

Key Native Ecosystem Operational Plan for Pākuratahi Forest

2022-2027



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1. Purpose

The purpose of the five-year Key Native Ecosystem (KNE) Operational Plan for Pākuratahi Forest 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

Under the Resource Management Act 1991 (RMA)¹ Regional Councils have 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 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, the Regional Pest Management Plan 2019-2039 (RPMP)⁵ and Toitū Te Whenua Parks Network Plan⁶.

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 commonplace	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. Pākuratahi Forest Key Native Ecosystem site

The Pākuratahi Forest KNE site (7,180 ha) is a large area of mature native forest located on the western side of the Remutaka Ranges. It occupies the Pākuratahi and part of the Kaitoke basin catchments (see Appendix 1, Map 1).

Pākuratahi Forest is an important ecological site in the region because it contains multiple ecosystem types with continuous connections between them. Six different forest types, plus wetlands and sub-alpine tussock lands are present in the KNE site.

While most of the forest ecosystem types present are not threatened, the KNE provides a representative example of each, especially silver beech and red beech-silver beech forest types. It is the southern-most extent of red beech in the region and is one of the few sites in the region where four beech species can be found. Ladle Bend wetland is a representative manuka, swamp coprosma wetland.

There are a large number of regionally and nationally threatened plant species present and a large variety of native forest bird populations, including whitehead, rifleman, and tomtit. The Pākuratahi River provides significant habitat for several freshwater fish species including dwarf galaxids, Cran's bully and redfin bully.

5. Parties involved

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

5.1. Landowner

The Pākuratahi Forest KNE site is entirely owned by Greater Wellington and managed by Greater Wellington's Parks department as the Pākuratahi Regional Park. The regional park's management is guided by Toitū Te Whenua that guides the recreational and amenity uses of the park and identifies biodiversity protection and enhancement measures.

This KNE operational plan is consistent with the wider objectives and policies of Toitū Te Whenua. The Biodiversity and Parks departments will work collaboratively to efficiently deliver the activities in these plans.

The regional park has primarily been retained as a future water collection area to ensure it is protected as a sustainable source of secure, fresh and clean water for potential future use. However, the regional park is also managed to ensure the protection of biodiversity and heritage values, and to provide a range of recreational opportunities and production forestry.

5.2. Operational delivery

Within Greater Wellington, three departments are involved in delivering the Pākuratahi Forest KNE operational plan.

- 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 programme budget funds the coordination of pest control activities.
- The Biosecurity department coordinates and implements ecological weed and pest animal control measures at the KNE site.
- The Parks department primarily manages recreational access and maintains assets such as roads, tracks and amenity areas within the KNE site. The Park Ranger is the primary contact for volunteers and contractors.

Pest Free Upper Hutt volunteers recently re-established pest control in the Tunnel Gully area of the KNE site. This builds on the possum control the Upper Hutt branch of the Forest and Bird Protection Society carried out in the Tunnel Gully area from 2007 until 2016.

5.3. Mana whenua partners

Greater Wellington has six mana whenua partners within the region and is committed to exploring opportunities on how they wish to be involved in KNE operational plan development or operational delivery of KNE activities.

Ngāti Toa Rangātira and Taranaki Whānui ki Te Upoko o Te Ika retain mana whenua over the land within the KNE site and their representative Trusts are considered mana

whenua partners at this KNE site. Both iwi have strong ties to Te Awa Kairangi (Hutt River) and all its tributaries including the Pākuratahi River.

Māori sites of significance are limited within the Pākuratahi Forest KNE site as there were few early permanent Māori settlements in the area. However, Māori have a strong association with the area as they often travelled through the area to Wairarapa.

Greater Wellington is aware that Wairarapa-based iwi; Ngāti Kahungunu ki Wairarapa and Rangitane ō Wairarapa have adopted a watching brief on their interests in the Pākuratahi Regional Park⁷.

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 Pākuratahi Forest KNE site.

Table 1: Designations at the Pākuratahi Forest KNE site

Designation level	Type of designation
National	Part of the KNE site is designated as a Scientific Reserve: <ul style="list-style-type: none"> Two land parcels within the KNE site are gazetted as Scenic Reserve
Regional	Parts of the KNE site are designated under GW's proposed Natural Resources Plan as a: <ul style="list-style-type: none"> River with Significant Indigenous Ecosystems – habitat for threatened and at-risk fish species (Schedule F1): The Pākuratahi River and all tributaries River with Significant Indigenous Ecosystems – habitat with high macroinvertebrate community health (Schedule F1): The Pākuratahi River and all tributaries Significant Natural Wetland (Schedule F3): Ladle Bend Wetland
District	Part of the KNE site has been designated within UHCC's District Plan ⁸ for its high ecological, visual and/or landscape values: <ul style="list-style-type: none"> Southern Hills Overlay Area (Development or the removal of vegetation has the potential to significantly impact on the identified values)

6.2. Ecological significance

The Pākuratahi Forest 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 within the KNE site
- Its **ecological context** is valuable at the landscape scale as it contains a variety of large, intact and inter-connected habitats and provides core habitat for threatened indigenous plant and animal species.

Representativeness

The Singers and Rogers (2014)⁹ classification of pre-human vegetation indicates the Pākuratahi Forest KNE site contains six original forest ecosystem types that are still highly representative examples of these original ecosystem types. The present vegetation cover is largely unmodified in the Pākuratahi headwaters to the south, and a mosaic of original and regenerating podocarp remnants and scrub in the north.

While most of the forest ecosystem types present are not threatened, the KNE provides a representative example of each, especially silver beech and red beech forest types.

Two of the forest ecosystem types present are now considered regionally threatened, having less than 30% of the pre-human extent remaining in the region. They are tawa, kamahi, podocarp forest (MF7) and hard beech forest (MF20). There is now only 22.5% and 26% respectively of the pre-human extent of these forest types remaining in the Wellington region¹⁰.

Rarity/distinctiveness

The KNE site includes Ladle Bend Wetland, a mānuka (*Leptospermum scoparium*) dominated bog. Wetlands are now considered an uncommon habitat type in the Wellington region with less than 3% of their original extent remaining¹¹.

New Zealand's national threat classification system lists many nationally 'Threatened' or 'At Risk' plant, bird, fish, lizard and invertebrate species within the KNE site. Appendices 2 and 3 contain lists of nationally and regionally threatened species found within the KNE site.

Diversity

The Pākuratahi KNE site comprises six different forest ecosystem types as well as a sub-alpine scrub ecosystem at higher altitudes. These ecosystem types are red beech, podocarp forest (CLF9); red beech, silver beech forest (CLF10); silver beech forest (CLF11-2); black beech forest (MF5); tawa, kamahi, podocarp forest (MF7); hard beech forest (MF20); and olearia, pseudopanax, dracophyllum scrub (sub-alpine scrub) (CDF6).

Ecological context

The Pākuratahi forest is contiguous with the Remutaka Forest Park to the east and south and the Hutt Water Collection Area to the north linking to the Tararua ranges. This provides an important ecological corridor as well as providing core breeding habitat for a large assemblage of forest bird species and threatened plant species that includes the only areas of snow tussock in the Remutaka ranges.

6.3. Ecological features

The Pākuratahi KNE site is located within the Tararua Ecological District¹². The KNE site is characterised by steep to very steep, dissected hill country rising to 860m at Mt Climie. Rainfall is high with an annual mean of about 2,200mm falling in the main valleys. The site has a sheltered north-easterly aspect; however, strong north-westerly and south-easterly winds occur on exposed faces and ridgelines. A belt of sheared Torlesse greywacke underlies the Pākuratahi area. The greywacke has been folded and lifted by tectonic forces and volcanic and ocean floor material such as basalt, chert and limestone has been incorporated into the rock.

Vegetation communities and plants

Although the KNE site contains a multitude of forest types and vegetation associations, the site can be separated into four broad geographical areas. These are described below and shown on Map 2 in Appendix 1.

Pākuratahi north

In this northern most area of the KNE site the vegetation is largely regenerating native forest and scrub, on a rolling to steep amphitheatre-shaped piece of land on the eastern side of the Pākuratahi basin. Some areas that have suffered fire damage in the recent past here are good examples of successional sequences. A small area of original forest remains between Farm Creek and the northern boundary. Emergent tree species present include hard beech (*Fuscospora truncata*), rimu (*Dacrydium cupressinum*), kahikatea (*Dacrycarpus dacrydioides*) and rewarewa (*Knightia excelsa*), while silver beech (*Lophozonia menziesii*) is found on the ridgelines. The regionally rare southern rātā (*Metrosideros umbellata*) is also found here. The area known as the “Puffer” is a nationally recognised ground orchid site with over 30 species of orchid having been recorded there.

Pākuratahi River valley (Remutaka Rail Trail area)

The vegetation in the middle section of the Pākuratahi River valley where the rail trail passes through the site is now a mosaic of regenerating scrubland and forest, small pockets of original forest. This area is interspersed with areas of radiata pine plantations which aren't included in the KNE site.

Four areas of notable vegetation and a wetland are located within this zone. They are known as Rifle Range Bush, Pākuratahi Terrace Bush, Rimutaka Bush A and B, and Ladle Bend Wetland.

Rifle Range Bush is a remnant of podocarp/broadleaf/hard beech forest. It contains a significant area of swamp maire (*Syzygium maire*), a once common, but now rare species in the Kaitoke/Upper Hutt district.

Pākuratahi Terrace Bush contains kahikatea, hard beech, black maire (*Nestegis cunninghamii*), rātā, rewarewa and swamp maire as canopy emergents. This small remnant provides an important seed source to the surrounding regenerating forest.

Rimutaka Bush A and B contain excellent stands of red beech (*Fuscospora fusca*) forest. Hard, silver and black beech (*Fuscospora solandri*) are also present.

Ladle Bend Wetland is a 1.5 ha rain-fed wetland (bog) dominated by manuka. There is no open water but the area is probably subject to occasional flooding. Two distinct communities make up the wetland: a less boggy region with dense manuka and a wetter region with grass, sedge and sphagnum where the manuka is less dense.

Tunnel Gully to Mt Climie

A large pocket of original forest remains at Tunnel Gully, while the rest of this area is a mosaic of mixed scrub and regenerating bush. The original forest is the only example of podocarp-tawa forest on alluvial terrace left in the region. Large terrestrial rātā and both swamp and black maire are found in this forest.

The road to Mt Climie demonstrates the altitudinal vegetation sequence for the Hutt Valley. It is one of the only places in the region that this sequence can be easily accessed. At Tunnel Gully (altitude 200m) northern rātā (*Metrosideros robusta*), rimu, mataī (*Plumnopitys taxifolia*), kahikatea and pukatea (*Laurelia novae-zealandiae*) emerge above a canopy of tawa (*Beilschmiedia tawa*), hinau (*Elaeocarpus dentatus*), rewarewa and kāmahi (*Weinmania racemosa*). Above this lowland forest a mixed

podocarp/broadleaf with beech mixture forms an intermediate band before the beech forest proper. In this band miro (*Plumnopitys ferruginea*) and Hall's tōtara (*Podocarpus hallii*) become more abundant, and rimu and rātā become less common. Beech trees appear on ridge crests and spurs. This forest type covers the lower slopes and fertile valley floors between 400-500m.

With increasing altitude, the podocarp/broadleaf forest gradually gives way to beech forest. Moisture loving kamahi become abundant and cold hardy species such as horopito (*Pseudowintera colorata*), stinkwood (*Coprosma foetidissima*) and tree fuchsia (*Fuchsia excorticata*) become common. Black and hard beech are restricted to dry infertile sites, while red beech is found on slightly more fertile and moist sites. The Pākuratahi KNE site is the southern limit for red beech in the Wellington region.

Above 550m, as soils become less fertile, temperature falls and rainfall increases, silver beech increasingly predominates. Mountain cabbage tree (*Cordyline indivisa*) appears and *Astelia* spp. become more common on the forest floor. By 700m the canopy is almost entirely silver beech. Haumakaroa (*Raukaua simplex*) and horopito form the shrubby understory. Mountain five-finger (*Pseudopanax colensoi*) is found here – a species now rare in the region, due to it being a preferred food of browsing animals such as deer and possums.

Pākuratahi headwaters (south)

The sequence described in the previous section makes up the bulk of the vegetation of this large area of largely unmodified mature native forest. The regionally threatened perching kohukohu (*Pittosporum cornifolium*) and *Pimelea gnidia* are present here, as is the nationally at risk kohurangi/Kirk's daisy (*Brachyglottis kirkii* var. *kirkii*). A fire in the 1920's cleared the Mt Climie summit of forest and only a few scattered silver beech have returned. Sub-alpine and bog communities now predominate. A dense sward of *Astelia* sp. aff. *nervosa* spreads over the boggy ground, grasses such as mountain toetoe (*Cortaderia fulvida*) and *Chionachloa conspicua* are found on better draining areas, and areas of *Oreobolus* cushionfield are found with low emergent shrubs. The only area of snow tussock (*Chionachloa flavescens*) on the Remutaka Range is found at spot height 826m.

Species

Birds

Nineteen species of native bird have been recorded in the KNE site¹³. The site contains a large enough area of mature forest to support large breeding populations of all native forest bird species present in the region. Of particular note are the nationally threatened species rifleman (*Acanthisitta chloris*), New Zealand falcon (*Falco novaeseelandiae*) and New Zealand pipit (*Anthus novaeseelandiae*). In addition, the KNE site also supports species such as tomtit (*Petroica macrocephala*) and whitehead (*Mohoua albicilla*) that are now uncommon to the region.

Reptiles

Barking gecko (*Naultinus punctatus*) is the only lizard species that has been recorded in the KNE site, but it is likely that ngahere gecko (*Mokopirirakau* "southern North Island"),

northern grass skink (*Oligosoma polychroma*) and ornate skink (*O. ornatum*) are also present, as these species have been recorded nearby in similar habitat¹⁴.

Fish

Five species of native fish have been recorded within the Pākuratahi KNE site. These are longfin eel (*Anguilla dieffenbachia*), dwarf galaxid (*Galaxias divergens*), kōaro (*Galaxias brevipinnis*), redfin bully (*Gobiomorphus huttoni*) and Cran's bully (*Gobiomorphus basalis*). All but Cran's bully are classified as At-Risk – Declining¹⁵.

Shortfin eel (*Anguilla australis*), bluegill bully (*Gobiomorphus hubbsi*) and upland bully (*Gobiomorphus breviceps*) have been recorded in the Pākuratahi River downstream of the KNE site boundary¹⁶. However, as there are no barriers to fish passage in the main river channel, it is possible that these species are also present within the KNE site.

Invertebrates

Twelve species of indigenous snails were found in the leaf litter of the wetland in 2000¹⁷.

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 Pākuratahi Forest KNE site.

7.1. Key threats

The most significant threats to the ecological values of Pākuratahi KNE site come from a range of ecological weeds, browsing and predatory pest animals, and the potential impacts of some management and recreational activities.

Ecological weeds are prevalent and widespread throughout the northern half of the KNE site, with the densest known infestations concentrated in discrete locations. Often, these are sites of historic interest or present human activity. Wilding pines, primarily *Pinus radiata* and *Pinus contorta* are the most significant and widespread ecological weeds within the KNE site spreading from existing or abandoned commercial forestry stands. In addition, gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) pose a significant threat to sensitive sub-alpine (snow) tussock land habitat along the Mt Climie ridgeline. Weeds are also a significant threat to the integrity of the wetland ecosystems and watercourses within the KNE site.

There are several pest animal species known to exist within the KNE site. The species considered to pose the greatest threat to the ecological values of the KNE site are possums (*Trichosurus vulpecula*), feral goats (*Capra hircus*), rats (*Rattus* spp.) and stoats (*Mustela erminea*).

8. Vision and objectives

8.1. Vision

The native ecosystems within the KNE site support a diverse range of native flora and fauna and support a healthy, sustainable source of secure, fresh, clean water. Emergent trees are common across the forest, indigenous birds are thriving, and the ecosystem function of the wetland and river systems is high.

8.2. Objectives

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

The following objectives will guide the operational activities at the Pākuratahi KNE site.

1. Protect the integrity of the natural wetland and main riverine ecosystems
2. Protect and enhance the integrity of the indigenous forest cover
3. Maintain the values of the uncommon ecosystems and habitat features within the KNE site, eg, snow tussock-lands and rātā forest

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).

9.1. Ecological weed control

Ecological weed control is targeted to maintain the integrity of the wetland and riverine ecosystems primarily whilst, protecting the sub-alpine forest/scrub cover from invasive *pinus* species. The following approaches are taken to planning and undertaking ecological weed control:

Multi-species control in wetlands, stream corridors and other uncommon ecosystems

Greater Wellington undertakes annual control of high impacting weed species within targeted high biodiversity value areas within the KNE site. These areas include Ladle Bend wetland, Maymorn wetland, Collins Creek stream corridor and the snow-tussock lands along the Climie ridgeline.

The ecological weeds listed in Appendix 4, will be controlled within these operational areas which are shown on Map 3.

Wilding pine control

Two ex-plantation stands of *Pinus contorta* are known within the KNE site at Maire Stream headwaters and along Marchant ridge. Greater Wellington will coordinate further control of *Pinus contorta* in these areas funded via the KNE programme and Biosecurity's RPMP funded work.

The Maire Stream operational area has previously been targeted for control between 2015-18. Whilst this operation has been successful further control is required in this operational area.

The Marchant Ridge operational area has not been targeted for control previously. It is likely that contractors will be required to 'drill and fill' trees progressively throughout the operational area over several years. This approach is aimed at minimizing impact on the native understorey regeneration that is currently present. Pines within two tree-lengths of the popular Marchant Ridge walking track will be left for felling at a later stage. Isolated groups of wilding pines near this area will also be controlled.

Surveillance of historic weed sites and back country areas

Ecological weed control has been undertaken in a coordinated approach since 2005. During this time, good progress has been made in reducing the density of weed infestations. However, follow up surveillance and control are required at all previous control sites to ensure that ecological weeds do not regenerate. These historic sites will be checked every other year by Greater Wellington.

Follow up surveillance and control is undertaken every second year at all previous control sites to ensure that ecological weeds do not regenerate.

During this operational plan an aerial surveillance flight for ecological weeds will be undertaken in the back country areas of the KNE site. The previous surveillance flight occurred in 2019. High impacting weeds identified will be mapped and programmed for

future control. To make the operation more feasible, it might be undertaken in conjunction with surveillance of other KNE sites with similar back country terrain.

9.2. Pest animal control

The purpose of pest animal control is to maintain the integrity of the overall forest cover and protect uncommon ecosystem types and habitat features from further degradation. This is achieved through the control of mammalian browsers; primarily possums and goats, with deer and pigs also controlled as encountered during targeted goat hunting operations. See pest animal operational areas map, Appendix 1, Map 4.

Aerially-sown 1080 operations

Possums are controlled by the use of aerially-sown 1080 (sodium fluoroacetate) throughout the majority of the KNE site, and some surrounding forestry plantation areas if feasible at the time.

Past monitoring results have shown aerial 1080 operations are likely to be needed every five to seven years to maintain the overall possum population density below 5% residual trap catch (RTC).

The last aerial possum control operation was carried out in 2017 by OSPRI's TBfree programme. Pending funding confirmation, an aerial 1080 operation will be undertaken as part of OSPRI's TBfree programme again in 2024.

Ground-based trapping

Pest Free Upper Hutt have recently re-established and started servicing a network of rat, possum and mustelids traps around the Tunnel Gully recreation area to protect the rare podocarp-tawa forest. These traps are serviced every two weeks by Pest Free Upper Hutt.

Greater Wellington has supported this trapping through the provision of traps for the network and advice on monitoring protocols. Pest Free Upper Hutt are continually looking to expand their pest control networks and will work with Greater Wellington on any developments to the network in and adjacent to the Tunnel Gully area.

Ungulate control

Feral goats are culled annually to suppress populations to levels that are considered low enough to only have negligible impacts on native plant regeneration. This involves targeting the areas of the KNE site that are most favoured by goats, while still checking other less favourable areas intermittently to ensure that any unanticipated population increases are controlled. Any feral deer or pigs encountered during goat culling operations will also be controlled as these species are known to adversely affect forest regeneration and function.

Feral goat culling operations utilise a combination of ground-based and aerial hunting methods to target areas most frequented by goats. Approximately 44 person-days of ground-based hunting and two hours of aerial hunting are planned to be undertaken annually.

9.3. Revegetation

Revegetation planting is undertaken on an ad hoc basis within the KNE site, in particular targeting areas along the rail trail corridor and in areas not going back into pine forest rotation once felled. The Parks department is largely responsible for coordinating these activities.

10. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Pākuratahi Forest KNE site, and their timing and cost over the five-year period from 1 July 2022 to 30 June 2027. The budget for years 2023/24 to 2026/27 are indicative only and subject to change. Maps of operational areas can be found in Appendix 1.

Table 2: Five-year operational plan for the Pākuratahi Forest KNE site

Objective	Activity	Operational area	Intended 5-year outcome	Implementing party	Timetable and resourcing where allocated				
					2022/23	2023/24	2024/25	2025/26	2026/27
1, 3	Multi-species weed control	Ladle bend and Maymorn wetlands, Collins Creek, Mt Climie surrounds	Protect and maintain integrity of these Priority wetlands and river corridors and sub-alpine ecosystem types	GW Biosecurity	✓ \$13,000	✓ \$13,000	✓ \$10,000	✓ \$13,000	✓ \$13,000
2	Ungulate control	Entire KNE site - operational areas to be determined an annually	Forest understorey and sub-canopy continues to regenerate	GW Biosecurity	✓ \$24,300	✓ \$24,300	✓ \$24,300	✓ \$24,300	✓ \$24,300
2, 3	Aerial weed surveillance	Historic sites and back country areas	Undertake surveillance for high priority weeds and map new incursions	GW Biosecurity	-	-	✓ \$3,000	-	-
2, 3	Wilding pine control	K and L	Protect valued sub-alpine ecosystems from pine incursions	GW Biosecurity	✓ \$20,000*	✓ \$20,000*	✓ \$20,000*	✓ \$20,000*	✓ \$20,000*
2	Multi-species predator control	Tunnel Gully Rec Area	Monthly servicing of ground-based poison bait stations to protect the rātā forest around Tane's track	Pest Free Upper Hutt	✓ \$300 bait provision	✓ \$300 bait provision	✓ \$300 bait provision	✓ \$300 bait provision	✓ \$300 bait provision

Objective	Activity	Operational area	Intended 5-year outcome	Implementing party	Timetable and resourcing where allocated				
					2022/23	2023/24	2024/25	2025/26	2026/27
2	Aerial 1080 operations	Entire KNE site	Possoms kept to low numbers across the landscape eliminating Tb and protecting the indigenous canopy cover	OSPRI's Tb free programme		✓ #			

* Comprises GW contributions from KNE programme (\$10,000) and Regional Pest Management Plan programme (\$10,000)

Externally funded through OSPRI's Tb free programme

11. Funding contributions

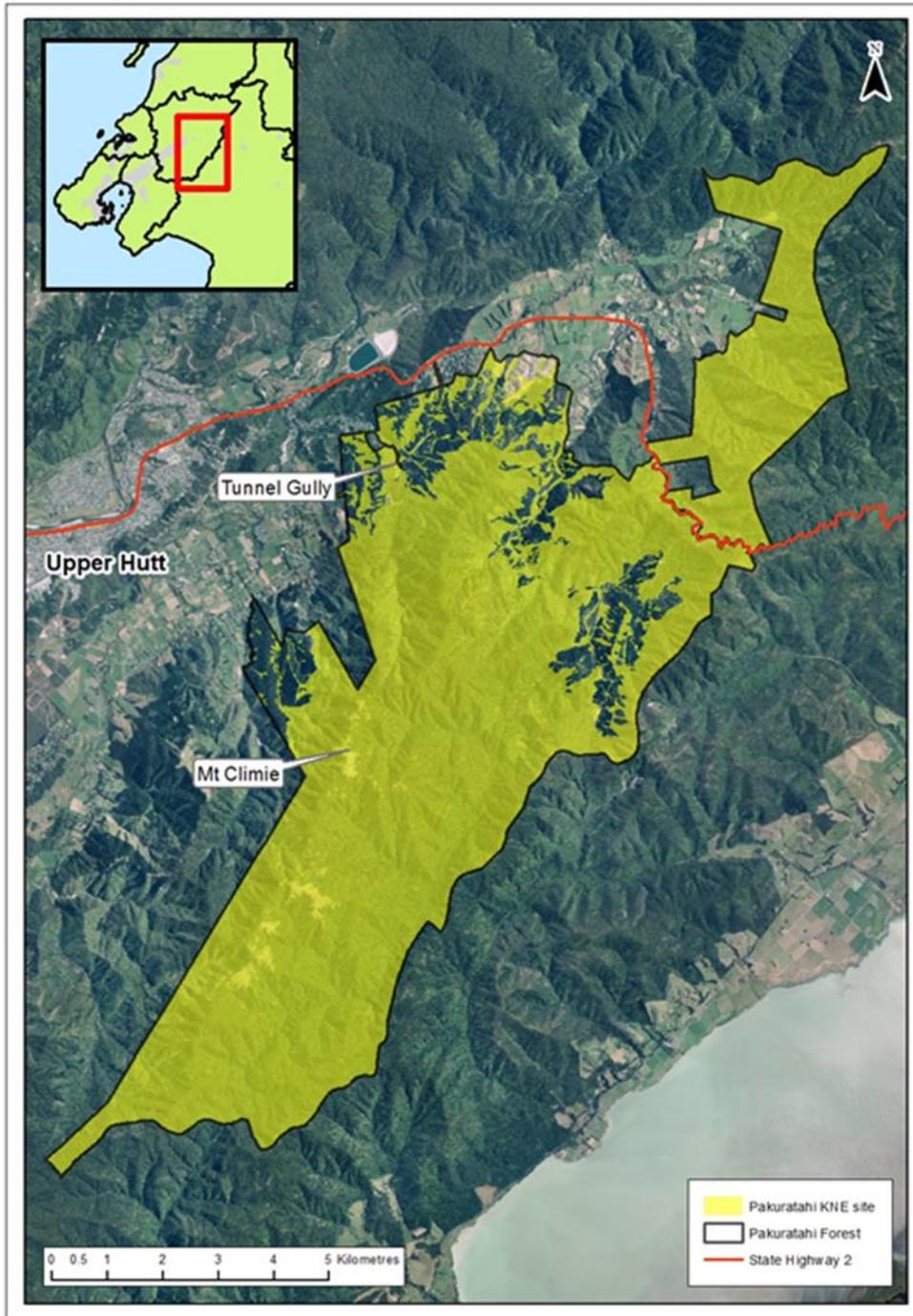
11.1. Budget allocated by Greater Wellington

The budget for the years 2023/24 to 2026/27 are indicative only and subject to change.

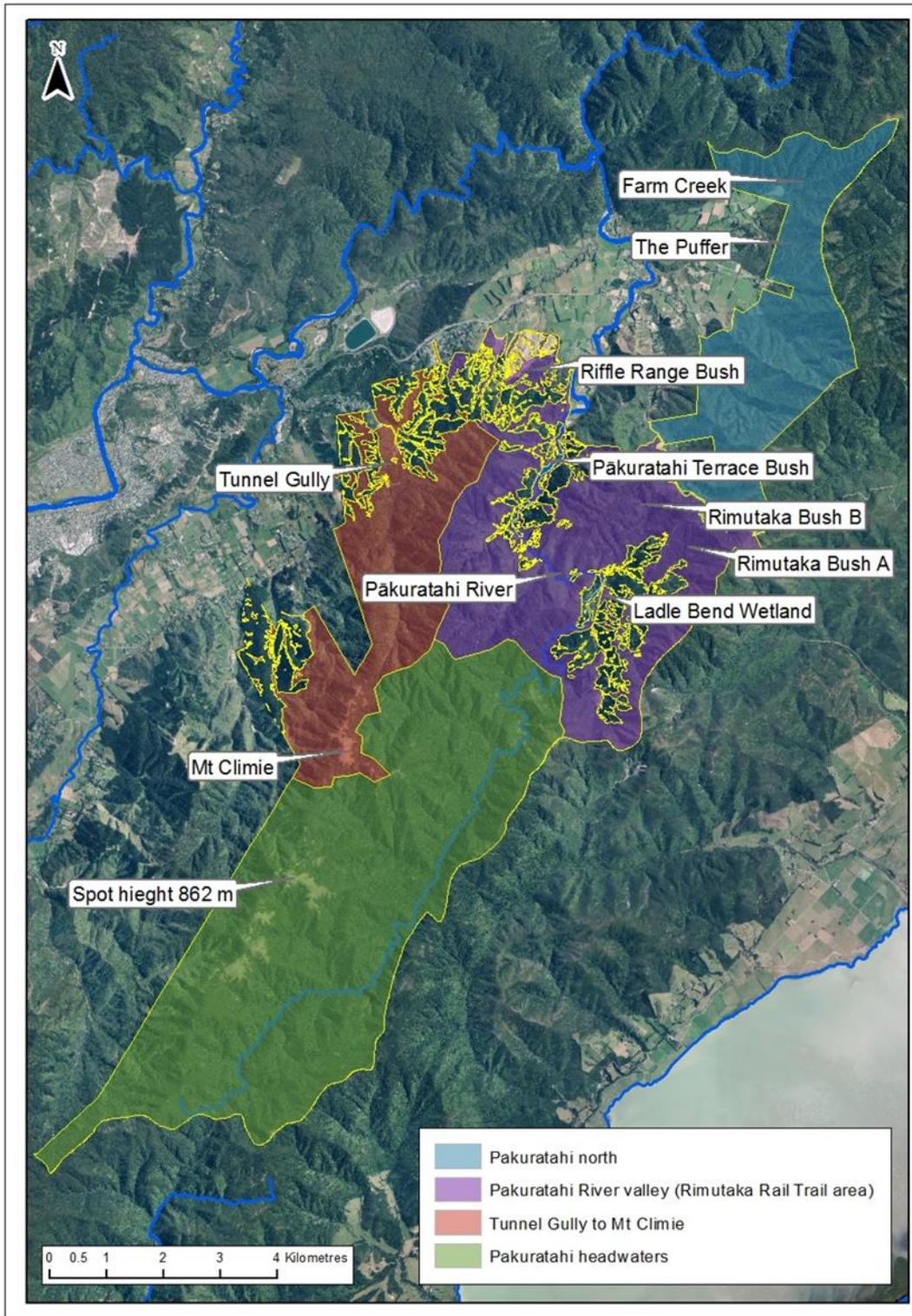
Table 3: Greater Wellington allocated budget for the Pākuratahi Forest KNE site

Management activity	Timetable and resourcing				
	2022/23	2023/24	2024/25	2025/26	2026/27
Ecological weed control	\$23,000	\$23,000	\$23,000	\$23,000	\$23,000
Pest animal control	\$24,600	\$24,600	\$24,600	\$24,600	\$24,600
Total	\$47,600	\$47,600	\$47,600	\$47,600	\$47,600

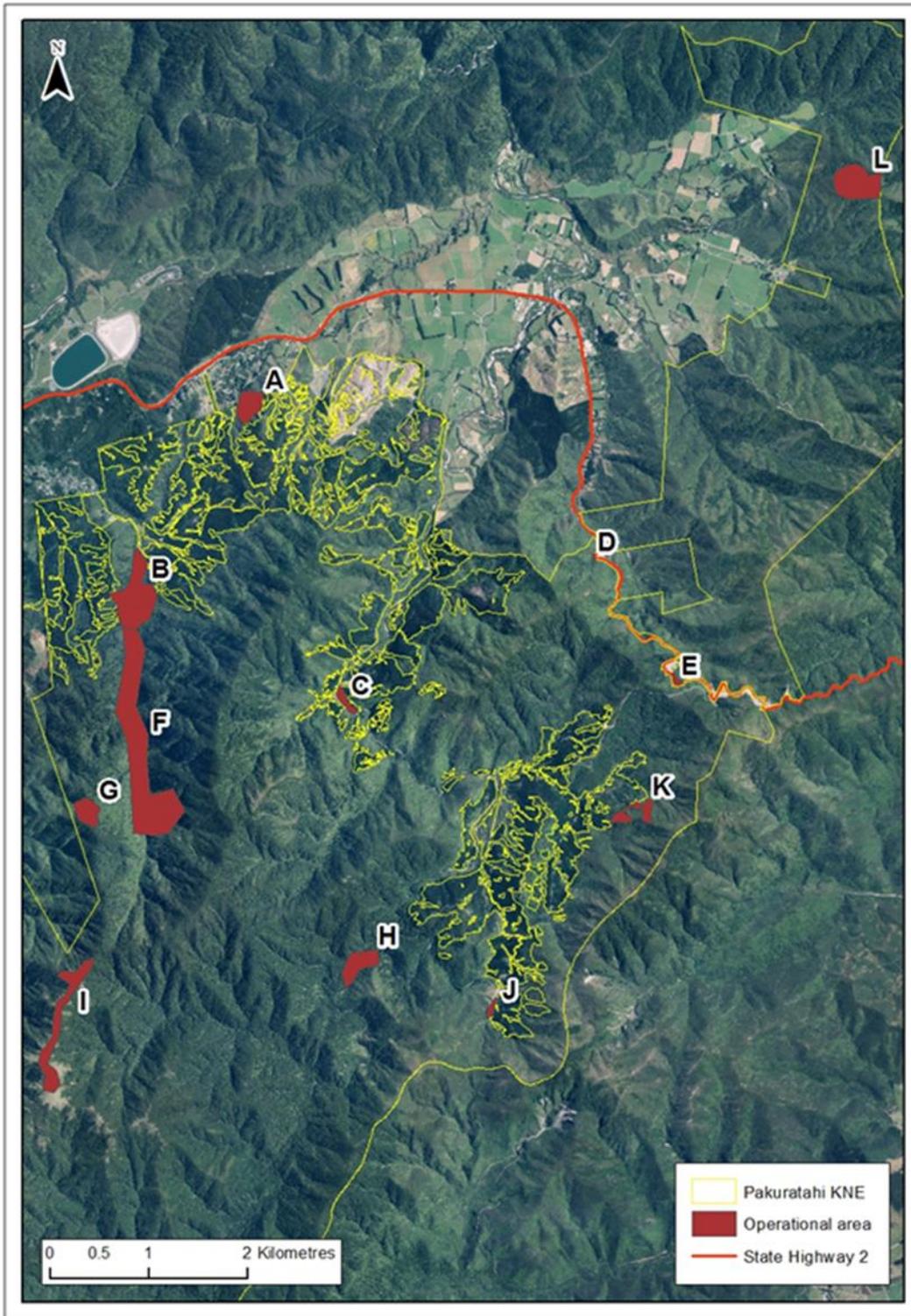
Appendix 1: Pākuratahi Forest KNE site maps



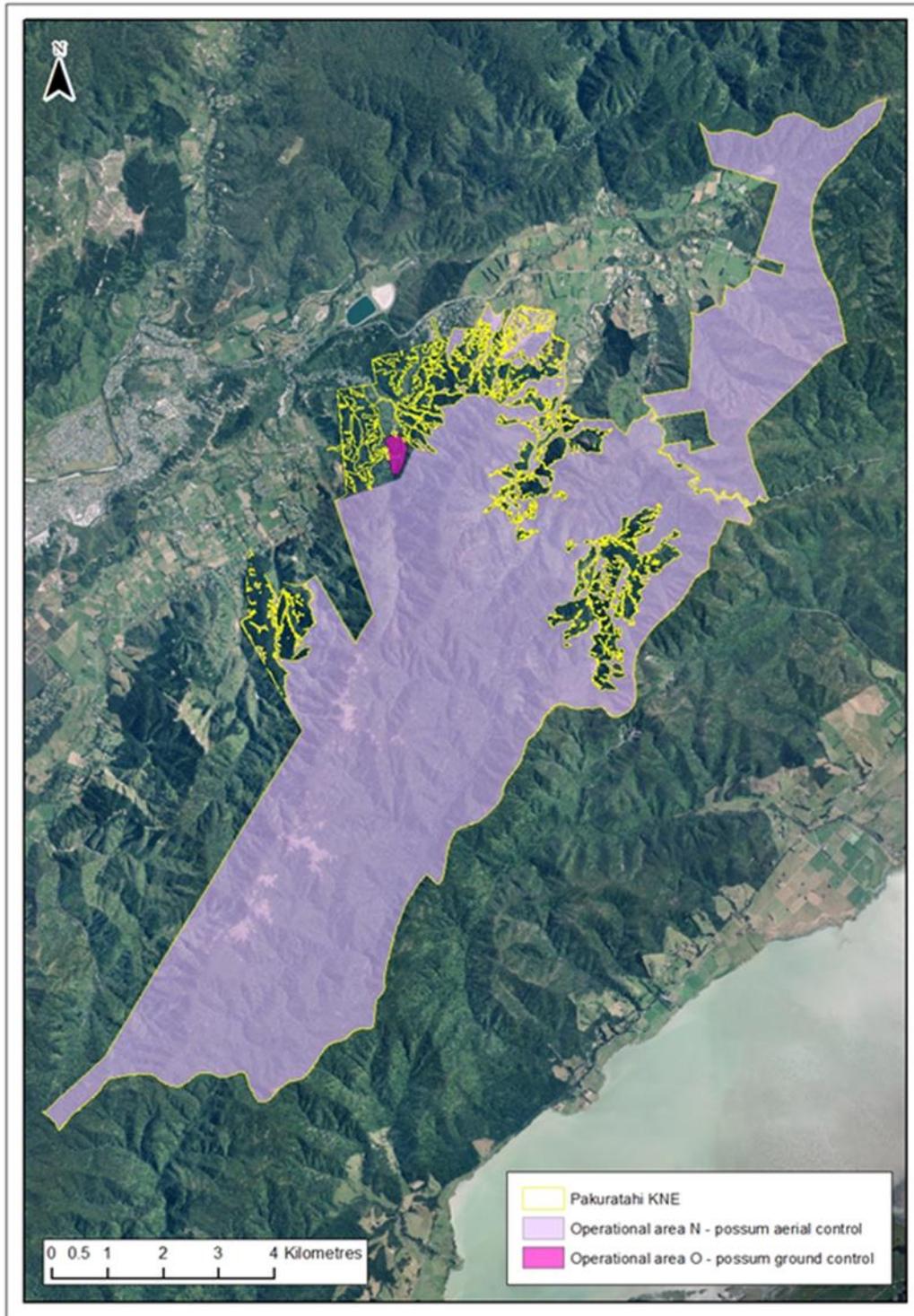
Map 1: The Pākuratahi Forest KNE site boundary



Map 2: Ecological areas and habitat features for the Pākūratahi Forest KNE site



Map 3: Weed control operational areas in the Pākuratahi Forest KNE site



Map 4: Pest animal control in the Pākuratahi Forest 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 cycle¹⁸. 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 Pākuratahi Forest KNE site.

Table 4: Threatened and At Risk species at the Pākuratahi Forest KNE site

Scientific name	Common name	Threat status	Source
Plants (vascular) ¹⁹			
<i>Brachyglottis kirkii</i> var. <i>kirkii</i>	Kohurangi/Kirk's daisy	At Risk – Declining	GWRC 2008 ²⁰
<i>Corybas dienemus</i>		Threatened – nationally critical	Crisp P. 2020 ²¹
<i>Gastrodia cooperae</i>	Cooper's black orchid	Threatened – nationally critical	Crisp P. 2020
<i>Hymenophyllum australe</i>	Filmy fern	At Risk – Naturally uncommon	Crisp P. 2020
<i>Peraxilla colensoi</i>	Red mistletoe	At Risk – Declining	GWRC 2008
<i>Peraxilla tetrapetala</i>	Pirirangi/red mistletoe	At Risk – Declining	GWRC 2008
<i>Pterostylis foliata</i>	greenhood	At Risk – Naturally uncommon	GWRC 2008
<i>Pterostylis tasmanicum</i>	Plumed orchid	Threatened – Nationally Vulnerable	GWRC 2008
<i>Teucrium parvifolium</i>		At Risk– Declining	GWRC 2008
Birds ²²			
<i>Acanthisitta chloris</i>	Rifleman	At Risk – Declining	McArthur N 2021 ²³
<i>Anthus novaeseelandiae</i>	New Zealand pipit	At Risk – Declining	McArthur N 2021
<i>Cyanoramphus auriceps</i>	Yellow crowned parakeet	At Risk – Declining	McArthur N 2021
<i>Eudynamis taitensis</i>	Long-tailed cuckoo	Threatened – Nationally vulnerable	McArthur N 2021

Scientific name	Common name	Threat status	Source
<i>Falco novaeseelandiae</i>	New Zealand falcon	Threatened – Nationally vulnerable	McArthur N 2021
Reptiles ²⁴			
<i>Naultinus punctatus</i>	Barking gecko	At Risk – Declining	GW Reptile distribution database
Freshwater fish ²⁵			
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk – Declining	GW NZ Freshwater Fish database
<i>Galaxias brevipinnis</i>	Kōaro	At Risk – Declining	GW NZ Freshwater Fish database
<i>Galaxias divergens</i>	Dwarf galaxias	At Risk – Declining	GW NZ Freshwater Fish database

Appendix 3: Regionally threatened plant 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, (eg, 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 Pākuratahi Forest KNE site.

Table 5: Regionally threatened species recorded in the Pākuratahi Forest KNE site

Plants ²⁶			
<i>Aciphylla aurea</i>	golden spaniard	Data deficient	Crisp P. 2020
<i>Brachyglottis kirkii</i> var. <i>kirkii</i>	Kohurangi/Kirk's daisy	Declining	GWRC 2008 ²⁷
<i>Carex flaviformis</i>		Sparse	GWRC 2008
<i>Corybas dienemus</i>		Critical	Crisp P. 2020
<i>Gastrodia cooperae</i>	Cooper's black orchid	Critical	Crisp P. 2020
<i>Hymenophyllum australe</i>	Filmy fern	Critical	Crisp P. 2020
<i>Korthalsella lindsayi</i>	Dwarf mistletoe	Naturally uncommon	GWRC 2008
<i>Lindsaea linearis</i>		Naturally uncommon	GWRC 2008
<i>Lycopodiella lateralis</i>		Critical	GWRC 2011 ²⁸
<i>Mida salicifolia</i>	Maire-taiki/willow-leaved maire	Declining	GWRC 2008
<i>Notogrammitis givenii</i>		Critical	Crisp P. 2020
<i>Notogrammitis pseudociliata</i>		Naturally Uncommon	Crisp P. 2020
<i>Olearia avicenniifolia</i>		Data deficient	Crisp P. 2020
<i>Peraxilla colensoi</i>	Red mistletoe	Critical	GWRC 2008
<i>Peraxilla tetrapetala</i>	Pirirangi/red mistletoe	Critical	GWRC 2008
<i>Pimelea gnidia</i>		Critical	GWRC 2008
<i>Pittosporum cornifolium</i>	Tawhirikaro/perching kohukohu	Naturally uncommon	GWRC 2008
<i>Pterostylis foliata</i>	Greenhood	Naturally uncommon	GWRC 2008

<i>Pterostylis tasmanica</i>	Plumed orchid	Extirpated	Crisp P. 2020
<i>Raukaua edgerleyi</i>	Raukaua/raukawa	Naturally uncommon	GWRC 2008
<i>Schizaea australis</i>	southern comb fern	Critical	Crisp P. 2020
<i>Teucrium parvifolium</i>		Vulnerable	GWRC 2008
Birds²⁹			
<i>Acanthisitta chloris</i>	Rifleman	At risk – Declining	McArthur N 2021
<i>Apteryx mantelli</i>	North Island Brown Kiwi	Critical	McArthur N 2021 ³⁰
<i>Cyanoramphus auriceps</i>	Yellow Crowned Parakeet	Endangered	McArthur N 2021
<i>Eudynamys taitensis</i>	Long Tailed Cuckoo	Naturally uncommon	McArthur N 2021
<i>Falco novaeseelandiae</i>	New Zealand Falcon	Critical	McArthur N 2021
<i>Hemiphaga novaeseelandiae</i>	New Zealand Pigeon	At risk – Recovering	McArthur N 2021
<i>Anthus novaeseelandiae</i>	New Zealand Pipit	Vulnerable	McArthur N 2021
<i>Phalacrocorax</i>	Little Shag	Vulnerable	McArthur N 2021
Reptiles³¹			
<i>Naultinus punctatus</i>	<i>Barking gecko</i>	Vulnerable	GW Reptile distribution database

Appendix 4: Threat table

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

Table 6: Threats to the Pākuratahi Forest KNE site

Threat code	Threat and impact on biodiversity in the KNE site
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... (see full list in Appendix 5).
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species include... (see full list in Appendix 5).
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... (see full list in Appendix 5).
Pest animals	
PA-1	Possums (<i>Trichosurus vulpecula</i>) browse palatable canopy vegetation until it can no longer recover ^{32,33} . This destroys the forest's structure, diversity and function. Possums may also prey on native birds and invertebrates ³⁴ .
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 ^{35,36} .
PA-3	Mustelids (stoats ^{37,38} (<i>Mustela erminea</i>), ferrets ^{39,40} (<i>M. furo</i>) and weasels ^{41,42} (<i>M. nivalis</i>)) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions.
PA-4*	Hedgehogs (<i>Erinaceus europaeus</i>) prey on native invertebrates ⁴³ , lizards ⁴⁴ and the eggs ⁴⁵ and chicks of ground-nesting birds ⁴⁶ .
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 ^{47,48} .
PA-6*	Pest and domestic cats (<i>Felis catus</i>) prey on native birds ⁴⁹ , lizards ⁵⁰ and invertebrates ⁵¹ , reducing native fauna breeding success and potentially causing local extinctions ⁵² .
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 ⁵³ .
PA-8	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 ^{54,55,56} .

Threat code	Threat and impact on biodiversity in the KNE site
PA-9	Feral pigs (<i>Sus scrofa</i>) root up the soil and eat roots, invertebrates, seeds and native plants preventing forest regeneration ⁵⁷ .
PA-10	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 ⁵⁸ .
Human activities	
HA-1*	Recreational use such as tramping, mountain biking and horse riding can cause damage and disturbance of the native ecosystem. It is also likely to disturb native fauna and introduce ecological weeds.
HA-2*	Plantation forestry on adjoining land parcels to the KNE site have the potential to cause habitat loss or degradation, disturb native wildlife, damage boundary fencing and increase sediment load in watercourses via surface run-off during harvesting operations.

*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 Pākuratahi Forest 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 7: Ecological weed species in the Pākuratahi Forest KNE site

Scientific name	Common name	Level of distribution	Management aim
<i>Buddleja davidii</i>	Buddleia	Widespread and abundant	Suppression. Control where encountered
<i>Clematis vitalba</i>	Old man's beard	Patchy and abundant	Suppression. Control where encountered
<i>Cortaderia selloana</i> and <i>C. jubata</i>	Pampas	Patchy and sparse	Suppression. Control where encountered
<i>Cotoneaster glaucophyllus</i>	Cotoneaster	Widespread and sparse	Suppression. Control where encountered
<i>Cytisus scoparius</i>	Broom	Widespread and abundant	Localized suppression in higher value areas
<i>Eucalyptus</i> spp.	Gum tree species	Widespread and sparse	Suppression. Control where encountered
<i>Hakea sericea</i>	Prickly hakea	Localised and sparse	Surveillance of previous control sites
<i>Ilex aquifolium</i>	Holly	Widespread and abundant	Suppression. Control where encountered
<i>Lonicera japonica</i>	Japanese honeysuckle	Widespread and abundant	Localized suppression in higher value areas
<i>Pinus contorta</i>	Lodgepole pine	Widespread and abundant	Suppression
<i>Pinus radiata</i>	Radiata pine	Widespread and abundant	Suppression
<i>Salix</i> spp.	Willow	Widespread and Patchy	Suppression. Control where encountered
<i>Tradescantia fluminensis</i>	Tradescantia	Widespread and abundant	Localized suppression in higher value areas
<i>Ulex europaeus</i>	Gorse	Widespread and abundant	Localized suppression in higher value areas
<i>Urtica dioica</i> subsp. <i>Dioica</i>	Perennial nettle	Localised and sparse	Surveillance of previous control sites
<i>Vinca major</i>	Periwinkle	Localised and sparse	Surveillance of previous control sites

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