919 because of her love of native forest. She maintained the property with help from her niece, Esther Mary North and a skilled bushman, Frank "Rangi" Herbert Phillips. Esther Mary North inherited the property and subsequently donated it to The Royal Forest and Bird Protection Society (F&B) in 1965⁹.

5. Parties involved

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

5.1. Landowners

The Wi Tako Ngātata KNE site has four landowners:

- Taranaki Whānui ki Te Upoko o Te Ika, represented by Port Nicholson Block Settlement Trust (PNBST), owns the Wi Tako Ngātata Scenic Reserve (59 ha)
- The Royal Forest and Bird Protection Society (F&B) owns Ecclesfield Scenic Reserve (5 ha) and manages it in accordance with the Ecclesfield Reserve Management Plan
- Upper Hutt City Council (UHCC) owns Fendalton Recreation Reserve (1.5 ha)
- The Department of Corrections (DoC) administer the remainder of the KNE site (88 ha) located on the north side of the main ridge.

In addition, GWRC funds and advises the landowners above on biodiversity management within the KNE site.

An unformed paper road exists along much of the western boundary of the KNE site and between Wi Tako Ngātata and Ecclesfield Scenic Reserves.

Land ownership boundaries are indicated on Appendix 1; Map 2.

5.2. Operational delivery

Within Greater Wellington, the Environment Restoration, Pest Animals, Pest Plants and Monitoring – Land, Ecosystems and Air teams are responsible for delivering the Wi Tako Ngātata KNE operational plan.

- The Environment Restoration team is the lead team for Greater Wellington on the longer-term planning and coordination of biodiversity management activities and advice within the KNE site
- The Pest Animals and Pest Plants teams coordinate and implement ecological weed and pest animal control measures at the KNE site with funding from the Environment Restoration team's KNE programme budget
- The Monitoring – Land, Ecosystems and Air team coordinates bird monitoring in conjunction with F&B Upper Hutt Branch volunteers. This is funded by Upper Hutt City Council.

F&B Upper Hutt Branch volunteers undertake revegetation plantings and work to maintain the track network within Ecclesfield Scenic Reserve. They also control pests by servicing the pest animal network throughout the KNE site.

5.3. Mana whenua partners

The Wi Tako Ngātata KNE site area is significant to Taranaki Whānui ki Te Upoko o Te Ika, who, represented by PNBST, are mana whenua partners with Greater Wellington.

PNBST are seeking opportunities for active involvement in the future management of their reserve. Greater Wellington is committed to identifying ways in which kaitiakitanga can be strengthened by exploring opportunities on how mana whenua partners wish to be involved in the KNE operational plan development or operational delivery of the KNE site.

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.

The KNE site lies across two ecological districts. The lower slopes are located within the Wellington Ecological District, while the upper slopes are within the Tararua Ecological District¹⁰. Both ecological districts are characterized by steep, strongly faulted hill ranges and have windy, wet, and mild climates¹¹.

6.1. Ecological designations

Table 2 below, lists ecological designations at all or part of the Wi Tako Ngātata KNE site.

Table 2: Designations at the Wi Tako Ngātata KNE site

Designation level	Type of designation
National	Parts of the KNE site are designated as scenic reserves. These are: * Wi Tako Scenic Reserve * Ecclesfield Scenic Reserve
District	A Part of the KNE site is designated as recreation reserve. This is: * Fendalton Recreational Reserve

6.2. Ecological significance

The Wi Tako Ngātata KNE site is of regional importance because:

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

Representativeness

The Singers and Rogers¹² classification of pre-human forest vegetation indicates the KNE site would likely have been comprised of mostly hard beech forest (MF20) and a small area of tawa, kamahi, podocarp forest (MF7). Only 24.1% of the original extent of MF7 and 54.4% of MF20 remains in the Wellington Region¹³ (see Appendix 1, Map 3).

The dominant species of these ecosystem types would have included tawa (*Beilschmiedia tawa*), kamahi (*Weinmannia racemosa*), and hard beech (*Nothofagus truncata*). Although the existing ecosystems are modified, having experienced selective logging, hunting and clearances, much of the KNE site is still representative of the original ecosystem types.

The Threatened Environment Classification system indicates that areas of lower slopes in the northern part of the KNE site are classified as Acutely Threatened, Chronically

Threatened or At Risk because there is only <10 – 30% native vegetation remaining on these types of land in New Zealand¹⁴ (see Appendix 1, Map 4).

Rarity/distinctiveness

This KNE site supports two plant species, three bird species, two lizard species and two fish species which are defined as ‘Threatened’ or ‘At risk’ under New Zealand’s national threat classification system. Appendixes 2 and 3 contain lists of nationally and regionally threatened species found within the KNE site.

The KNE site contains a small fen wetland. Wetlands are now considered an uncommon habitat type in the Wellington Region with less than 3% remaining of their original extent¹⁵.

Diversity

The KNE site contains inter-connected ecosystems including primary beech forest, regenerating secondary mānuka-kamahi scrub and a fen wetland area. Within these ecosystem types there has been noted a great amount of species diversity with numerous podocarp, broad-leaved, fern and orchid species recorded throughout the KNE site.

Ecological context

The KNE site is considered one of the most important reserves for native birds in Upper Hutt; it supports the most diverse native communities in the area with 20 native species recorded within the KNE site¹⁶.

The primary hard beech forest is not a Threatened¹⁷ ecosystem as 54.4% of the historic regional extent of this forest type remains. However, large intact tracts of forest, such as what is found within the Wi Tako Ngātata KNE site, are seldom found in a lowland, urban environment.

6.3. Ecological features

Vegetation communities and plants

The Singers and Rogers¹⁸ classification of pre-human vegetation indicates the Wi Tako Ngātata KNE site would have been characterised by hard beech forest (MF20) and tawa, kamahi, podocarp forest (MF7). Hard beech forest would have included black beech (*Fuscospora solandri*), kamahi (*Weinmannia racemose*), rimu (*Dacrydium cupressinum*), northern rātā (*Metrosideros robusta*), hīnau (*Elaeocarpus dentatus var. dentatus*), and rewarewa (*Knightia excelsa*). This type of species assemblage and forest mix is still evident today within the KNE site.

The primary hard beech – black beech forest has a canopy over 20 m with mature rimu, kahikatea (*Dacrycarpus dacrydioides*), tawa (*Beilschmiedia tawa*), and northern rātā. These are well represented throughout the KNE site with a well-developed shrub understory. The mānuka – kamahi secondary scrub areas are well developed with emergent trees such as rewarewa and tawa and other broad-leaved species¹⁹. The fen wetland land area contains a diverse variety of wetland and shrub species, most notable being *Gahnia rigida* which is considered uncommon in the Wellington region²⁰.

Other notable flora within the KNE site includes red mistletoe (*Peraxilla tetrapetala*), a Threatened species classified as At-Risk-Declining, and large numbers of native ferns,

orchids and sedges²¹. White mistletoe (*Tupeia antarctica*) has also been recorded at the site²².

Species

Birds

North Island rifleman/titipounamu (*Acanthisitta chloris*) and kākārīki (*Cyanoramphus novaezealandiae novaezealandiae*) are present within the KNE site. The KNE site appears to provide habitat for both these species which are struggling to re-establish in the landscape. Both species' populations appear to be small and at risk of local extinction²³.

Other notable bird species present include bellbird/korimako (*Anthornis melanura*), whitehead/pōpokotea (*Mohoua albicilla*) and tomtit/miromiro (*Petroica macrocephala*), along with more common indigenous forest birds such as fantail/pīwakawaka (*Rhipidura fuliginosa*), tūī (*Prothemadera novaeseelandiae*), silvereve/tauhou (*Zosterops lateralis*), kererū (*Hemiphaga novaeseelandiae*), grey warbler/riroriro (*Gerygone igata*), New Zealand kingfisher/kōtare (*Todiramphus sanctus*)²⁴, and morepork/ruru²⁵ (*Ninox novaeseelandiae*).

The New Zealand falcon/kārearea (*Falco novaeseelandiae*) a Threatened - Nationally Vulnerable species is thought to be breeding locally. The bird has been recorded irregularly within the KNE site²⁶.

Reptiles (herpetofauna)

The KNE site has records for two lizard species, the barking gecko (*Naultinus punctatus*) and ornate skink (*Oligosoma ornatum*)²⁷. Both these species have a national threat status of At-Risk-Declining²⁸.

Freshwater fish

Three species of freshwater fish species have been recorded at the KNE site. These species are longfin eel (*Anguilla dieffenbachia*), giant kokopu (*Galaxias argenteus*), and common bully (*Gobiomorphus cotidianus*).

Freshwater Invertebrates:

Koura (*Paranephrops planifrons*) is present at the site.

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 key threats to the ecological values at each KNE site. Appendix 4 presents a summary of all known threats to the Wi Tako Ngātata KNE site.

7.1. Key threats

Ecological weeds and pest animals are the main threats at the Wi Tako Ngātata KNE site.

Ecological weeds are widespread throughout the KNE site. The main threats include pines (*Pinus radiata*), wattles (*Acacia* spp.), buddleia (*Buddleja davidii*), and old man's beard (*Clematis vitalba*) (full list of weed species in Appendix 5). The border of the KNE site is largely suburban which can lead to reinvasion of significant weed species from properties on the edge of the site and from the high number of visitors to the site.

Introduced pest animal species are also a major threat. These primarily include possums (*Trichosurus vulpecula*), rats (*Rattus* spp.) and mustelids (*Mustela* spp.). Pest animal species impact on the native forest regeneration and food resource availability whilst preying on native species of both, flora and fauna.

Feral goats (*Capra hircus*) and pigs (*Sus scrofa*) are also known to be present at the KNE site. They are an on-going threat to the biodiversity of the site due to continual invasion from the Eastern Hutt hills.

There is an extensive network of walking tracks throughout the KNE site which are of high scenic and recreational use. These are used by walkers and mountain bikers. If the network was not planned and maintained well, impacts on biodiversity values could occur through things such as sediment runoff and light wells allowing weed invasion.

8. Vision and objectives

8.1. Vision

A flourishing beech and mānuka-kamahī forest ecosystem and a thriving wetland which supports a variety of native wildlife including birds, lizards, and rare plant species.

8.2. Objectives

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

The following objectives will guide the operational activities at the Wi Tako Ngātata KNE site.

- 1. Maintain high abundance and diversity of native bird and lizard species.*
- 2. Improve the condition, diversity, and complexity of species and habitats within the ecosystems.*
- 3. Improve the natural regeneration, seed dispersal, and the provision of food and habitat for native species.*

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 3).

Access to the Department of Corrections (DoC) block of the KNE site is restricted. However, an agreement between DoC and Greater Wellington allows biodiversity management in this block in accordance with the protocol set out in the *Access Procedure and Incident Reporting* document²⁹ and in accordance with the described activities provided in this KNE Operational Plan. Any change in activity or access requirement needs to be agreed with the Department of Corrections prior to being undertaken.

9.1. Ecological weed control

Ecological weed control at the site aims to enhance the regeneration of native species by reducing the density of ecological weeds.

Greater Wellington undertakes ecological weed control within the KNE site. The control targets areas of high weed density and areas where weeds are likely to establish. Weed sweeps are undertaken across the KNE site, where most dense infestations are located (see Appendix 1, Map 2). This control involves targeting species including pines, wattles, buddleia, and old man's beard. Weed sweeps are undertaken annually to follow up on previous years' work and control any new infestations. Appendix 5 contains a full list of ecological weeds present at the KNE site.

Mature wilding pines that were located throughout the Department of Corrections land were poisoned and felled during the last few years. Monitoring of the Department of Corrections land will be undertaken to note and control new establishing pines.

Greater Wellington have been liaising with the Department of Corrections regarding their weed control within an area adjacent to the KNE site boundary. Greater Wellington will continue to advise the Department of Corrections on the control of weeds and revegetation requirements in this area to ensure that native vegetation succession occurs, and ecological weeds do not reinvade the KNE site.

9.2. Pest animal control

Pest animal control is undertaken at the KNE site to reduce the pressure predators put on the native species at the site. Pest animal control targets possums, rats, hedgehogs, and mustelids. The control helps to reduce pressure on native birds and lizards whilst facilitating regeneration of the native forest and an increased abundance of food resources for native fauna.

A bait station network is serviced quarterly by Forest and Bird (F&B) volunteers with anticoagulant bait supplied by Greater Wellington. This is aimed at reducing the densities of possums and rats. A DOC-200 kill-trap network targeting rats, hedgehogs, and mustelids is also serviced quarterly by F&B volunteers with bait supplied by Greater Wellington. The bait station and trap networks (Appendix 1, Map 5) are audited annually by Greater Wellington to ensure all devices are working well and fit for purpose.

Feral pigs and goats are known to be present in the eastern hills and on occasion are found in the Wi Tako Ngātata KNE site. These animals are controlled by the Pest Animals team if and when sightings are reported.

9.3. Bird monitoring

Bird monitoring is undertaken at the Wi Tako Ngātata KNE site. This work is coordinated by the Monitoring – Land, Ecosystems and Air team, undertaken by Forest and Bird volunteers and funded by Upper Hutt City Council (UHCC). Five-minute bird counts are undertaken annually to assess trends in abundance, diversity, and distribution of native bird species across UHCC parks and reserves and are used to monitor the success of the management activities funded by UHCC.

10. Future opportunities

10.1. Red mistletoe monitoring

Pikirangi/red mistletoe (*Peraxilla tetrapetala*) grow parasitically on host trees which are commonly beech trees. The mistletoe's nectar is dispersed by native birds, and it is classified as 'At risk – declining'. Annual monitoring of red mistletoe is done around the region by a Forest and Bird volunteer, including in the Wi Tako Ngātata KNE site. As red mistletoe is rare, more effort could be put into monitoring the species which would be in accordance with Objective 2 of this KNE operational plan.

Monitoring could take the form of ensuring all observations of mistletoe by Greater Wellington staff and contractors are recorded to increase the data on the distribution and abundance of the species.

Monitoring of Red mistletoe can also be used to indicate possum abundance. As possums feed on the mistletoe, higher numbers of mistletoe indicate a decrease in possums at the KNE site. This data could then be used to aid in the planning of pest animal management. To use mistletoe as an indicator of possum density, trees would need to be marked and a standard monitoring protocol would need to be applied to track changes.

10.2. Lizard monitoring

There are three species of lizard that haven't been recorded at the KNE site but could be expected to be present based on the KNE site's habitat types. These species are: raukawa gecko (*Woodworthia maculata*), ngahere gecko (*Mokopirirakau* "Southern North Island") and northern grass skink (*Oligosoma polychroma*). Therefore, a lizard survey could be undertaken to try to ascertain whether these species are currently present in the KNE site. This would be in line with Objective 1 of this operational plan as it could determine if any of these species are present and provide data on the abundance and distribution of all lizard species in the KNE site. Examples of methods that could be used to survey lizards include spotlighting, ground searches, tracking cards, tree wraps, and pitfall traps. Lizard surveys are best conducted in summer so this would need to be considered in the planning of monitoring.

11. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Wi Tako Ngātata KNE site, and their timing and cost over the five-year period from 1 July 2023 to 30 June 2028. The budget for years 2024/25 to 2027/28 are indicative only and subject to change. A map of operational areas can be found in Appendix 1 (see Map 2).

Table 3: Five-year operational plan for the Wi Tako Ngātata KNE site

Objective	Activity	Operational area	Intended 5-year outcome	Implementing party	Timetable and resourcing where allocated				
					2023/24	2024/25	2025/26	2026/27	2027/28
2,3	Ecological weed control	Entire KNE site	Reduction in the distribution and abundance of ecological weed species	Pest Plants team	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
1	Pest animal control	Entire KNE site	Enhanced regeneration of native species Possums <5% RTC * Rats < 10% TTI** Mustelids <5% TTI**	F&B volunteers	Nil	Nil	Nil	Nil	Nil
	Pest animal control	Entire KNE site	An annual audit is undertaken of the Pest Animal network	Pest Animals Team	\$1488	\$1488	\$1488	\$1488	\$1488
1	Bird monitoring Five-minute bird count	Entire KNE site	Annual bird survey and reporting completed	Monitoring – Land, Ecosystems and Air team	\$2,000†	\$2,000†	\$2,000†	\$2,000†	\$2,000†
Total					\$6,488	\$6,400	\$6,400	\$6,400	\$6,400

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

†= UHCC fund bird monitoring across several sites annually including Wi Tako Ngātata totalling \$2,000. This funding isn't included in the KNE programme budget

12. Funding contributions

12.1. Budget allocated by Greater Wellington

As shown in table 4, the budget for the years 2024/25 to 2027/28 are indicative only and subject to change.

Table 4: Greater Wellington allocated budget for the Wi Tako Ngātata KNE site

Management activity	Timetable and resourcing				
	2023/24	2024/25	2025/26	2026/27	2027/28
Ecological weed control	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
Pest animal control	\$1,488	\$1,488	\$1,488	\$1,488	\$1,488
Total	\$4,488	\$4,488	\$4,488	\$4,488	\$4,488

12.2. Budget allocated by Upper Hutt City Council

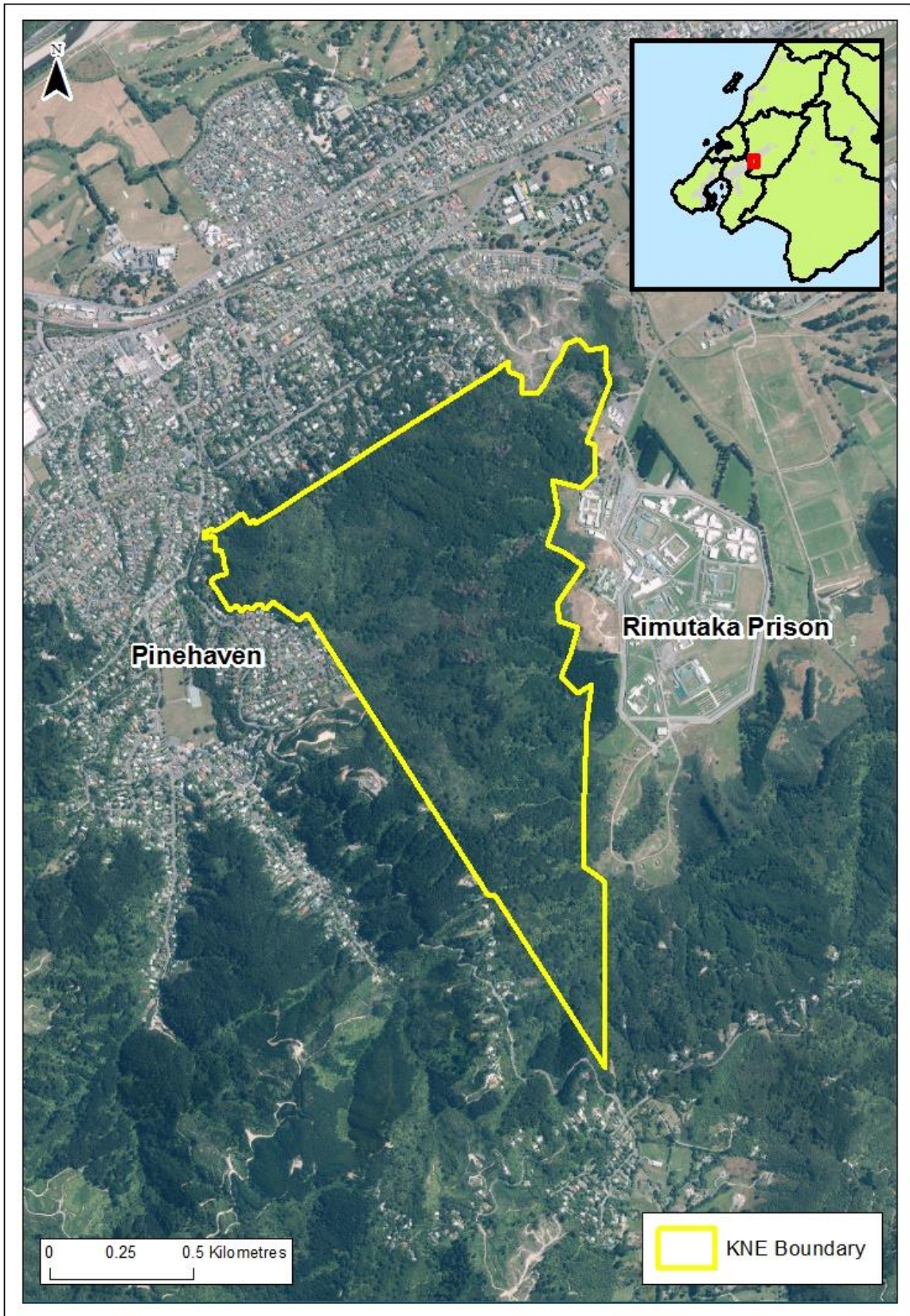
The budget is subject to confirmation through UHCC ten-year planning process (see table 5).

Table 5: UHCC allocated budget for the Wi Tako Ngātata KNE site

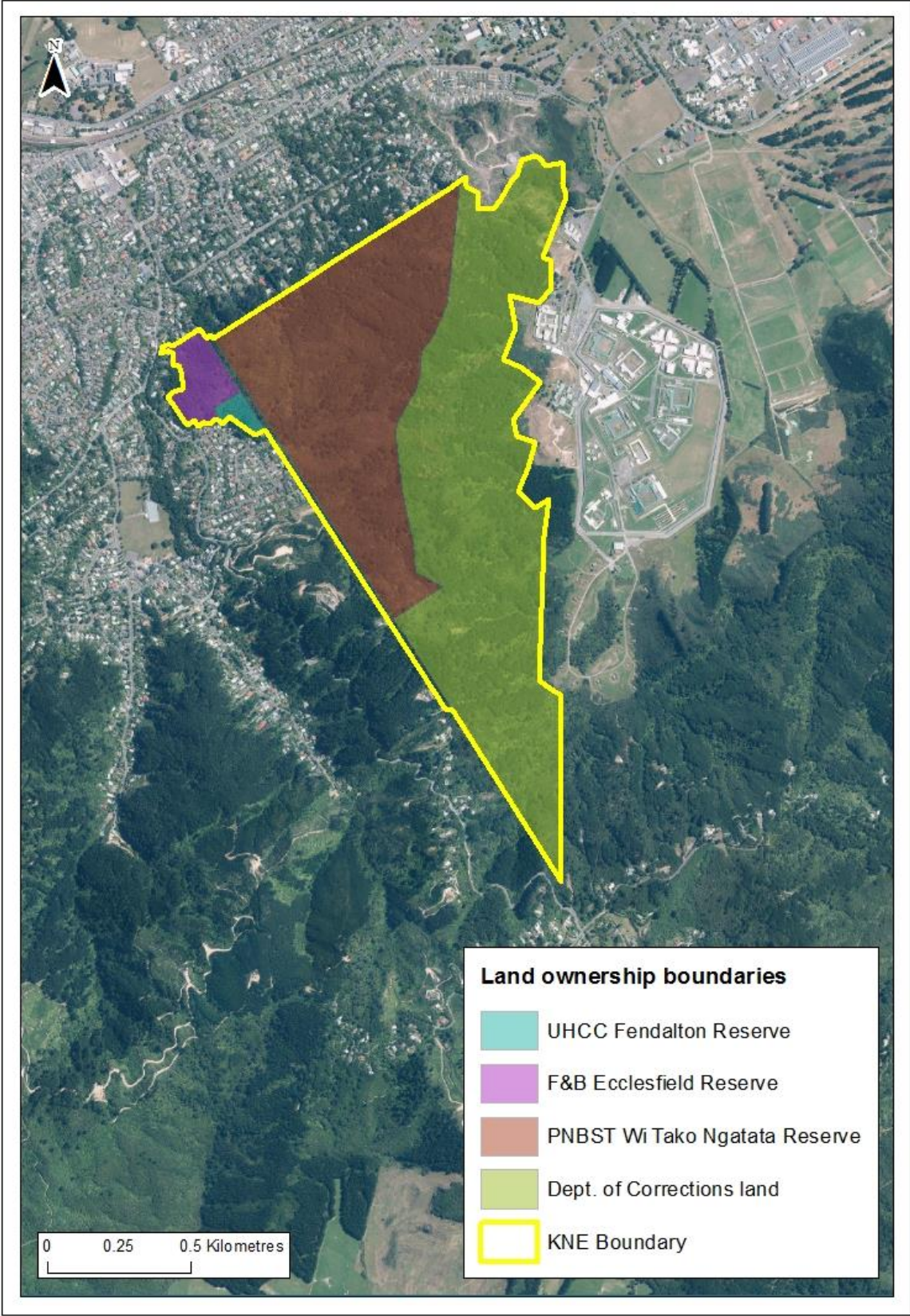
Management activity	Timetable and resourcing				
	2023/24	2024/25	2025/26	2026/27	2027/28
Bird monitoring	\$2,000†	\$2,000†	\$2,000†	\$2,000†	\$2,000†
Total	\$2,000†	\$2,000†	\$2,000†	\$2,000†	\$2,000†

† = UHCC fund bird monitoring across several sites annually including Wi Tako Ngātata totaling \$2,000. This funding isn't included in the KNE programme budget.

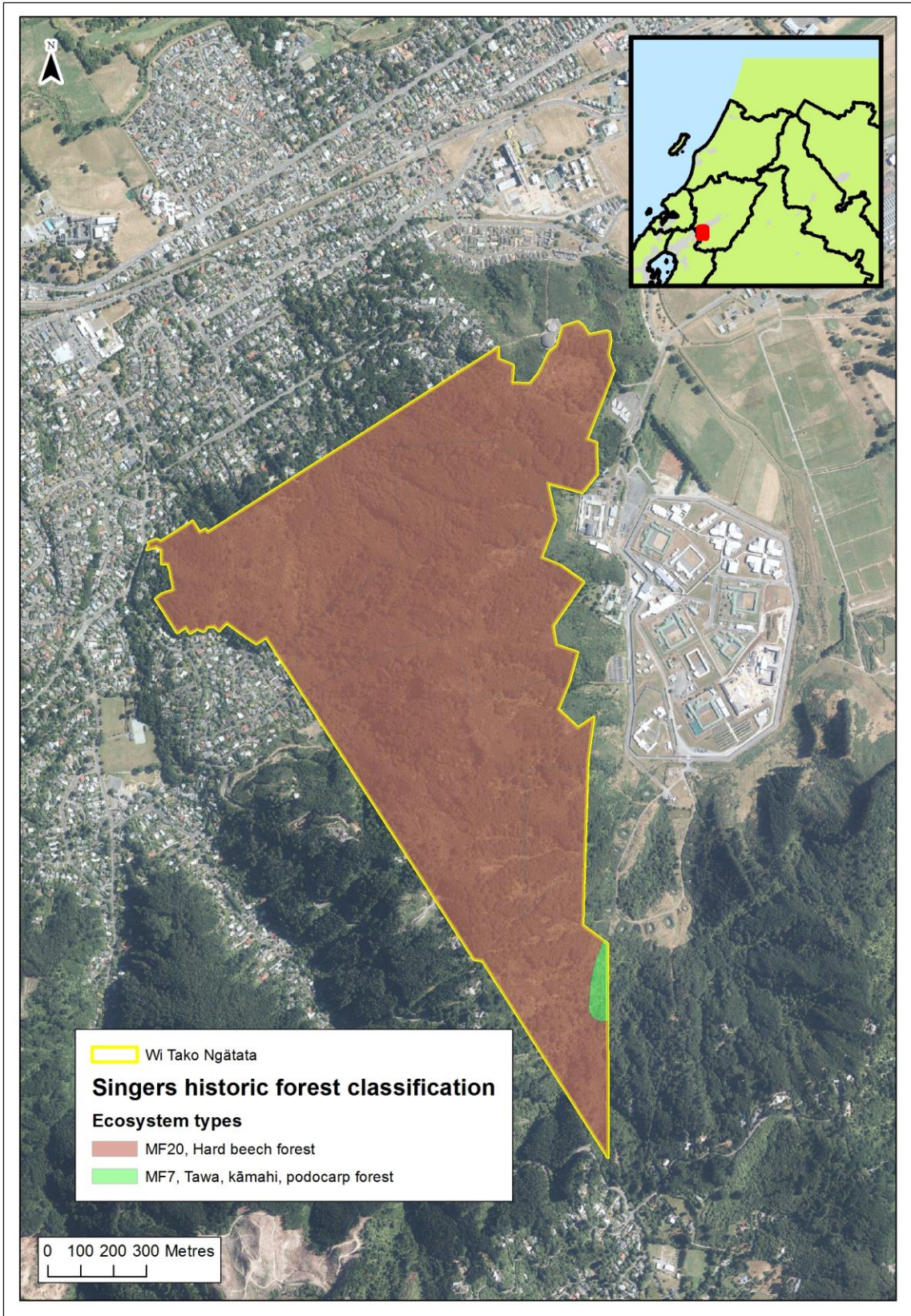
Appendix 1: Wi Tako Ngātata KNE site maps



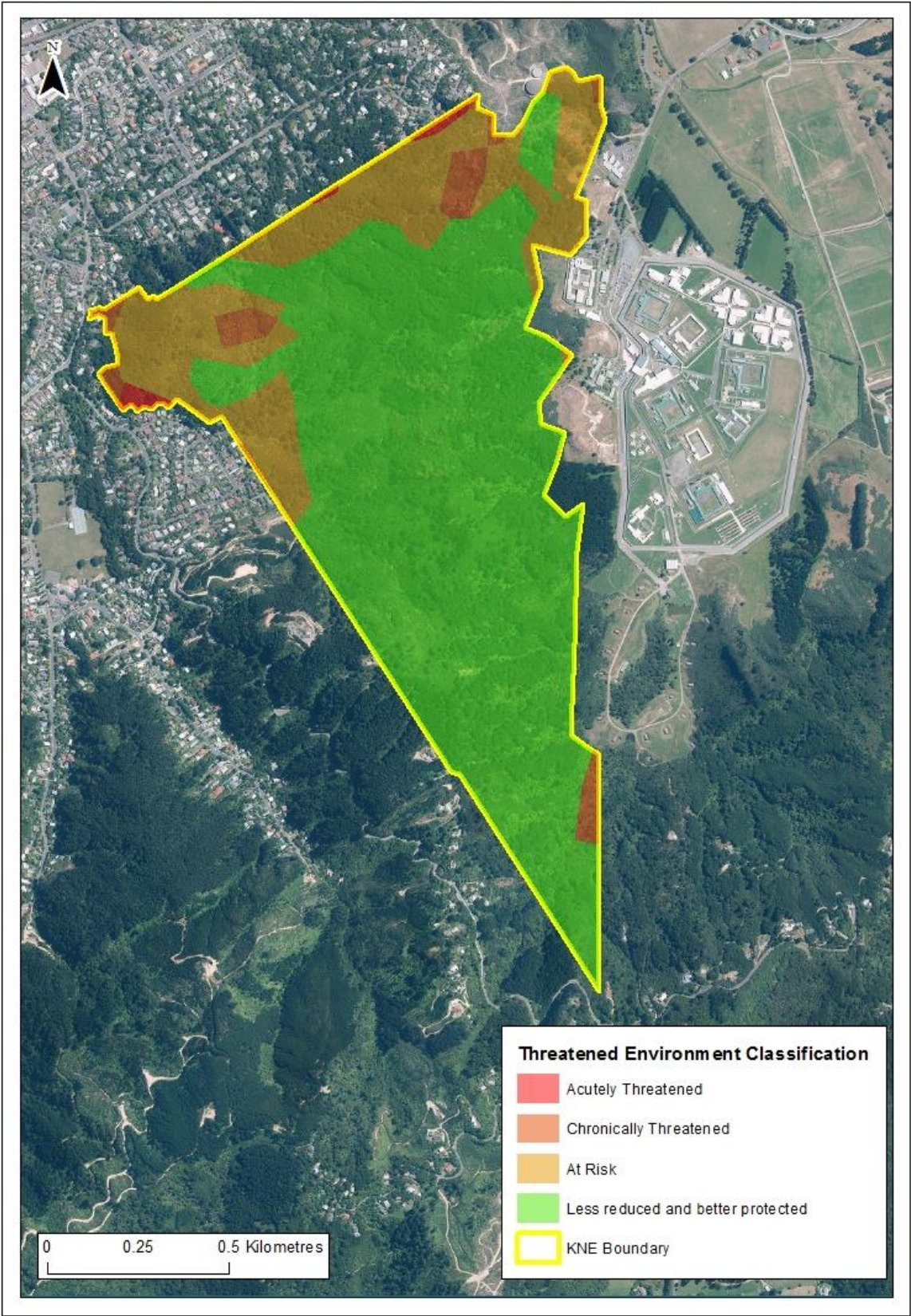
Map 1: The Wi Tako Ngātata KNE site boundary



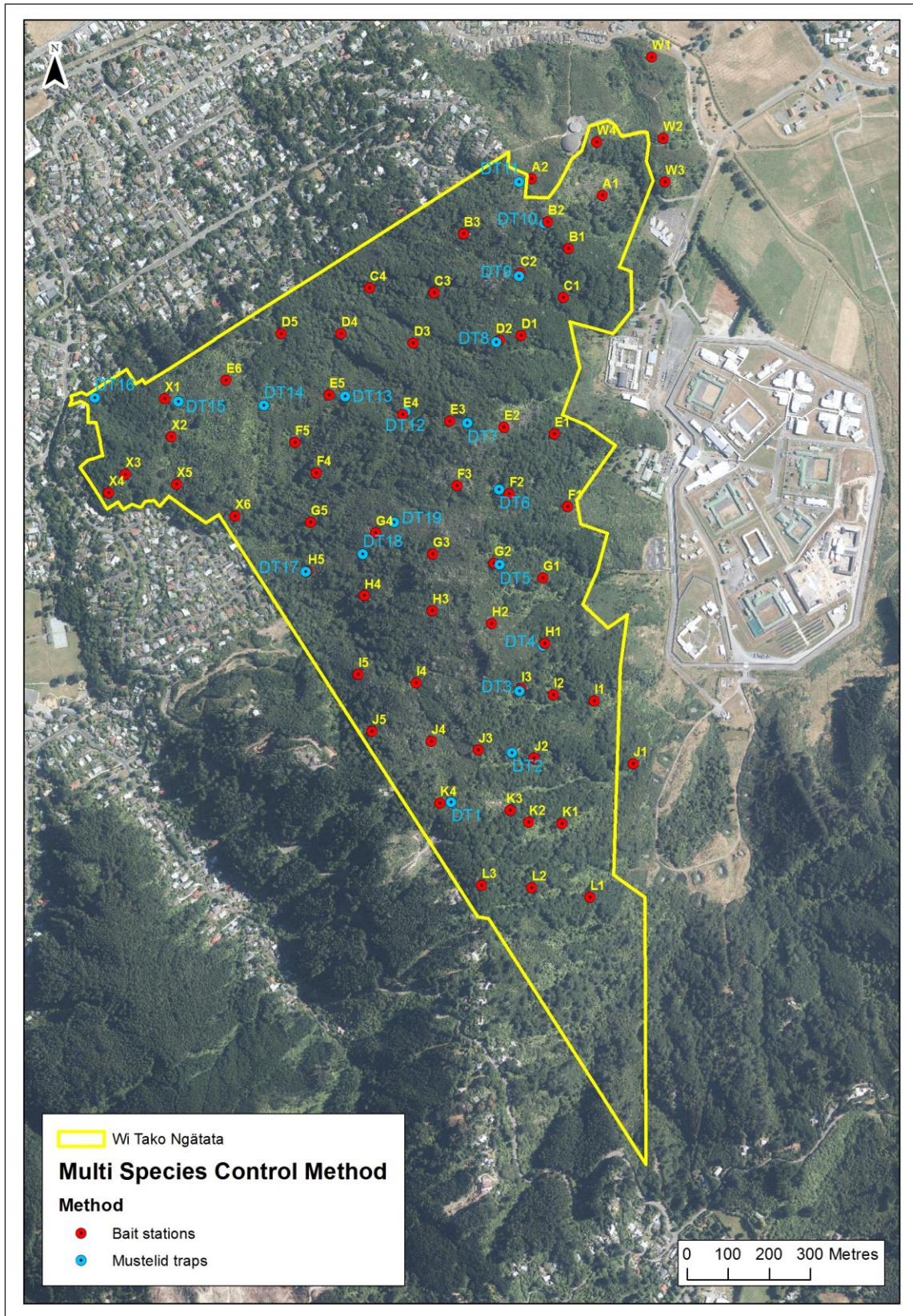
Map 2: Land ownership boundaries for the Wi Tako Ngātata KNE site



Map 3: Forest cover classifications for the Wi Tako Ngātata KNE site



Map 4: Land Environment New Zealand threat classifications for the Wi Tako Ngātata KNE site



Map 5: Pest animal control in the Wi Tako Ngātata 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^{30,31,32}. 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 Wi Tako Ngātata KNE site.

Table 6: Threatened and At Risk species at the Wi Tako Ngātata KNE site

Scientific name	Common name	Threat status	Observation
Plants(vascular)³³			
<i>Peraxilla tetrapetala</i>	Red mistletoe	At Risk – Declining	Wassilieff and Clark 1986 ³⁴
<i>Tupeia antarctica</i>	White mistletoe	At risk – Declining	White P 2001 ³⁵
Birds³⁶			
<i>Acanthisitta chloris granti</i>	North Island rifleman / titi pounamu	At Risk – Declining	McArthur <i>et al</i> 2015 ³⁷
<i>Cyanoramphus novaezelandiae novaezelandiae</i>	Red-crowned parakeet, kākārīki	At Risk – Relict	McArthur <i>et al</i> 2015
<i>Falco novaeseelandiae</i>	New Zealand falcon, kārearea	Threatened – Nationally Vulnerable	Bell D. 2014 ³⁸
Reptiles³⁹			
<i>Naultinus punctatus</i>	Barking gecko	At Risk – Declining	Department of Conservation 2022 ⁴⁰
<i>Oligosoma ornatum</i>	Ornate skink	At Risk – Declining	Department of Conservation 2022
Freshwater Fish⁴¹			
<i>Anguilla dieffenbachii</i>	Longfin eel	At risk – Declining	NIWA Fish Atlas ⁴²
<i>Galaxias argenteus</i>	Giant kokopu	At risk – Declining	NIWA Fish Atlas

Appendix 3: Regionally threatened species list

A methodology to create regional threat lists was developed by a collaborative group comprising representatives from DOC, regional councils, and a local authority. The resulting regional threat listing methodology leverages off the NZTCS, but applies a species population threshold adjusted to the regional land area under consideration (relative to the national land area) for species that are not nationally threatened. The assigned regional threat status cannot be lower than that of the national threat status, but can be higher, (e.g., a Nationally Vulnerable species could be assessed as being Regionally Critical). Other assessments made in the regional threat listing process include identifying populations that are national strongholds and the use of regional qualifiers, such as natural or historic range limits.

The following table lists regionally threatened species that have been recorded in the Wi Tako Ngātata KNE site.

Table 7: Regionally threatened species recorded in the Wi Tako Ngātata KNE site

Scientific name	Common name	Threat status	Observation
Plants⁴³			
<i>Gahnia rigida</i>	Gahnia	Regionally critical	Myers and Spearpoint ⁴⁴
Birds⁴⁵			
<i>Acanthisitta chloris granti</i>	North Island rifleman / titi ponamu	At risk - declining	McArthur <i>et al</i> 2015
<i>Cyanoramphus novaezelandiae</i>	Red crowned parakeet / kākārīki	At risk - recovering	McArthur <i>et al</i> 2015
<i>Falco novaeseelandiae</i>	New Zealand falcon / kārearea	Threatened - critical	Bell D. 2014
<i>Hemiphaga novaeseelandiae</i>	New Zealand pigeon / kererū	At risk – recovering	McArthur <i>et al</i> 2015
Reptiles⁴⁶			
<i>Naultinus punctatus</i>	Barking gecko	Threatened - vulnerable	Department of Conservation 2022
<i>Oligosoma ornatum</i>	Ornate skink	At Risk – Declining	Department of Conservation 2022

Appendix 4: Threat table

Appendix 4 presents a summary of all known threats to the Wi Tako Ngātata KNE site including those discussed in section 7.

Table 8: Threats to the Wi Tako Ngātata 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 for control include climbing asparagus (<i>Asparagus scandens</i>) and tradescantia (<i>Tradescantia fluminensis fluensis</i>) (see full list in Appendix 5).	Entire KNE site
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species include pine (<i>Pinus</i> spp.), wattle spp. (<i>Acacia</i> spp.) and willow-leaved hakea (<i>Hakea salicifolia</i>) (see full list in Appendix 5).	Entire KNE site
EW-3	Climbing weeds smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition. Key climbing ecological weed species include Japanese honeysuckle (<i>Lonicera japonica</i>), German ivy (<i>Delairea odorata</i>), and jasmine (<i>Jasminum polyanthum</i>) (see full list in Appendix 5).	Entire KNE site
Pest animals		
PA-1	Possums (<i>Trichosurus vulpecula</i>) browse palatable canopy vegetation until it can no longer recover ^{47,48} . This destroys the forest's structure, diversity, and function. Possums may also prey on native birds and invertebrates ⁴⁹ .	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 ^{50,51} .	Entire KNE site
PA-3	Mustelids (stoats ^{52,53} (<i>Mustela erminea</i>), ferrets ^{54,55} (<i>M. furo</i>) and weasels ^{56,57} (<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 ⁵⁸ , lizards ⁵⁹ , and the eggs ⁶⁰ and chicks of ground-nesting birds ⁶¹ .	Entire KNE site
PA-5	House mice (<i>Mus musculus</i>) browse native fruit, seeds and vegetation, and prey on invertebrates. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and small eggs and nestlings ^{62,63} .	Entire KNE site
PA-6*	Pest and domestic cats (<i>Felis catus</i>) prey on native birds ⁶⁴ , lizards ⁶⁵ , and invertebrates ⁶⁶ , reducing native fauna breeding success and potentially causing local extinctions ⁶⁷ .	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-7	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 ⁶⁸ .	Entire site KNE
PA-8	Feral pigs (<i>Sus scrofa</i>) root up the soil and eat roots, invertebrates, seeds, and native plants preventing forest regeneration ⁶⁹ .	Entire site KNE
PA-9	Goats (<i>Capra hircus</i>) browsing affects the composition and biomass of native vegetation in the understory tiers of forest habitats, preventing regeneration of the most palatable understory species and reducing species diversity ⁷⁰ .	Entire site KNE
PA-10	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 ^{71,72} .	Entire site KNE
Human activities		
HA-1	Garden waste dumping often leads to ecological weed invasions into natural areas.	North-western urban fringe
HA-2*	Recreational use such as tramping and mountain biking can cause damage and disturbance of the native ecosystem. It is also likely to disturb native fauna and introduce ecological weeds.	Entire site KNE
HA-3*	Ex-plantation forestry on adjoining land parcels to the KNE site have the potential to cause habitat degradation through the spreading of wilding pines that can change the vegetation composition and structure of the forest.	Entire site KNE
HA-4*	Open fires are known to be started within the KNE site occasionally and are considered a risk to the area given the generally dry nature of the site and its surrounds.	Entire site KNE

*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 Wi Tako Ngātata KNE site.

The distribution and density of individual species within each operational area 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 Wi Tako Ngātata KNE site

Scientific name	Common name	Priority	Level of distribution	Management aim
<i>Pinus radiata</i>	Monterey pine	High	Widespread and abundant	Suppression. Control when encountered and when possible
<i>Acacia spp.</i>	Acacia/wattle	High	Widespread and abundant	Suppression. Control when encountered
<i>Buddleja davidii</i>	Buddleia	High	Widespread and abundant	Suppression. Control when encountered
<i>Clematis vitalba</i>	Old man's beard	High	Patchy and sparse	Suppression. Control when encountered
<i>Erica lusitanica</i>	Spanish heath	High	Widespread and abundant	Suppression. Control when encountered
<i>Hakea salicifolia</i>	Willow-leaved hakea	High	Localised and sparse	Suppression. Control when encountered
<i>Cortaderia spp.</i>	Pampas	High	Localised and sparse	Suppression. Control when encountered
<i>Acer pseudoplatanus</i>	Sycamore	Low	widespread and sparse	No management
<i>Ajuga reptans</i>	Ajuga	Low	Patchy and dense	Surveillance
<i>Asparagus scandens</i>	Climbing asparagus	High	Localised and sparse	Suppression. Control when encountered
<i>Callistemon citrinus</i>	Bottle brush	Low	Widespread and sparse	Surveillance
<i>Cotoneaster spp.</i>	Cotoneaster	High	Widespread and sparse	Surveillance
<i>Crococoma x crocosiflora</i>	Montbretia	High	Widespread and sparse	Surveillance

Scientific name	Common name	Priority	Level of distribution	Management aim
<i>Cupressus lawsoniana</i>	Lawson's cypress	High	Widespread and sparse	Surveillance
<i>Cytisus scoparius</i>	Broom	High	Widespread and sparse	Suppression. Control when encountered
<i>Delairea odorata</i>	German ivy	High	Widespread and abundant	Suppression. Control when encountered
<i>Erica arborea</i>	Tree heath	High	Localised and sparse	Surveillance
<i>Galeobdolon luteum</i>	Artillery weed	High	Localised and sparse	Suppression. Control when encountered
<i>Hedra helix</i>	English ivy	High	Localised and sparse	Suppression. Control when encountered
<i>Hedychium gardnerianum</i>	Wild ginger	High	Localised and sparse	Surveillance
<i>Hydrangea</i> app.	Hydrangea	Low	Widespread and sparse	Surveillance
<i>Iris foetidissima</i>	Stinking iris	High	Widespread and sparse	Suppression. Control when encountered
<i>Jasminum polyanthum</i>	Jasmine	High	Localised and sparse	Suppression. Control when encountered
<i>Lonicera japonica</i>	Japanese honeysuckle	High	Patchy and sparse	Suppression. Control when encountered
<i>Pittosporum ralphii</i> *	Karo	High	Localised and sparse	Suppression. Control when encountered
<i>Prunus</i> spp.	Cherry species	High	widespread and sparse	Suppression. Control when encountered
<i>Psuedopanax lessonii</i>	Psuedopanax hybrid	High	Localised and sparse	Surveillance
<i>Pteris cretitan</i>	Cretan brake fern	High	Localised and sparse	Surveillance

Scientific name	Common name	Priority	Level of distribution	Management aim
<i>Rhododendron</i> spp.	Rhododendron	High	Localised and sparse	Surveillance
<i>Rubus fruticosus</i> agg.	Blackberry	High	Widespread and sparse	Suppression. Control when encountered
<i>Salix</i> spp.	Willow species	High	Localised and sparse	No management
<i>Tradescantia fluensis</i>	Tradescantia	High	Patchy and sparse	Suppression. Control when encountered
<i>Ulex europeaus</i>	Gorse	High	localised and sparse	Suppression. Control when encountered
<i>Zantedeschia aethiopica</i>	Arum lily	High	Localised and sparse	Suppression. Control when encountered

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

References

- ¹ New Zealand legislation. 1991. Resource Management Act 1991.
- ² Greater Wellington Regional Council. Greater Wellington Regional Council Long Term Plan Ko Te Pae Tawhiti: 2021 – 2031.
- ³ Greater Wellington Regional Council. 2016. Greater Wellington Regional Council Biodiversity Strategy. <http://www.gw.govt.nz/assets/council-publications/Biodiversity-Strategy-2016.pdf>
- ⁴ Greater Wellington Regional Council. Proposed Natural Resources Plan for the Wellington Region. 2019.
- ⁵ Greater Wellington Regional Council. 2019. Greater Wellington Regional Pest Management Plan 2019–2039. GW/BIO-G-2019/74.
- ⁶ Boffa Miskell, 2008. Southern Hills Environmental Management Study. Prepared for Upper Hutt City Council.
- ⁷ Te Ara. The encyclopedia of New Zealand. Online resource <http://www.teara.govt.nz/en/biographies/1n10/ngatata-wiremu-tako>.
- ⁸ Taranaki Whanui ki Te Upoko o Te Ika Settlement Summary <http://nz01.terabyte.co.nz/ots/Livearticle.asp?ArtID=1219027573>.
- ⁹ Ecclesfield reserve <http://www.forestandbird.org.nz/what-we-do/branches/upper-hutt/restoration-project>.
- ¹⁰ Department of Conservation. 1987. Ecological Regions and Districts of New Zealand.
- ¹¹ Department of Conservation. 1987. Ecological Regions and Districts of New Zealand.
- ¹² Singers NJD, Rogers GM. 2014. A classification of New Zealand's terrestrial ecosystems. Science for Conservation No. 325. Department of Conservation, Wellington. 87 p.
- ¹³ Singers N, Crisp P, Spearpoint O. 2018. Forest ecosystems of the Wellington Region.
- ¹⁴ 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.
- ¹⁵ Ausseil A-G, Gerbeaux P, Chadderton W, Stephens T, Brown D, Leathwick J. 2008. Wetland ecosystems of national importance for biodiversity. Landcare Research Contract Report LC0708/158 for Chief Scientist, Department of Conservation.
- ¹⁶ McArthur, N.; Govella, S.; Walter, J. and Small, D. 2015. State and trends in the diversity, abundance and distribution of birds in Upper Hutt City. Client report prepared for Greater Wellington Regional Council. Wildlife Management International Ltd, Blenheim.
- ¹⁷ Crisp P and Singers N 2015. (in prep). Terrestrial ecosystems of the Wellington region.
- ¹⁸ Singers N.J.D., and Rogers G.M. 2014. A classification of New Zealand's terrestrial ecosystems. Science for Conservation No. 325. Department of Conservation, Wellington. 87pp.
- ¹⁹ Wassilieff, M. C.; Clark, D. J 1986. Scenic Reserves of the Lower North Island.
- ²⁰ Myers and Spearpoint 2015. Field survey of Wi Tako gahnia wetland. Unpublished report.
- ²¹ Wassilieff, M. C.; Clark, D. J 1986. Scenic Reserves of the Lower North Island.
- ²² White, Peter 2001. Ecclesfield Reserve Management Plan (draft), Ecclesfield reserve plant checklist.
- ²³ McArthur, N.; Govella, S.; Walter, J. and Small, D. 2015. State and trends in the diversity, abundance and distribution of birds in Upper Hutt City. Client report prepared for Greater Wellington Regional Council. Wildlife Management International Ltd, Blenheim.
- ²⁴ McArthur, N.; Govella, S.; Walter, J. and Small, D. 2015. State and trends in the diversity, abundance and distribution of birds in Upper Hutt City. Client report prepared for Greater Wellington Regional Council. Wildlife Management International Ltd, Blenheim.
- ²⁵ Michael Urlich 2014. Greater Wellington Regional Council. Site observation.
- ²⁶ Bell D. 2014. NZ Falcon Survey - Wellington Region data extract. Accessed: 30 November 2014.
- ²⁷ Department of Conservation. 2022. Department of Conservation Herpetofauna Database (Bioweb). Accessed November 2022.
- ²⁸ Department of Conservation. 2021. Conservation status of New Zealand reptiles.

- ²⁹ Greater Wellington Regional Council. 2017. GWRC access procedure and incident reporting for biodiversity management and monitoring on land vested with Department of Corrections/Rimutaka Prison (part of Wi Tako Ngātata KNE site).
- ³⁰ Townsend AJ, de Lange PJ, Duffy CAJ, Miskelly CM, Molloy J, Norton DA. 2008. New Zealand Threat Classification System manual. Department of Conservation, Wellington. 36 p.
- ³¹ Rolfe J, Makan T, Tait A. 2021. Supplement to the New Zealand Threat Classification System manual 2008: new qualifiers and amendments to qualifier definitions, 2021. Department of Conservation, Wellington. 7 p.
- ³² Michel P. 2021. Amendment to the New Zealand Threat Classification System manual 2008: revised categories 2021. Department of Conservation, Wellington. 5 p.
- ³³ de Lange PJ, Rolfe JR, Barkla JW, Courtney SP, Champion PD, Perrie LR, Beadel SM, Ford KA, Breitwieser I, Schonberger, I, Hindmarsh-Walls R, Heenan PB, Ladley K. 2018. Conservation status of New Zealand indigenous vascular plants, 2017. New Zealand Threat Classification Series 22. Department of Conservation, Wellington. 82 p.
- ³⁴ Wassilieff, M. C.; Clark, D. J 1986. .Scenic Reserves of the Lower North Island.
- ³⁵ White, Peter, 2001. Ecclesfield Reserve Management Plan (draft), Ecclesfield reserve plant checklist.
- ³⁶ Robertson HA, Baird KA, Elliot GP, Hitchmough RA, McArthur NJ, Makan TD, Miskelly CM, O'Donnell CFJ, Sagar PM, Scofield RP, Taylor GA, Michel P. 2021. Conservation status of birds in Aotearoa New Zealand, 2021. New Zealand Threat Classification Series 36. Department of Conservation, Wellington. 43 p.
- ³⁷ McArthur, N.; Govella, S.; Walter, J. and Small, D. 2015. State and trends in the diversity, abundance and distribution of birds in Upper Hutt City. Client report prepared for Greater Wellington Regional Council. Wildlife Management International Ltd, Blenheim.
- ³⁸ Bell D. 2014. NZ Falcon Survey - Wellington Region data extract. Accessed: 30 November 2014.
- ³⁹ Hitchmough R, Barr B, Knox C, Lettink M, Monks JM, Patterson GB, Reardon JT, Tocher M, Van Winkel D, Rolfe J, Michel P. 2021. Conservation status of New Zealand reptiles, 2021. New Zealand Threat Classification Series 35. Department of Conservation, Wellington. 15 p.
- ⁴⁰ Department of Conservation. 2022. Department of Conservation Atlas of the amphibians and reptiles of New Zealand. [Atlas of the amphibians and reptiles of New Zealand: Atlas \(doc.govt.nz\)](https://www.doc.govt.nz). Accessed December 2022.
- ⁴¹ Hitchmough R, Barr B, Knox C, Lettink M, Monks JM, Patterson GB, Reardon JT, Tocher M, Van Winkel D, Rolfe J, Michel P. 2021. Conservation status of New Zealand reptiles, 2021. New Zealand Threat Classification Series 35. Department of Conservation, Wellington. 15 p.
- ⁴² NIWA. 2022. NIWA Fish Atlas. [NIWA Atlas of NZ Freshwater Fishes | NIWA](https://www.niwa.co.nz). Accessed December 2022.
- ⁴³ Crisp, P. 2020. Conservation status of indigenous vascular plant species in the Wellington region. Greater Wellington Region Council. GW/ESCI-G-20/20.
- ⁴⁴ Myers and Spearpoint 2015. Field survey of Wi Tako gahnia wetland. Unpublished report.
- ⁴⁵ P. Crisp. 2020. Conservation status of native bird species in the Wellington region. Greater Wellington Regional Council, Publication No. GW/ESCI-G-20/75, Wellington.
- ⁴⁶ Crisp P. 2020. Conservation status of lizard species in the Wellington region. Greater Wellington Regional Council, Publication No. WRC/ESCI-G-20/2, Wellington.
- ⁴⁷ 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.
- ⁴⁸ 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.
- ⁴⁹ 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.
- ⁵⁰ 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.
- ⁵¹ Innes JG. 2005. Ship rat. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 187–203.
- ⁵² 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.

- ⁵³ King CM and Murphy EC. 2005. Stoat. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 261–287.
- ⁵⁴ 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.
- ⁵⁵ Clapperton BK, Byron A. 2005. Feral ferret. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 294–307.
- ⁵⁶ King CM. 2005. Weasel. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 287–294.
- ⁵⁷ 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.
- ⁵⁸ 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.
- ⁵⁹ 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.
- ⁶⁰ 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.
- ⁶¹ 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.
- ⁶² Ruscoe WA, Murphy EC. 2005. House mouse. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 204–221.
- ⁶³ 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.
- ⁶⁴ 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.
- ⁶⁵ 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.
- ⁶⁶ 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.
- ⁶⁷ Gillies C, Fitzgerald BM. 2005. Feral cat. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 308–326.
- ⁶⁸ 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.
- ⁶⁹ McIlroy JC. 2005. Feral pigs. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 334–345.
- ⁷⁰ Parkes. JP. 2005. Feral goat. In: King CM ed. The handbook of New Zealand mammals. Oxford University Press. Pp. 374–391.
- ⁷¹ Wright D, Clout M 2001. The eastern rosella (*Platycercus eximius*) in New Zealand. DOC Science Internal Series 18.
- ⁷² Galbraith JA. 2013. Eastern rosella. In Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

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