

Key Native Ecosystem Operational Plan for Kourarau Valley

2019-2024



greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao



Contents

1. Purpose	1
2. Policy Context	1
3. The Key Native Ecosystem Programme	2
4. Kourarau Valley forest fragments Key Native Ecosystem site	3
5. Parties involved	3
6. Ecological values	5
7. Threats to ecological values at the KNE site	7
8. Vision and objectives	10
9. Operational activities	10
10. Operational delivery schedule	12
11. Funding contributions	13
12. Future opportunities	13
Appendix 1: Site maps	14
Appendix 2: Nationally threatened species list	17
Appendix 3: Regionally threatened plant species list	18
References	19

1. Purpose

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

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

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

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

2. Policy Context

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

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

Greater Wellington Long Term Plan

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

Proposed Natural Resources Plan – decisions version

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

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

Greater Wellington Biodiversity Strategy

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

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

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

Goal One
Areas of high biodiversity value are protected or restored

3. The Key Native Ecosystem Programme

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

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

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

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

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

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

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

4. Kourarau Valley forest fragments Key Native Ecosystem site

The Kourarau Valley forest fragments KNE site (68.79 ha; see Appendix 1, Map 1) lies in the upper reaches of the Kourarau Stream valley in the Admiral Hill area, 18 km south-east of Carterton. The Kourarau Stream runs approximately north-east and flows into the Kourarau dam and hydroelectric reservoir system.

The KNE site and its forest remnants is characterised by its underlying limestone-dominated geology with numerous active springs, elevation (310-460 m a.s.l.) and cool climate, and is in the Eastern Wairarapa Ecological District⁴. The surrounding land use is intensive agriculture.

Indigenous forest remnants on this landform are now nationally-rare. The KNE site contains modified remnants of a forest type now critically-endangered in the Wellington region, already naturally-uncommon prior to human settlement and now with only 0.7% remaining of its previous extent. It contains five nationally-endangered endemic plant species, including *Olearia gardneri*, *Coprosma wallii* and *Tupeia antarctica* and several other rare and uncommon endemic plant species. The area has high water quality and aquatic biodiversity with its limestone springs (eg, high densities of Kōura, *Paranephrops planifrons*) and significant mana whenua values.

5. Parties involved

The entire KNE site is under private land ownership.

5.1. Landowners

There are five landowners in the KNE site (see Appendix 1, Map 2).

Dandaloo Farm and its forest remnant is owned by Angus and Trish Thomson, and is valued as an attractive part of their farm.

The remnant adjoining Dandaloo is on the Waimana property, owned by Bill Cooper but currently under a farming lease.

The remnant on Glenside Farm is owned by Jamie and Marilyn Strang, with the surrounding land under lease. The Strang’s are passionate about forest protection and restoration, and a second KNE site is at the western end of the property (Strang’s Bush KNE site).

Koromiko’s remnant is owned by Joe and Hayley Quirke and they are keen to see the bush protected and restored, and are planning to retire more of the remnant area from grazing in future.

Kouratahi Farm and its bush remnant is owned by Mike Murray and currently managed by Mike and Jane Cammock. Both parties are keen to be part of the programme and see their remnant protected and restored.

5.2. Operational delivery

Within Greater Wellington, the Biodiversity, and Biosecurity departments are responsible for delivering the KNE operational plan. The Biodiversity department is the overarching lead department for Greater Wellington on the coordination of biodiversity management activities and advice within the KNE site. The Biosecurity department coordinates and carries out pest control activities.

The landowners are management partners given the unique nature of the site and the objectives for the site’s management, including maintaining surrounding stock fencing to protect the forest from grazing, and management of pest animals not being undertaken by Greater Wellington (ie, feral deer).

5.3. Stakeholders

DOC has a long history of involvement with this site, dating back to the 1990s. They have been involved in landowner advocacy, fencing and retirement, protection, propagation and monitoring of rare plants, and pest plant and animal control.

5.4. Mana whenua partners

Kourarau is a site of significance for Ngāti Kahungunu ki Wairarapa and Rangitāne o Wairarapa (see Table 1), and has a rich oral history of habitation and food gathering, tribal migration routes from inland areas to the coast, and a resident taniwha.

They are aware that their areas of interest are located on private land. Greater Wellington will provide contact details of landowners to both iwi if they wish to consult directly with landowners about the values at the site.

The Kourarau Stream and Reservoir area has been identified in Schedule C in the Proposed Natural Resources Plan, for its wāhi tīpuna (ancestral sites), wai ora (source of healthy water) and mahinga kai (food gathering) values.

Table 1: Schedule C sites of significance in the Kourarau Valley forest fragments KNE site⁵

Sites of significance	Mana whenua values
Kourarau Stream and Reservoir	Wāhi tīpuna, wai ora, mahinga kai

6. Ecological values

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

6.1. Ecological designations

Table 2 below lists ecological designations at all or part of the Kourarau KNE site.

Table 2: Designations at the Kourarau Valley forest fragments KNE site

Designation level	Type of designation
District	Department of Conservation RAP 24 (Kourarau Valley and Pukemangamanga)

6.2. Ecological significance

The Kourarau Valley forest fragments KNE site is considered to be of regional importance because:

- It contains highly **representative** ecosystems that were once typical or commonplace in the region
- It contains ecological features that are very **rare and distinctive** in the region

Representativeness

The forest fragments present are highly representative of the original forest habitats in this area of the ecological district.

The Threatened Environment Classification system⁶ indicates all of the site is Category 1 (Acutely Threatened), containing less than 10% of its original vegetation cover.

A 2018 classification of pre-human vegetation⁷ indicates most of the original forest component of the forest sites here was kahikatea, tōtara, matai forest (CLF4), of which only 0.7% now remains in the region. The Dandaloo, Waimana, Glenside and Koromiko sites (see Appendix 1, Map 2) contains small primary remnants of this forest type, modified primary remnants, regenerating secondary remnants and degraded areas of mixed primary and secondary remnant. The Kouratahi remnant is near the boundary between the CLF4 forest type and a second type, MF1 tōtara, tītoki forest, and this site contains modified primary and regenerating secondary forest of this type. Less than 2% remains in the region of this MF1 forest type.

Rarity/distinctiveness

New Zealand's national threat classification system⁸ lists three plant species as nationally Threatened or At Risk within the KNE site. Nationally Threatened species are listed in Appendix 2.

6.3. Ecological features

The combination of geology and soil type, climate and elevation have created an uncommon set of environmental conditions, and the native forest type found in this

environment was similarly uncommon in pre-human times. The wider area is prized for its soil fertility, cool temperate climate and year-round water supplies for agriculture.

Habitats (including vegetation communities and plants)

Podocarp forest ecosystems

The most intact primary CLF4 remnants are characterised by a tall canopy of emergent tōtara (*Podocarpus tōtara*), kahikatea (*Dacrycarpus dacrydioides*), matai (*Prumnopitys taxifolia*), rīmu (*Dacrydium cupressinum*) and rewarewa (*Knightia excelsa*) along with black maire (*Nestegis cunninghamii*) and white maire (*Nestegis lanceolata*). The understorey contains houhere (*Hoheria sexstylosa*), horopito (*Pseudowintera colorata*) and māhoe (*Meliclytus ramiflorus*).

The MF1 area on Kouratahi contains tōtara and matai in its emergent layer, with a tōtara, tītoki (*Alectryon excelsus*), rewarewa and hinau (*Elaeocarpus dentatus*) canopy. Typically more uncommon species such as black maire and white maire are relatively widespread here. Kahikatea is present in the main gully, with occasional ngaio (*Myoporum laetum*) and kowhai (*Sophora microphylla*) throughout. Its understorey is mainly kawakawa (*Piper excelsum*), māhoe, supplejack (*Ripogonum scandens*), various *Coprosma* species and scattered ferns such as *Botrychium bifforme*.

Species

Plants

Five nationally-threatened plants have been recorded here to date^{9,10}. These are *Olearia gardneri* (Threatened – Nationally Endangered), *Neomyrtus pedunculata* (Threatened – Nationally Critical), *Tupeia antarctica* (At Risk – Declining), *Coprosma wallii* (At Risk – Declining), and *Coprosma virescens* (At Risk – Declining).

Other notable or regionally-uncommon species on this landform and ecological district are raukawa (*Raukawa edgerleyi*), red beech (*Fuscospora fusca*) and northern rātā (*Metrosideros robusta*).

Fish (inc. koura)

The Kourarau Stream and its catchment of numerous year-round flowing springs contains high populations of kōura or freshwater crayfish (*Paranephrops planifrons*), which is likely how the area came to be named¹¹.

Birds

The KNE site provides seasonal or core habitat for a range of common forest birds including tūī (*Prosthemadera novaeseelandiae*), bellbird (*Anthornis melanura*), fantail or pīwakawaka (*Rhipidua fuliginosa*), morepork (*Ninox novaeseelandiae*), silvereye (*Zosterops lateralis*), kererū (*Hemiphaga novaeseelandiae*), grey warbler (*Gerygone igata*) and Australasian harrier (*Circus approximans*).

7. Threats to ecological values at the KNE site

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

7.1. Key threats

Ecological pest plants displace native plant species performing important structural and ecological functions such as providing food sources, shelter, roosts and refuge from predators for native fauna. They also inhibit the natural regeneration of native plant species including rare or threatened species such as *Olearia gardneri*.

There are currently low densities of several recognised ecological pest plants throughout the KNE site. These include old man's beard (*Clematis vitalba*), tradescantia (*Tradescantia fluminensis*), blackberry (*Rubus fruticosus*), elderberry (*Sambucus nigra*) and Japanese spindle tree (*Euonymus japonicus*).

Pest animals are present throughout the KNE site and are known to damage native vegetation and prey on native animals. Pest animals known to be present include possums (*Trichosurus vulpecula*), mustelids (*Mustela* spp.), Ship and Norway rats (*Rattus rattus* and *R. norvegicus*), mice (*Mus musculus*), hedgehogs (*Erinaceus europaeus*), feral cats (*Felis catus*), rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus*).

Feral red deer (*Cervus elaphus*) and fallow deer (*Dama dama*) are present in low numbers throughout the KNE site. Left unchecked, deer can significantly damage forest understory and composition through selective browsing.

The forest remnants are vulnerable to the impacts of edge effects due to their fragmented distribution, small size and relatively large forest edge. Some studies suggest that regularly-shaped forest fragments of less than 9 ha are strongly influenced by edge patterns and processes¹².

While the key threats discussed in this section are recognised as the most significant, a number of other threats to the KNE site's values have also been identified. Table 3 presents a summary of all known threats to the Kourarau Valley forest fragments KNE site (including those discussed above), detailing which operational areas they affect, how each threat impacts on ecological values, and whether they will be addressed by operational activities.

Table 3: Summary of all threats to ecological values present at the Kourarau Valley forest fragments KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Ecological weeds		
EW-1	Ground covering ecological weeds smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species for control include tradescantia (<i>Tradescantia fluminensis</i>) and blackberry (<i>Rubus fruticosus</i>)	Entire KNE site
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include elderberry (<i>Sambucus nigra</i>) and Japanese spindle tree (<i>Euonymus japonicus</i>)	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 weed species include old man's beard (<i>Clematis vitalba</i>)	Entire KNE site
Pest animals		
PA-1	Possums (<i>Trichosurus vulpecula</i>) browse palatable canopy vegetation until it can no longer recover ^{13,14} . This destroys the forest's structure, diversity and function. Possums may also prey on native birds and invertebrates ¹⁵	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 ^{16,17}	Entire KNE site
PA-3	Mustelids (stoats ^{18,19} (<i>Mustela erminea</i>), ferrets ^{20,21} (<i>M. furo</i>) and weasels ^{22,23} (<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 ²⁴ , lizards ²⁵ and the eggs ²⁶ and chicks of ground-nesting birds ²⁷	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 ^{28,29}	Entire KNE site
PA-6	Feral, stray and domestic cats (<i>Felis catus</i>) prey on native birds ³⁰ , lizards ³¹ and invertebrates ³² , reducing native fauna breeding success and potentially causing local extinctions ³³	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 ³⁴ .	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 ³⁵	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-9*	Red deer (<i>Cervus elaphus</i>) and fallow deer (<i>Dama dama</i>) browse the forest understory and can significantly change vegetation composition by preferential browsing and preventing regeneration ^{36,37,38}	Entire KNE site
Human activities		
HA-1*	Agricultural practices, particularly grazing livestock can result in pugging soils, grazing native vegetation inhibiting regeneration, wildlife disturbance and increasing nutrient content of soils and watercourses ³⁹	Entire KNE site
HA-2*	Barriers to native fish passage are present in streams within the KNE site preventing migrating fish from completing their life-cycle	Entire KNE site
HA-5*	Dogs (<i>Canis lupus familiaris</i>), if uncontrolled/unleashed can disturb or kill nesting birds and chicks, and lizards within the KNE site, particularly in close proximity to walking tracks ⁴⁰	Entire KNE site
Other threats		
OT-1*	Fragmentation of the forest remnants and associated edge effects alter the ability of the KNE to regenerate effectively by 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) ^{41,42}	Entire KNE site

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

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

8. Vision and objectives

8.1. Vision

The Kourarau Valley forest fragments are managed to protect and restore their rare ecosystem and biodiversity values.

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 Kourarau Valley forest fragments KNE site.

1. **To restore the structure and function of native plant communities**
2. **To protect native wildlife from predation**
3. **To expand the threatened plant populations and habitats**
4. **To support and advise landowners on restoration and land retirement opportunities**

9. Operational activities

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

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

9.1. Ecological weed control

The aim of ecological weed control undertaken at the KNE site is to maintain the existing native biodiversity values and facilitate the development of a more natural structure and functioning ecosystem. This work will be undertaken by Greater Wellington Biosecurity.

Control of ground-covering pest plants such as tradescantia will be done using herbicide in several areas across the KNE site, in particular the Waimana and Dandaloo sites.

Woody weed control work of species such as Japanese spindle tree will be done using herbicide in several areas across the KNE site, such as Koromiko.

Control of climbing species such as Old man's beard will be done using herbicide in several areas across the KNE site, in particular the Waimana and Kouratahi sites.

Surveillance for other weed species will be undertaken while controlling known species and infestations, and as progress is made on these species then as resources allow, other species may be prioritised and control carried out.

9.2. Pest animal control

Pest animal control is critical to protecting the wildlife present in this KNE site.

A multi-species approach to predator control is being taken following best practice⁴³, using a range of management methods. A trap and bait station network designed to control possums, mustelids, feral cats and hedgehogs was installed in 2019 by Greater Wellington Biosecurity. At each location is a Sentry bait station baited with anticoagulant bait and DOC250 and Timms kill-traps (see Appendix 1, Map 3). This control network is serviced on a monthly basis by Greater Wellington Biosecurity.

9.3. Seed collection and revegetation

In order to help facilitate regeneration and expansion of the threatened ecosystem, Greater Wellington will develop a seed collection and revegetation plan for the KNE site and seek funding to enable its implementation within the timescale of this KNE plan.

9.4. Advice and support for landowners

Given there are still significant areas of modified native forest and parts of Kourarau Stream that remain unfenced (such as on Koromiko and Dandaloo), Greater Wellington will continue to advise and support individual landowners on any riparian and/or forest retirements. This support could entail working with Greater Wellington's Land Management department to access additional funding sources for fencing, native planting, water reticulation and weed control based on the vision and objectives of this plan through their Farm Environment Plans.

10. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Kourarau Valley forest fragments KNE site, and their timing and cost over the five-year period from 1 July 2019 to 30 June 2024. The budget for years 2020/21 to 2023/24 are indicative only and subject to change. A map of operational areas can be found in Appendix 1 (Map 2).

Table 4: Five-year operational plan for the Kourarau Valley forest fragments KNE site

Objective	Threat	Activity	Delivery	Description/detail	Target	Annual resourcing
1, 3	EW-1, 2, 3	Ecological weed control	GWRC Biosecurity	Control of ecological weed species throughout these areas	Improved condition of the forest fragments	\$5,000
2, 3	PA-1, 3, 4, 6	Pest animal control	GWRC Biosecurity	Traps and bait stations serviced on a monthly basis	Increased native wildlife and seed dispersal	\$6,200
3	OT- 1	Seed collection and revegetation	GWRC Biodiversity	GW to develop and start implementing a seed collection, propagation and revegetation plan for the KNE site	Safeguard important genetic materials and contribute to the regeneration of the fragments	Funding TBC
4	OT- 1, HA- 1, PA- 9	Advice and support for landowners	GWRC Biodiversity	Ongoing advice and support for landowners on land retirements and funding opportunities	Increased areas of protected habitats	n/a
Total						\$11,200

11. Funding contributions

11.1. Budget allocated by Greater Wellington

The budget for the years 2020/21 and 2023/24 are indicative only and subject to change.

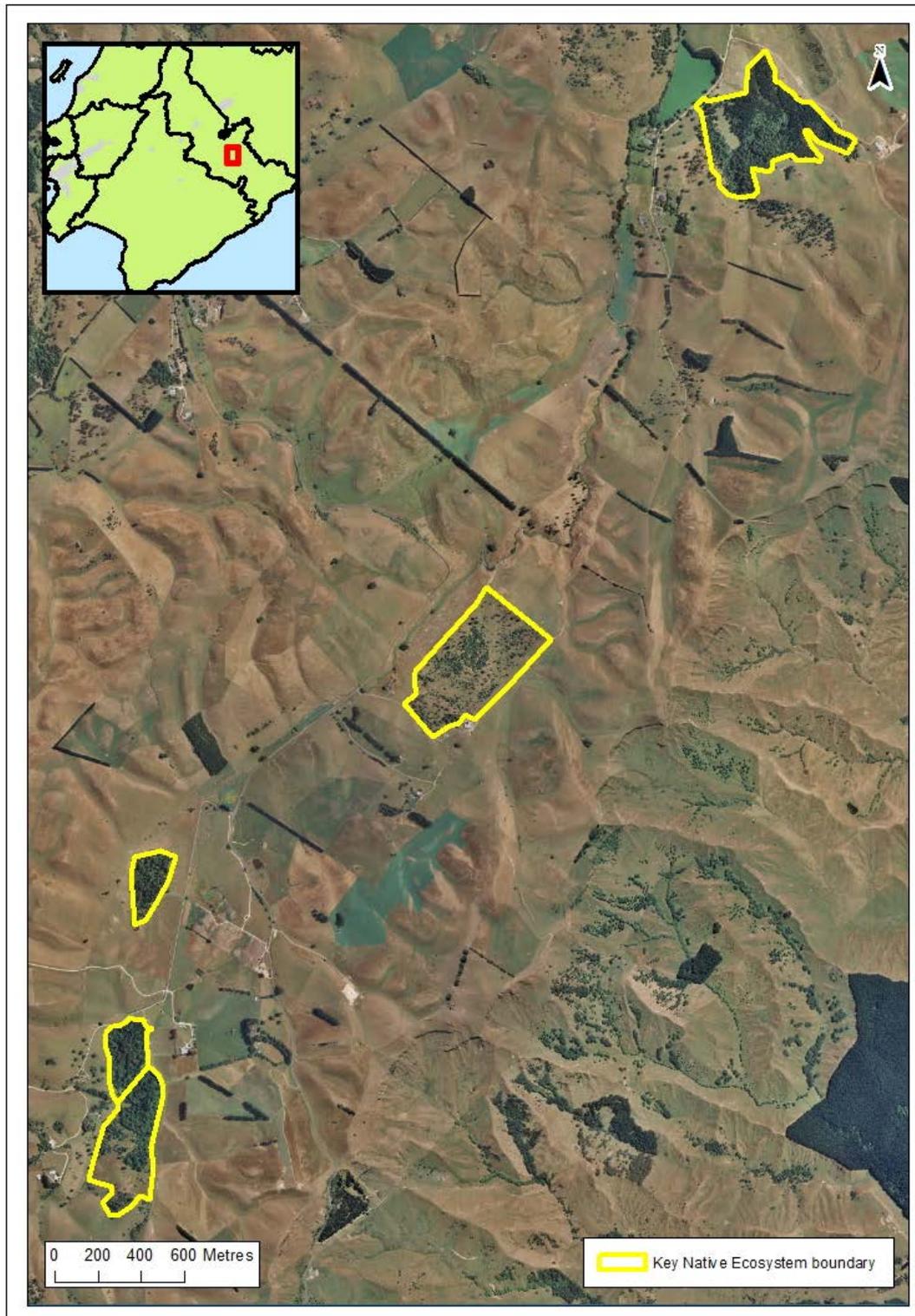
Table 5: Greater Wellington allocated budget for the Kourarau Valley forest fragments KNE site

Management activity	Timetable and resourcing				
	2019/20	2020/21	2021/2022	2022/23	2023/24
Ecological weed control	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
Pest animal control	\$6,200	\$6,200	\$6,200	\$6,200	\$6,200
Total	\$11,200	\$11,200	\$11,200	\$11,200	\$11,200

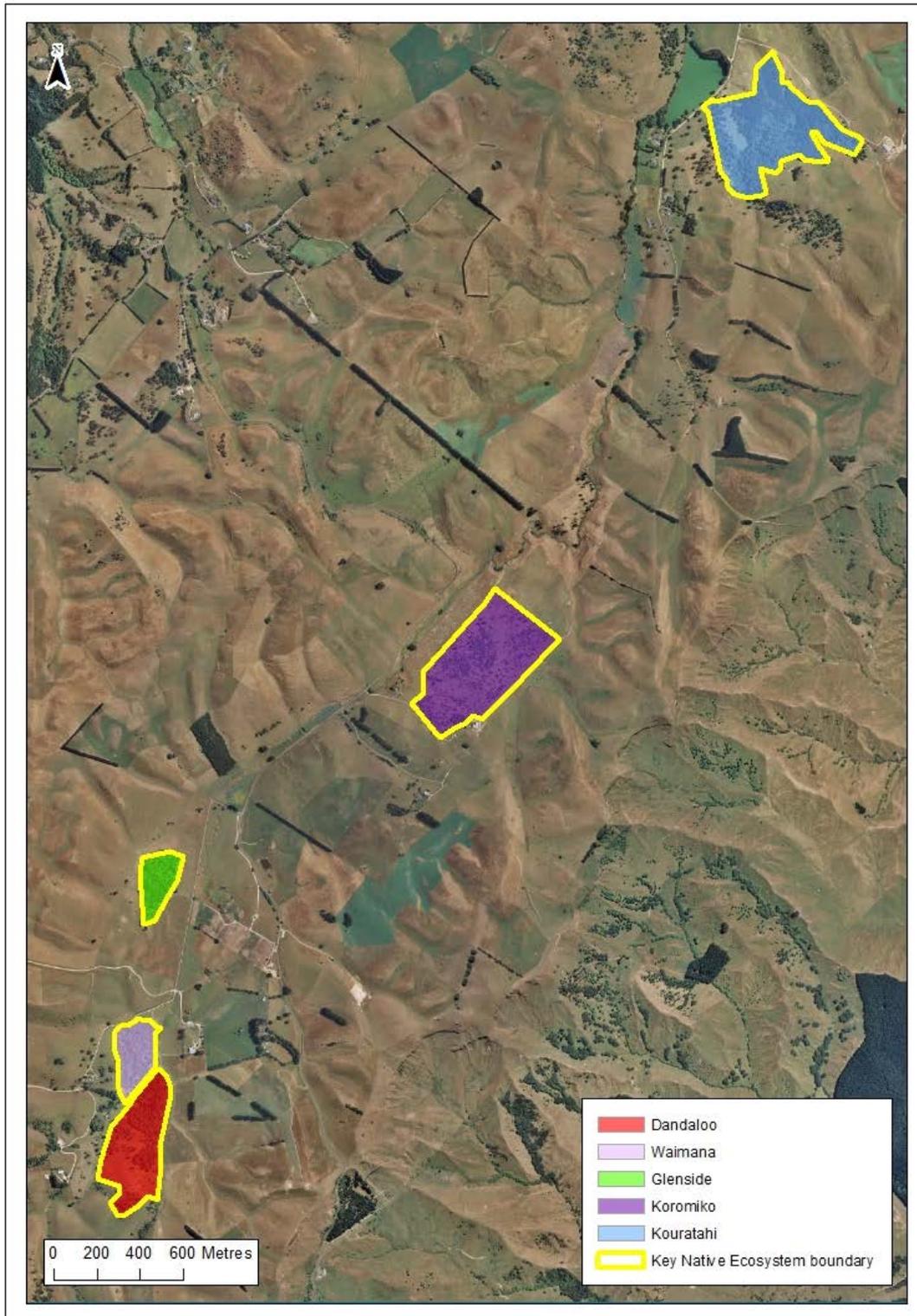
12. Future opportunities

There are numerous potential opportunities for landowners and iwi to be involved in biodiversity management in this area. Greater Wellington would welcome and support any landowner involvement in identified activities within this KNE plan.

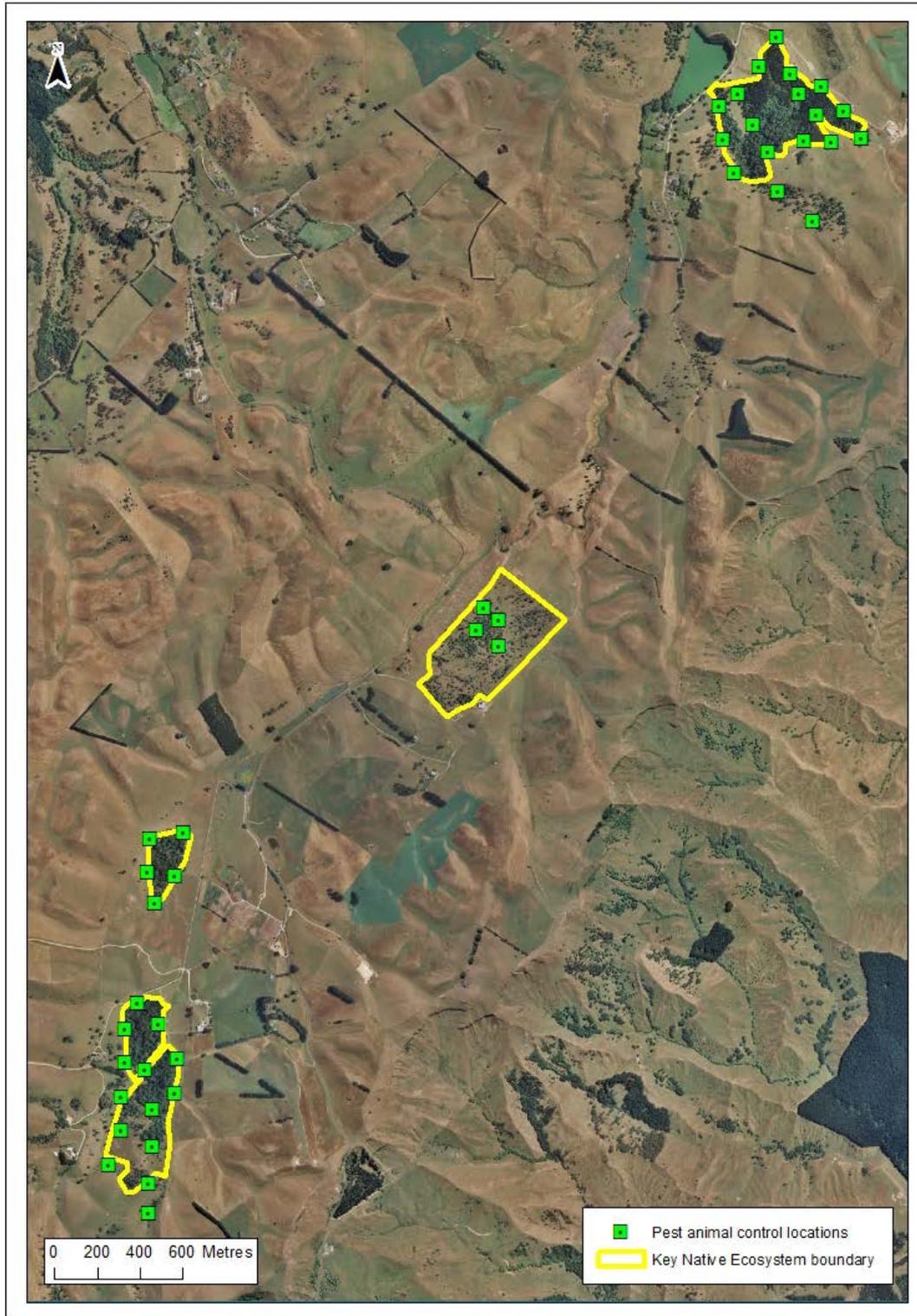
Appendix 1: Site maps



Map 1: The Kourarau KNE site boundary



Map 2: Landowner boundaries and operational areas in the Kourarau KNE site



Map 3: Pest animal control locations in the Kourarau 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 cycle⁴⁴. 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 Kourarau KNE site.

Table 6: Threatened and At Risk species at the Kourarau KNE site

Scientific name	Common name	Threat status	Observation
Plants(vascular) ⁴⁵			
<i>Coprosma virescens</i>		At Risk – Declining	Sawyer et al 1998 ⁴⁶
<i>Coprosma wallii</i>		At Risk – Declining	Sawyer et al 1998
<i>Neomyrtus pedunculata</i>		Threatened – Nationally Critical	Sawyer et al 1998
<i>Olearia gardneri</i>		Threatened – Nationally Endangered	Sawyer et al 1998
<i>Tupeia antarctica</i>	Pirita; white mistletoe	At Risk – Declining	Sawyer et al 1998

Appendix 3: Regionally threatened plant species list

The following table lists regionally threatened species that have been recorded in the Kourarau KNE site. Native plant species have been identified in the Plant Conservation Strategy, Wellington Conservancy 2004-2010⁴⁷.

Table 7: Regionally threatened plant species recorded in the Kourarau KNE site

Scientific name	Common name	Threat status	Observation
Plants			
<i>Botrychium biforme</i>	Parsley fern	Gradual decline	Enright et al 1998 ⁴⁸
<i>Kothalsella lindsayi</i>	Dwarf mistletoe, leafless mistletoe	Sparse	Enright et al 1998

References

- ¹ New Zealand legislation. 1991. Resource Management Act 1991.
- ² Greater Wellington Regional Council. Greater Wellington Regional Council Long Term Plan: 2018 – 2028.
- 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 Department of Conservation. 1987. Ecological Regions and Districts of New Zealand.
- ⁵ Greater Wellington Regional Council. 2015. Proposed Natural Resources Plan. P. 299.
- ⁶ 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.
- ⁷ Singers N, Crisp P, Spearpoint O. 2018. Forest ecosystems of the Wellington Region. Publication no. GW/ESCI-G-18-164. Greater Wellington Regional Council.
- ⁸ New Zealand Threat Classification System (NZTCS) <http://www.doc.govt.nz/about-us/science-publications/conservation-publications/nz-threat-classification-system/>
- ⁹ Beadel SM, Bibby CJ, Perfect AJ, Rebergen A, Sawyer J. 2004. Eastern Wairarapa Ecological District. Survey Report for the Protected Natural Areas Programme. Department of Conservation.
- ¹⁰ Enright P, John O, Beveridge P. 1998. Vascular plants in a bush patch at Kouratahi.
- ¹¹ Smith R, 2017. Pers. comm.
- ¹² Young A, Mitchell N. 1994. Microclimate and vegetation edge effects in a fragmented podocarp-broadleaf forest in New Zealand. *Biological Conservation* 67: 63-72.
- ¹³ 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.
- ¹⁴ 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.
- ¹⁵ 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.
- ¹⁶ 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.
- ¹⁷ Innes JG. 2005. Ship rat. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 187–203.
- ¹⁸ 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.
- ¹⁹ King CM and Murphy EC. 2005. Stoat. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 261–287.
- ²⁰ 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.
- ²¹ Clapperton BK, Byron A. 2005. Feral ferret. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 294–307.
- ²² King CM. 2005. Weasel. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 287–294.
- ²³ 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.
- ²⁴ 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.
- ²⁵ 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.

-
- ²⁶ 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.
- ²⁷ 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.
- ²⁸ Ruscoe WA, Murphy EC. 2005. House mouse. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 204–221.
- ²⁹ 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.
- ³⁰ 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.
- ³¹ 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.
- ³² 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.
- ³³ Gillies C, Fitzgerald BM. 2005. Feral cat. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 308–326.
- ³⁴ Norbury G, Flux JEC. 2005. Brown hare. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 151–158.
- ³⁵ 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.
- ³⁶ Stewart GH, Wardle JA and Burrows LE. 1987. Forest understory changes after reduction in deer numbers, Northern Fiordland, New Zealand. *New Zealand Journal of Ecology* 10: 35–42.
- ³⁷ Nugent G, Fraser W. 2005. Red deer. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 401–419.
- ³⁸ Nugent G, Asher G. 2005. Fallow deer. In: King CM ed. *The handbook of New Zealand mammals*. Oxford University Press. Pp. 447–459.
- ³⁹ 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.
- ⁴⁰ Holderness-Roddam B. 2011. The effects of domestic dogs (*Canis familiaris*) as a disturbance agent on the natural environment. Thesis submitted at University of Tasmania, Hobart.
- ⁴¹ Young A, Mitchell N. 1994. Microclimate and vegetation edge effects in a fragmented podocarp-broadleaf forest in New Zealand. *Biological Conservation* 67: 63–72.
- ⁴² Norton DA. 2002. Edge effects in a lowland temperate New Zealand rainforest. DOC Science Internal Series 27. Department of Conservation, Wellington.
- ⁴³ O'Donnell CFJ, Hoare JM. 2012. Quantifying the benefit of long-term integrated pest control for bird populations in a New Zealand temperate rainforest. *New Zealand Journal of Ecology* 36(2): 131–140.
- ⁴⁴ Department of Conservation. 2008. *New Zealand Threat Classification System manual*.
- ⁴⁵ de Lange PJ, Rolfe JR, Barkla JW, Champion PD, Courtney SP, Heenan PB, Hitchmough RA, Perrie LR, Beadel SM, Ford KA, Breitwieser I, Schonberger I, Hindmarsh-Walls R, Ladley K. 2017. Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series* 22. 86 p.
- ⁴⁶ Sawyer JWD, Townsend AJ, Beadel SM, de Lange PJ, Shaw WB. 1998. *Plants of national conservation concern in Wellington conservancy*. Department of Conservation, Wellington.
- ⁴⁷ Sawyer JWD. 2004. *Plant conservation strategy, Wellington Conservancy (excluding Chatham Islands), 2004–2010*. Department of Conservation, Wellington. 91 p.
- ⁴⁸ Enright P, John O, Beveridge P. 1998. *Vascular plants in a bush patch at Kouratahi*.

Greater Wellington Regional Council:

Wellington office
PO Box 11646
Manners Street
Wellington 6142

T 04 384 5708
F 04 385 6960

Upper Hutt office
PO Box 40847
Upper Hutt 5018

T 04 526 4133
F 04 526 4171

Masterton office
PO Box 41
Masterton 5840

T 06 378 2484
F 06 378 2146

Follow the Wellington
Regional Council



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

April 2020
GW/BD-G-19/28



Please recycle
Produced sustainably