Key Native Ecosystem Operational Plan for Kaitoke Regional Park

2022-2027

Contents

1. Purpose

The purpose of the five-year Key Native Ecosystem (KNE) Operational Plan for Kaitoke Regional Park 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 (e.g., 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 Strategy[3] 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 Plan[4], the Regional Pest Management Plan 2019-2039[5] and Toitū Te Whenua Parks Network Plan[6].

3. The Key Native Ecosystem Programme

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

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

KNE sites can be located on private or publicly owned land. Any work undertaken on private land as part of this programme, it is at the discretion of landowners, and their involvement in the programme is entirely voluntary. Involvement may just mean allowing work to be undertaken on that land. Land managed by the Department of Conservation (DOC) is generally excluded from this programme.

Sites are identified as of high biodiversity value for the purposes of the KNE Programme by applying the four ecological significance criteria described below.

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

A site must be identified as ecologically significant using the above criteria and be considered “sustainable” for management in order to be considered for inclusion in the KNE Programme. “Sustainable” for the purposes of the KNE Programme is defined as: a site where the key ecological processes remain intact or continue to influence the site and resilience of the ecosystem is likely under some realistic level of management

4. Kaitoke Regional Park Key Native Ecosystem site

The Kaitoke Regional Park KNE site (2,671 ha) comprises all the native forest clad parts of Kaitoke Regional Park, which is located in the southern foothills of the Tararua Range approximately 7km north-east of Upper Hutt (see Appendix 1, Map 1). The KNE site is mostly original or selectively-logged beech/broadleaf/podocarp native forest with considerable diversity within the podocarp-broadleaf forest component. It is contiguous with similar forest of the Hutt Water Collection Area to the north-east and privately owned bush-clad land to the west.

The topography is characterised by rising hill country, steeply incised by Te Awa Kairangi/Hutt River and several of its tributaries and includes areas of river terrace at Kaitoke and Te Mārua. The steeper hill country, which comprises most of the KNE site, is remote in nature with no vehicle access or maintained walking tracks. However, the more accessible parts of the KNE site are popular for picnicking, walking, and tramping.

5. Parties involved

5.1. Landowner

All land in the KNE site is owned by Greater Wellington and managed by Greater Wellington's Parks department as part of Kaitoke Regional Park. Management of Kaitoke Regional Park is guided by Toitū Te Whenua Parks Network Plan[7]. Most of the land is gazetted for the purposes of water supply, recreation, and plantation forestry. However, there is no area of plantation forestry within the KNE site or plan to use any part of it for forestry in the future.

5.2. Operational delivery

Greater Wellington's Biodiversity, Biosecurity and Parks departments are responsible for delivering the Kaitoke Regional Park 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 Biosecurity department to coordinate and carry out 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. However, the Parks department funds ecological restoration work within the KNE site by making available on an annual basis an Environmental Restoration budget for use by volunteer groups within the Regional Park. The purpose and use of this fund are jointly agreed by the Park Ranger and volunteer groups. The Park Ranger is the primary contact for volunteers and contractors.

5.3. Mana whenua partners

The Kaitoke Regional Park KNE site is significant to Taranaki Whānui ki Te Upoko o Te Ika (Taranaki Whānui) and Ngāti Toa Rangatira (Ngāti Toa), who are mana whenua partners with Greater Wellington.

Taranaki Whānui and Ngāti Toa have an association with Te Awa Kairangi/Hutt River as outlined in the Statutory Acknowledgements from the respective Claims Settlement Acts for each iwi[8].

The area has been identified under the Proposed Natural Resources Plan (PNRP)[9] as culturally important with particular reference to Te Awa Kairangi/Hutt River which flows through the KNE site. Tables 1 and 2 below list the values that Te Awa Kairangi/Hutt River holds for mana whenua as listed in the PNRP[10].

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 plan development or operational delivery of the KNE site.

Table 1: Taranaki Whānui sites of significance in Kaitoke Regional Park KNE site[11]

Sites of significance	Mana whenua values
Te Awa Kairangi/Hutt River (Schedule B - Ngā Taonga Nui a Kiwa)	Ngā Mahi a ngā Tūpuna Te Mahi Kai Wāhi Whakarite Te Mana o te Tangata Te Manawaroa o Te Wai Te Mana o Te Wai Wāhi Mahara

Table 2: Ngāti Toa sites of significance in Kaitoke Regional Park KNE site[12]

Sites of significance	Mana whenua values
Te Awa Kairangi/Hutt River (Schedule B - Ngā Taonga Nui a Kiwa)	Ngā Mahi a ngā Tūpuna Te Mahi Kai Te Mana o Te Tangata Te Manawaroa o te Wai Te Mana o Te Wai

5.4. Stakeholders

The Wellington Botanical Society (WBS) and the Upper Hutt Branch of the Royal Forest and Bird Protection Society (UHF&B) are both stakeholders at the site. A combined effort from these groups has been instrumental in the protection and restoration of an important 1 ha remnant of lowland river-terrace forest which lies within the KNE site at its southern tip. This forest remnant is known as Te Mārua Bush. Since 1991 WBS and UHF&B have carried out large amounts of weed control and rubbish removal and have planted native trees on the edges of the remnant to bolster its resilience to the impacts of ecological weeds and extreme climatic events. Plantings have contributed to the substantial increase in the size of Te Mārua Bush from 0.6 ha in 1991 to 1 ha today, with a resultant increase in the area-to-edge ratio[13].

UHF&B members have grown most of the native plants that have been used in the restoration of Te Mārua Bush. Plants have been propagated from seed collected from plants within or nearby the forest remnant to ensure plant species and genetics are appropriate for the site. Members of WBS have provided expert botanical advice on forest health and the selection of species for planting.

A small group of local kayaking enthusiasts are currently in the process of establishing a pest animal control project focusing on the southern side of Te Awa Kairangi/Hutt River gorge. The group is keen to assist in protecting the biodiversity values of the KNE site and has chosen to work in this area so that they can combine their pastime of kayaking the river with undertaking the pest control.

Wellington Water has a significant interest in the KNE site as water supply infrastructure critical to the supply of drinking water to much of the Wellington region is located within or immediately adjacent to the KNE site. This infrastructure includes pipelines, treatment plants and water storage lakes.

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 3, below, lists ecological designations at all or part of the Kaitoke Regional Park KNE site.

Table 3: Designations at the Kaitoke Regional Park KNE site

Designation level	Type of designation
Regional	Parts of the KNE site are designated under Greater Wellington's proposed Natural Resources Plan as a: • River with Significant Indigenous Ecosystems – habitat with high macroinvertebrate community health (Schedule F1): Te Awa Kairangi/Hutt River and all tributaries • River with Significant Indigenous Ecosystems – habitat for threatened and at risk fish species (Schedule F1): Te Awa Kairangi/Hutt River and all tributaries • River with Significant Indigenous Ecosystems – habitat for six or more migratory indigenous fish species (Schedule F1): Te Awa Kairangi/Hutt River
District	Part of the KNE site has been designated within UHCC's District Plan[14] for its high ecological, visual and/or landscape values: • 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 Kaitoke Regional Park 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 **rare or distinctive** in the region
- It contains high levels of ecosystem **diversity**, with several ecosystem types represented within the KNE site boundary
- 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 plant and animal species

Representativeness

The Singers and Rogers[15] classification of pre-human vegetation indicates that the KNE site contains three forest ecosystem types that are now considered regionally threatened, having less than 30% of the pre-human extent remaining in the region. They are: tōtara, mataī, ribbonwood forest (WF2); tawa, kāmahi, podocarp forest (MF7); and

hard beech forest (MF20) (see Appendix 1, Map 2). It is estimated that there is now only about 2.6%, 22.5% and 26% respectively of the pre-human extent of these forest types remaining in the Wellington Region[16]. Te Mārua Bush is a remnant example of WF2.

The Threatened Environment Classification system[17] indicates that 175 ha are classified as either Acutely Threatened, Chronically Threatened or At Risk. There is less than 10%, 10-20% and 20-30% respectively of native vegetation remaining on these types of land in New Zealand[18]. These areas of threatened environments within the KNE site are located on river terraces and valley floors, and include Te Mārua Bush (see Appendix 1, Map 3).

Rarity/distinctiveness

New Zealand's national threat classification system[19] lists four plant, six bird, one lizard and four freshwater fish species that are present within the site as nationally Threatened or At Risk. Eight plant, seven bird and one lizard species present are listed as regionally threatened. Appendices 2 and 3 contain lists of nationally and regionally threatened species found within the KNE site.

Diversity

The Kaitoke Regional Park KNE site comprises six different forest ecosystem types and one riverine ecosystem type[20]. These ecosystem types are: black beech forest (MF5); hard beech forest (MF20); red beech, podocarp forest (CLF9); kāmahi, broadleaf, podocarp forest (MF8); tawa, kāmahi, podocarp forest (MF7); tōtara, mataī, ribbonwood forest (WF2); and hard tussock, scabweed, gravelfield/stonefield (BR1) (see Appendix 1, Map 3).

Ecological context

The Kaitoke Regional Park KNE site contains a large area of mature indigenous forest representative of the original Akatarawa-Hutt Valley vegetation types. The forest is contiguous with that of the Hutt Water Collection Area. The KNE site provides core breeding habitat for a large assemblage of forest bird species and is refuge for nationally and regionally threatened plant species. Also significant within the KNE site is the forest of Te Mārua Bush as it is one of the few remaining lowland forest remnants of mataī (*Prumnopitys taxifolia*), tōtara (*Podocarpus totara*) and black maire (*Nestegis cunninghamii*) forest in the Wellington Region.

6.3. Ecological features

The KNE site straddles two ecological districts. The river terraces at the southern extent of the KNE site at Te Mārua are within the Wellington ecological district while the rest of the KNE site is in the Tararua ecological district[21].

Vegetation communities and plants

The forest types that were present in the KNE site prior to human arrival are still present. However, the composition of the vegetation has been modified by selective logging and the impacts of pests. The vegetation is essentially podocarp/broadleaf/beech forest with a large component of beech. Hard beech (*Fuscospora truncata*) and black beech (*Fuscospora solandri*) are common on the lowland hills. These are replaced by red beech

(*Fuscospora fusca*) on damper more fertile sites, grading into silver beech (*Lophozonia menziesii*) at higher elevations.

There is a rich diversity in the podocarp/broad-leaved component of the forest in places. In the gorges and terraces of Te Awa Kairangi/Hutt River, mataī, northern rātā (*Metrosideros robusta*) and kahikatea (*Dacrycarpus dacrydioides*) emerge over a canopy of kāmahi (*Weinmannia racemosa*), hīnau (*Elaeocarpus dentatus*), miro (*Prumnopitys ferruginea*), tawa (*Beilschmiedia tawa*) and black and swamp maire (*Syzygium maire*), with many understory species present. In the Putaputa and Kororipo streams, the main tributaries of Te Awa Kairangi/Hutt River within the KNE site, northern rātā, rimu (*Dacrydium cupressinum*), miro and pukatea (*Laurelia novae-zelandiae*) mix with kāmahi, silver beech and red beech in a largely podocarp forest. Small areas of tawa-tītoki (*Beilschmiedia tawa-Alectryon excelsus*) forest are present in the KNE site near Benge Stream[22].

The original vegetation on the river terraces at Kaitoke and Te Mārua is thought to have contained pockets of tōtara, mataī, kahikatea, rimu and northern rātā amongst broadleaf/beech forest with pukatea occurring in swampy sites[23]. The only semblance of the original forest that remains is found in Te Mārua Bush. This is a closed-canopy secondary stand of mataī-tōtara forest, growing on an old alluvial terrace of Te Awa Kairangi/Hutt River. The soils of this site are exceptionally stony. Mataī-tōtara forest has not been recognised elsewhere in the Hutt catchment and is now a rare type of forest on a national scale. Although very small and secondary in origin, Te Mārua Bush is probably replicating the composition of the forest originally present on the site[24].

Threatened plant species that are present within the old growth forest include red mistletoe (*Peraxilla tetrapetala*), scarlet mistletoe (*Peraxilla colensoi*) and Kirk's daisy (*Brachyglottis kirkii*). Orchid species are common in areas of regenerating beech and kāmahi.

Species

Birds

Twenty-six species of native bird have been recorded in the KNE site[25]. The KNE 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 amongst species considered resident in the KNE site are the nationally threatened species; white heron/kōtuku (*Ardea modesta*), rifleman/titipounamu (*Acanthisitta chloris*), whitehead/pōpokatea (*Mohoua albicilla*), New Zealand pipit/pīhoihoi (*Anthus novaeseelandiae*), New Zealand falcon/kārearea (*Falco novaeseelandiae*) and long-tailed cuckoo/koekoeā (*Eudynamys taitensis*). Yellow-crowned parakeet/kākāriki (*Cyaronamphus auriceps*) and North Island kākā (*Nestor meridionalis*) have been occasionally recorded in the KNE site. It is possible that kākāriki are resident in small numbers while it is more likely that kākā are just occasional visitors in search of seasonally available food. A significant gathering of kererū (*Hemiphaga novaeseelandiae*) occurs in September every year in trees on the river terrace at Kaitoke. They gather here to feed on fresh willow and tree lupin foliage.

Reptiles

The ngahere gecko (*Mokopirirakau* "southern North Island") is the only lizard species that has been recorded in the KNE site, but it is likely that barking gecko (*Naultinus punctatus*), northern grass skink (*Oligosoma polychroma*) and ornate skink (*O. ornatum*) are also present, as these species have been recorded nearby in contiguous habitat.

Fish

Six species of native freshwater fish have been recorded in the KNE site in the last 20 years. Four of these species are threatened (see Appendix 2). There are no barriers to fish passage within the KNE site. However, a large water intake weir on Te Awa Kairangi/Hutt River immediately beyond the boundary of the KNE site prevents the passage of many species further up the catchment.

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 Kaitoke Regional Park KNE site.

7.1. Key threats

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

There are a few ecological weed species present that are of significant concern due to their highly invasive nature. They are mostly sparse and localized within the large, forested areas, but the presence of species such as old man's beard (*Clematis vitalba*), African club moss (*Selaginella kraussiana*) and holly (*Ilex aquifolium*) on the margins poses a substantial threat. The integrity of the highly threatened forest type in Te Mārua Bush is at particular risk from woody weeds present in nearby paddock hedgerows.

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 rats (*Rattus* spp.), stoats (*Mustela erminea*), possums (*Trichosurus vulpecula*), feral goats (*Capra hircus*) and feral deer (*Cervus elaphus scoticus*).

Of these species, rats and stoats are likely to be having the greatest impact on ecological values as there is currently very little targeted control of these species and they are therefore likely to be present in consistently moderate to high numbers.

Possums are likely to be present in moderate numbers currently. While possum numbers have been kept low in the past through regular aerial 1080 operations, the last operation was in 2014 and numbers have likely increased to levels that they are impacting forest health and regeneration. Some plant species present in the KNE site that are at great risk from possum browse are northern and southern rātā (*Metrosideros robusta* and *M. umbellata*), tree fuchsia (*Fuchsia excorticata*) and mistletoes (*Ileostylus micranthus, Korthalsella lindsayi, Peraxilla colensoi* and *P. tetrapetala*).

The numbers of feral deer in the KNE site appears to have increased abruptly during the last few years. Mobs of deer are being observed regularly on the bush margins along the southern boundary of the KNE site from Kaitoke to Te Mārua and appear to be increasing in number between there and the Hutt River gorge. These mobs are likely to be significantly impacting understory regeneration and diversity.

Feral goats (*Capra hircus*) appear to be present in moderate to low numbers and are likely to be inhibiting regeneration of the forest in areas that they frequent. They are most prevalent in the lower valleys around the Hutt Gorge.

8. Vision and objectives

8.1. Vision

A healthy and diverse native forest ecosystem closely resembling that which was originally present, which is self-regenerating in the absence of impacting exotic influences and is supporting a multitude of native wildlife.

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 Kaitoke Regional Park KNE site.

1. Maintain and improve the structure and function of the native plant communities including populations of rare and threatened species
2. Protect native bird populations and improve the habitat for them
3. Facilitate and support the community's involvement in management of the KNE site

9. Operational activities

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

9.1. Ecological weed control

The aim of ecological weed control in the KNE site is to maintain the strong native integrity of the forest ecosystem present and to improve its ability to regenerate by removing the pressure and competition imposed by ecological weeds.

Ecological weed control undertaken in the KNE site over the last three years has in the most part delivered positive results. Aspects where improvements have been achieved include:

- The front slopes of the main forest and some outlying bush patches including the forest remnants at Te Mārua have been cleared of most weed infestations
- Good progress has been made on controlling weeds along the full length of the Te Awa Kairangi/Hutt River gorge, an area not worked until recent years
- The weed burden in Te Mārua Bush has been reduced to a negligible level, an area that in the past was heavily impacted by garden dumping and edge effects

Progress towards a planned elimination of African club moss has been slow. This species is possibly the most concerning weed species present due to it being a vigorous coloniser of the forest floor, being difficult to control and being easily spread by people and animals.

As the management of ecological weeds continues at the KNE site the five operational areas defined previously will continue to be used in planning strategic management approaches (see Appendix 1, Map 4). The definition of these operational areas is based on habitat type, weed burden and differing management requirements.

Operational Area A – Front slopes of the main forest from Kaitoke to Te Mārua:

Focus will be maintained on controlling ecological weeds classed as priority 1 in Appendix 4 in this area in order to protect this area and reduce the likelihood of weeds moving into the interior of the forest where the biodiversity values are greater and locating weed infestations is more difficult. Surveillance of the area is undertaken annually through inspections of historic infestation sites and locations likely to be prone to new infestation, and by investigating reports of weed infestation made by Greater Wellington staff and members of the general public. Visual scans of as much of the area as can be viewed from adjacent park and farmland will be undertaken every third year.

Attempts are being made to eliminate African club moss from the area. New approaches such as spraying or digging out the exotic grasses that it is growing within are being tried. Other invasive ecological weed species that are controlled when found in this area include old man's beard, Japanese honeysuckle (*Lonicera japonica*), climbing asparagus (*Asparagus scandens*), hops (*Humulus lupulus*), convolvulus (*Calystegia silvatica*), wandering willie (*Tradescantia fluminensis*), barberry (*Berberis glaucocarpa*), hawthorn

(*Crataegus monogyna*), holly, willow (*Salix* spp.) and sycamore (*Acer pseudoplatanus*). A full list in contained in Appendix 4.

Operational Area B – Te Awa Kairangi/Hutt River gorge:

Te Awa Kairangi/Hutt River is a vector for ecological weeds spreading in to and establishing in the KNE site. A first survey of the full length of the river gorge within the KNE site was undertaken in 2021-22 with the help of a commercial rafting business. Several partial surveys had been undertaken previously on foot. Several weed species that are of concern due to their invasiveness and relative absence from the KNE site, such as Chilean rhubarb (*Gunnera tinctoria*), were discovered and controlled during these surveys. Further surveys will be undertaken annually to pick up new and uncommon weed species, and consideration will be made of the practicality of controlling existing weed species within the gorge. Weed species that are well established in the gorge include African club moss, tradescantia, montbretia (*Crocosmia* x *crocosmiiflora*), Himalayan honeysuckle (*Leycesteria formosa*), blackberry (*Rubus fruiticosus*) and gorse (*Ulex europaeus*).

Operational Area C – Te Mārua Bush:

Te Mārua Bush contains very high ecological values and is at great risk of ongoing infestation by ecological weeds due to its small size and location next to large sources of weed seeds. Therefore, ecological weed control undertaken in this area is comprehensive and sustained. A large range of ecological weeds are controlled on an ongoing basis. Control is undertaken by members of WBS and UHF&B during annual working-bees, and subsequently by the Greater Wellington Biosecurity department. Members of the WBS and UHF&B control as much of the weed infestations as they are able within their capacity and with the methods available to them (pulling and stump treating). Greater Wellington then follows up with searches and control of remaining plants. All weedy exotic plant species found in this operational area are controlled, including priority 1 and 2 species listed in Appendix 4.

Operational Area D – Other forest remnants at Te Mārua:

As with Te Mārua Bush, the other three forest remnants at Te Mārua are also very vulnerable to infestation by ecological weeds due to their small size and location next to large sources of weed seeds. However, as these remnants don't contain the uncommon forest type that Te Mārua Bush does, they aren't of such high value. Therefore, only priority 1 ecological weeds are controlled in these areas and only every three years. This level of control is enough to keep the operational area relatively free of priority 1 weed species and overall impacts of ecological weeds.

Operational Area E – Te Mārua Pony Club lease area:

The shelter belts surrounding this area contain trees of weed species such as holly, hawthorn and sycamore interspersed through native trees. These large tree weeds produce large amounts of seed which pose a threat to the nearby native forest remnants. At times when there is funding and capacity available in the Parks department, tree weeds in the shelter belts that are not considered necessary for shelter or other amenity purposes will be progressively removed. This work will be lead and

funded by the Parks Department with consultation with the Te Mārua Pony Club. Many such trees have been removed from central parts of this area in the past which appears to have reduced the number of seedlings of these species found in nearby areas of native bush. There will be further value in the progressive removal of more of these trees.

9.2. Pest animal control

The primary aim of pest animal control undertaken in the Kaitoke Regional Park KNE site is to reduce the density of possums, goats and deer to levels that will allow recovery of the forest canopy and regeneration of the forest floor to occur throughout the site, which will in turn improve the habitat for native birdlife. Secondary aims are to provide an added level of protection to a small area of the original podocarp-rātā forest by intensively controlling possums and rats in this area, and to control predators in Te Awa Kairangi /Hutt gorge to protect the birdlife habitat that it provides.

Possum control hasn't been carried out in most of the KNE site since 2014 which is likely to have allowed possum numbers to grow to a level that they will now be impacting the forest canopy and understory regeneration. Control of goats and deer undertaken annually over the last few years appears to be keeping numbers of these species low in the KNE site. This should be allowing some regeneration of the understory to occur.

Possum control by aerially sown 1080

Greater Wellington plans to undertake an aerial 1080 possum control operation throughout most of the KNE site and the adjacent Hutt Water Collection Area in the winter of 2022. It is expected that the operation will reduce possum numbers to a very low level and that further control won't be required until 2027. In the past OSPRI has undertaken possum control in part of the KNE site under its TBfree New Zealand programme. This programme is part of a national strategy aiming to eradicate bovine tuberculosis from New Zealand (possums are the main vector of bovine tuberculosis). OSPRI might decide that there is a need to undertake possum control additional to that planned by Greater Wellington in order to achieve its objectives. If this comes about, Greater Wellington might delay the timing of its planned operations to make best use of resources.

Possum population monitoring is undertaken ahead of and following control operations. Information gained from monitoring undertaken ahead of an operation (pre-monitor) helps to confirm whether an operation is required at that time. Monitoring following an operation (post-monitor) provides an indication of whether the control was effective.

Ground based possum and predator control

Possum and rat populations are kept to low levels in operational areas C and F on an ongoing basis (see Appendix 1, Map 5). Control in these areas is undertaken by dispensing brodifacoum or a similar toxin from two networks of bait stations. Although most of Area F is included in aerial 1080 operations, ground-based control is undertaken here because the high value old growth podocarp-rātā forest of the area warrants more sustained protection than is provided by the intermittent aerial operations. Ground-based control is undertaken in Area C as it can't be included in aerial 1080 operations. The bait station servicing is undertaken by Greater Wellington Parks staff.

A group of local kayaking enthusiasts are currently in the process of establishing a pest animal control project focusing on the southern side of Te Awa Kairangi/Hutt River gorge – operational area G (see Appendix 1, Map 4). The group is keen to assist in protecting the biodiversity values of the KNE site and has chosen to work in this area so that they can combine undertaking pest control with their pastime of kayaking the river. The group will initially set up a line of predator traps through the river gorge which they will check at regular intervals using kayaks for access. They then intend to progressively expand the area of control south to cover the whole area bounded by the river and the southern boundary of the KNE site. A priority might be made of areas of particularly high value and vulnerability such as locations of mistletoe plants. The Parks and Biodiversity departments are contributing funding towards the purchase of some traps and the group is looking into raising funds for more.

Beyond the control undertaken in operational areas C, F and G, there is no widespread targeted rat or mustelid (weasel, stoat and ferret) control undertaken in the KNE site. This is because ground control over such a large and remote site would be extremely difficult and therefore expensive to undertake. However, monitoring of rat and mustelid populations following aerial 1080 possum control operations has shown that these operations usually also reduce rat and mustelid populations to very low levels. Although this control is short lived, with populations returning to pre-control levels within 18 months[26], it is hoped that native plants and animals will receive some benefit from these periods of reduced threats.

Feral goat and deer control

Feral goat and deer culling is undertaken annually to keep the number of goats very low and to reduce the number of deer in the KNE site. It has become apparent that while culling operations have kept the goat population in check, deer numbers have increased abruptly in recent years and more focus on deer control is required to bring their numbers under control.

Culling is mostly undertaken through ground-based hunting targeting areas most frequented by each of the species. Goats are most often found on the steep slopes of the river and stream valleys. Deer appear to be most abundant on the forest edges adjacent to pasture that they can feed on at night. Deer are increasingly targeted at night along these forest-pasture boundaries. A small amount of aerial hunting is undertaken mostly over open areas of the Hutt River gorge. Twenty days of ground-based hunting and one hour of aerial hunting are planned to be undertaken annually. An output target of no more than one goat or deer per eight hours of ground-based hunting, or five goats or deer per one hour of helicopter hunting is used for culling operations.

9.3. Revegetation

There are two aims of revegetation work at Kaitoke Regional Park KNE site. The first is to improve the composition and functionality of the forest in Te Mārua Bush. The second is to enhance the natural environment of amenity areas by revegetating areas with native species following the removal of patches of weeds.

Planting at Te Mārua Bush – operational area C (see Appendix 1, Map 6) is arranged and carried out by members of WBS and UHF&B and is overseen by the Parks department. This planting consists of planting in gaps on the edges of the forest to bolster the protection that lower stature species on the edges provide and planting successional species within the forest to accelerate the evolution of the forest to a climax state. All plants that are planted in Te Mārua Bush are grown by UHF&B from propagules sourced from Te Mārua Bush itself. Less than 50 plants per year are now planted.

Planting is undertaken from time to time in amenity areas of Kaitoke Regional Park at Kaitoke and Te Mārua. Most of this planting is undertaken beyond the KNE boundary but some is done within the KNE site in the vicinity of the forest remnants at Te Mārua – operational area H (see Appendix 1, Map 6). This planting is undertaken by the Parks department with help from local school groups and sometimes corporate volunteers. Only eco-sourced pioneer species that have proven to survive well at the site are planted. Appendix 5 contains a plant list for use in planning revegetation work.

Retirement and revegetation of farmland

Planning is underway for the retirement and revegetation of most of the land within Kaitoke Regional Park that is currently farmed. Most of this land is outside the KNE site but there is some included in the Te Mārua area adjacent to the forest remnants. The aim of this programme is to provide a permanent carbon sink for the region that will cut Greater Wellington's carbon footprint. But the revegetation will also provide biodiversity benefits that will complement the KNE site such as additional foraging habitat for native birds. 18ha of retired farmland at Kaitoke adjacent to the KNE site will be planted in 2022 and 2023. Progressive retirement and planting of other areas at Kaitoke and at Te Mārua will be planned for subsequent years as part of master-planning for the whole parks network.

9.4. Environmental protocols

To help protect the natural resources of the KNE site from the potential impacts of human activities, the following procedures are followed in the course of managing the KNE site as part of overall park management.

Environmental care

Greater Wellington's operational staff follow procedures to identify and avoid damage to biodiversity values such as plant and animal communities. Procedures may include undertaking assessments of environmental effects of planned works. This limits risks to these values that could occur as a result of carrying out the construction and maintenance of assets, and when permitting the use of the KNE site by other users.

Biosecurity guidelines[27] are used by all Greater Wellington personnel when entering and working in the KNE site. These guidelines involve checking for and removing seeds and plant fragments from vehicles, equipment and clothing before entering the site and ensuring construction material is free of weed material.

Instructional information on how to avoid introducing ecological weeds and damage to ecological values is included in the conditions contained in permits issued to visiting

researchers and private hunters and is conveyed to other users whenever appropriate and possible.

Research and the collection of natural materials

Research activities and the collection of native plants and animals in the KNE site is managed by a permit system run by the Environmental Science department. The system aims to prevent adverse impacts on native flora and fauna occurring as a result of these activities.

The illegal collection of native plants and animals has occurred occasionally in Regional Parks. This has included some species of native tree, which are valued for domestic uses such as fence construction and for firewood, some species of orchid, which are sought after by collectors and traders, and may have also included lizards and invertebrates. The Park Ranger will watch for this activity while carrying out normal duties within the Park.

Fire risk

To reduce the risk of uncontrolled fires occurring in the KNE site, open fires are only permitted on the riverbed, with cooking elsewhere only permitted on gas cookers. This policy is communicated to users through onsite signage, the park information brochure and Toitū Te Whenua Parks Network Plan[28].

9.5. Community engagement

The purpose of community engagement is to raise awareness of the KNE site's ecological values and involve the community in management activities to protect those values. Information about the site's ecological values is conveyed to the public during appropriate events held by Greater Wellington at the site such as guided nature walks. Observations of interesting or rare ecological occurrences such as visits by or breeding of uncommon bird species are published in social and local print media when opportunities are right.

10. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Kaitoke Regional Park 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. A map of operational areas can be found in Appendix 1 (see Maps 4, 5 and 6).

Table 4: Five-year operational plan for the Kaitoke Regional Park 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, 2	Ecological weed control: Search for and control all priority 1 and 2 ecological weed species (listed in Appendix 4) on the front slopes of the main forest and control just priority 1 weed species in outlying areas	A	Maintained dominance and improved condition of native plant communities	Greater Wellington Biosecurity department	$6,150	$1,500	$1,500	$5,000	$1,500
1, 2	Ecological weed control: Search the forest edges of Te Awa Kairangi/Hutt River gorge for ecological weeds and control all found	B	Maintained dominance and improved condition of native plant communities	Greater Wellington Biosecurity department	$1,500	$4,150	$6,150	$2,650	$4,150
1, 2	Ecological weed control: Control all weedy exotic plant species in Te Mārua Bush including all those listed in Appendix 4	C	Maintained dominance and improved condition of native plant communities	Greater Wellington Biosecurity department	$750	$750	$750	$750	$750
1, 2	Ecological weed control: Search for and control all priority 1 and 2 ecological weed species (listed in Appendix 4) in the forest remnants at Te Mārua (other than Te Mārua Bush itself)	D	Maintained dominance and improved condition of native plant communities	Greater Wellington Biosecurity department		$2,000			$2,000

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, 2	Ecological weed control: Fell and remove large weed trees in the shelterbelts surrounding the Te Mārua Pony Club lease area when resources are available*	E	Reduced sources of weed seeds resulting in less infestation of surrounding native plant communities	Greater Wellington Parks department	*	*	*	*	*
1	Pest animal control: Undertake possum population monitoring to help confirm when control is required	Entire KNE site	Scientific data is obtained to inform operational decisions	Greater Wellington Environmental Science departments	--	--	--	--	$11,000
1	Pest animal control: Control possums by undertaking an aerial 1080 operation • Operational planning to begin in October 2026 • Sowing of pre-feed and toxic bait to be undertaken in May-June 2027	Most of the KNE site**	Improved regeneration of the native forest understory and condition of the native forest canopy	Greater Wellington Biosecurity department	--	--	--	--	$129,000
1, 2	Pest animal control: Control possums and rats on an ongoing basis on the river terrace west of the Pākuratahi Forks and in Te Mārua Bush	C and F	Improved regeneration of the native forest understory and condition of the native forest canopy and improved breeding of native birds	Greater Wellington Parks department	$300	$300	$300	$300	$300

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	Pest animal control: Control predators in Te Awa Kairangi/Hutt River gorge and work towards expanding the area of control south towards the KNE site southern boundary and providing additional protection of mistletoe plants in this area	G	Improved breeding of native birds	Volunteers Greater Wellington Parks department funds traps Greater Wellington Biodiversity department funds bait	$3,500†	$500	$500	$500	$500
1	Pest animal control: Control goats and deer, focusing on preferred habitats, using ground-based and aerial methods: 20 days ground hunting, one hour aerial hunting	Entire KNE site	Improved regeneration and structure of the native forest	Greater Wellington Biosecurity department	$13,200	$13,200	$13,200	$13,200	$13,200
1	Revegetation: Plant on the edges and within gaps at Te Mārua Bush	C	Improved structure and function of the native plant community	WBS and UHF&B	$250	$250	$250	$250	$250
1	Revegetation: Plant amenity areas at Te Mārua following the removal of weeds	H	Enhanced natural environment of amenity areas	Greater Wellington Parks department	*	*	*	*	*

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, 2	Environmental protocols: Adhere to Greater Wellington best practice guidelines and policies aimed at protecting the natural environment while undertaking operational activities and managing recreational and commercial activities in the KNE site, including: • assessment of environmental effects procedures • pest plant biosecurity guidelines • research and natural material collection permitting system • fire ban policy	Entire KNE site	Biodiversity values aren't unnecessary impacted by management, recreational or commercial activities	Greater Wellington staff and members of the public	††	††	††	††	††
3	Community engagement: Convey the biodiversity values of the KNE site and the value of protecting it to the public through public events and media releases	Entire KNE site	The public are aware of native biodiversity and are willing to protect native biodiversity values	Greater Wellington Biodiversity, Parks and Communications departments	††	††	††	††	††

* The resources available for this activity each year depend on what other environmental restoration activities the Parks department are undertaking each year in areas of the park outside the KNE site and cannot be determined at this time.
** Operational boundaries will be determined at the time of the operation. The aim will be to include all areas that can safely be treated.
† Includes $3,000 funded by the Parks department.
†† In general, only staff time is required for this activity.

11. Funding contributions

11.1. Budget allocated by Greater Wellington

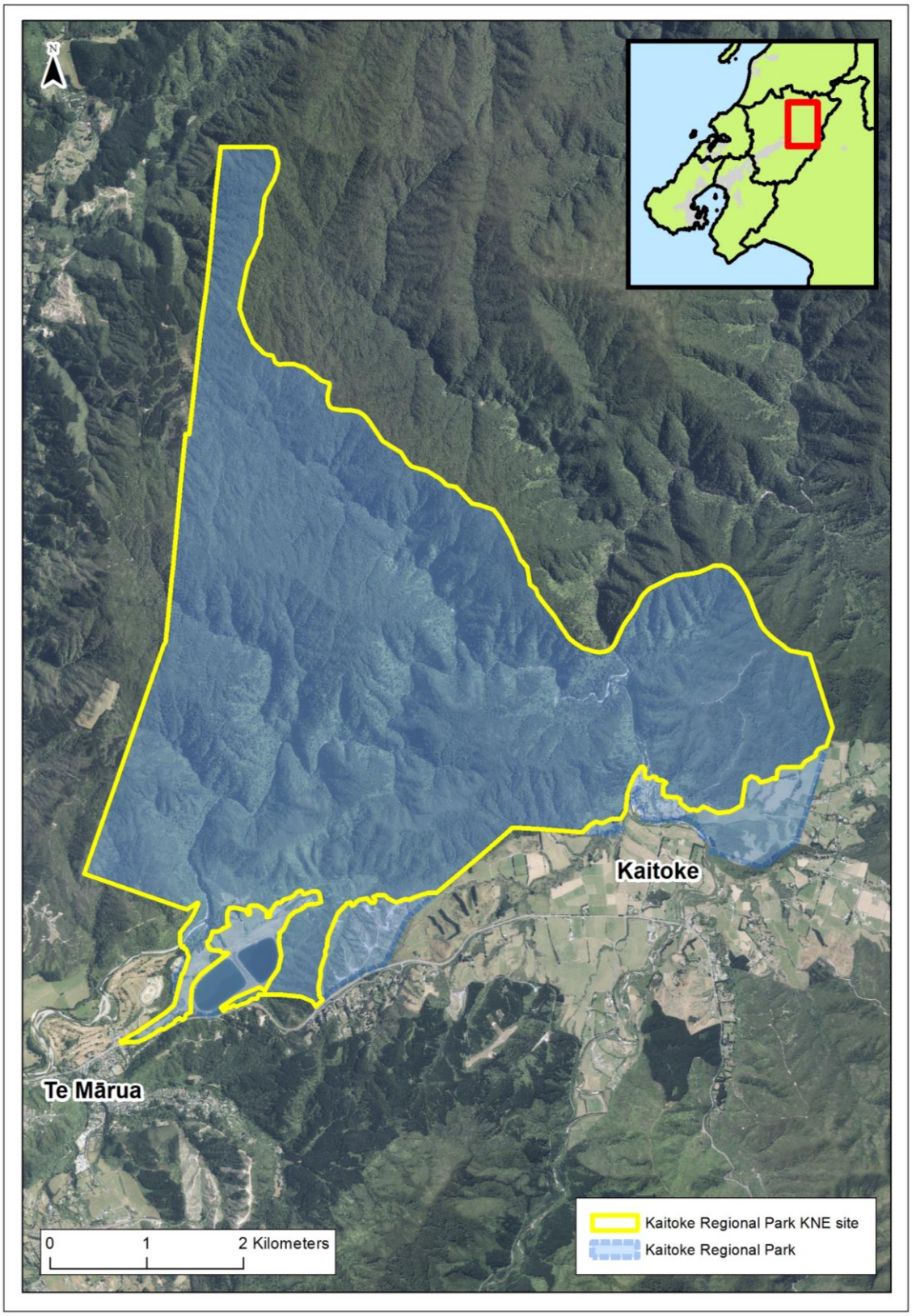
The budgets for the years 2023/24 to 2026/27 are indicative only and subject to change.

Table 5: Greater Wellington allocated budget for the Kaitoke Regional Park KNE site

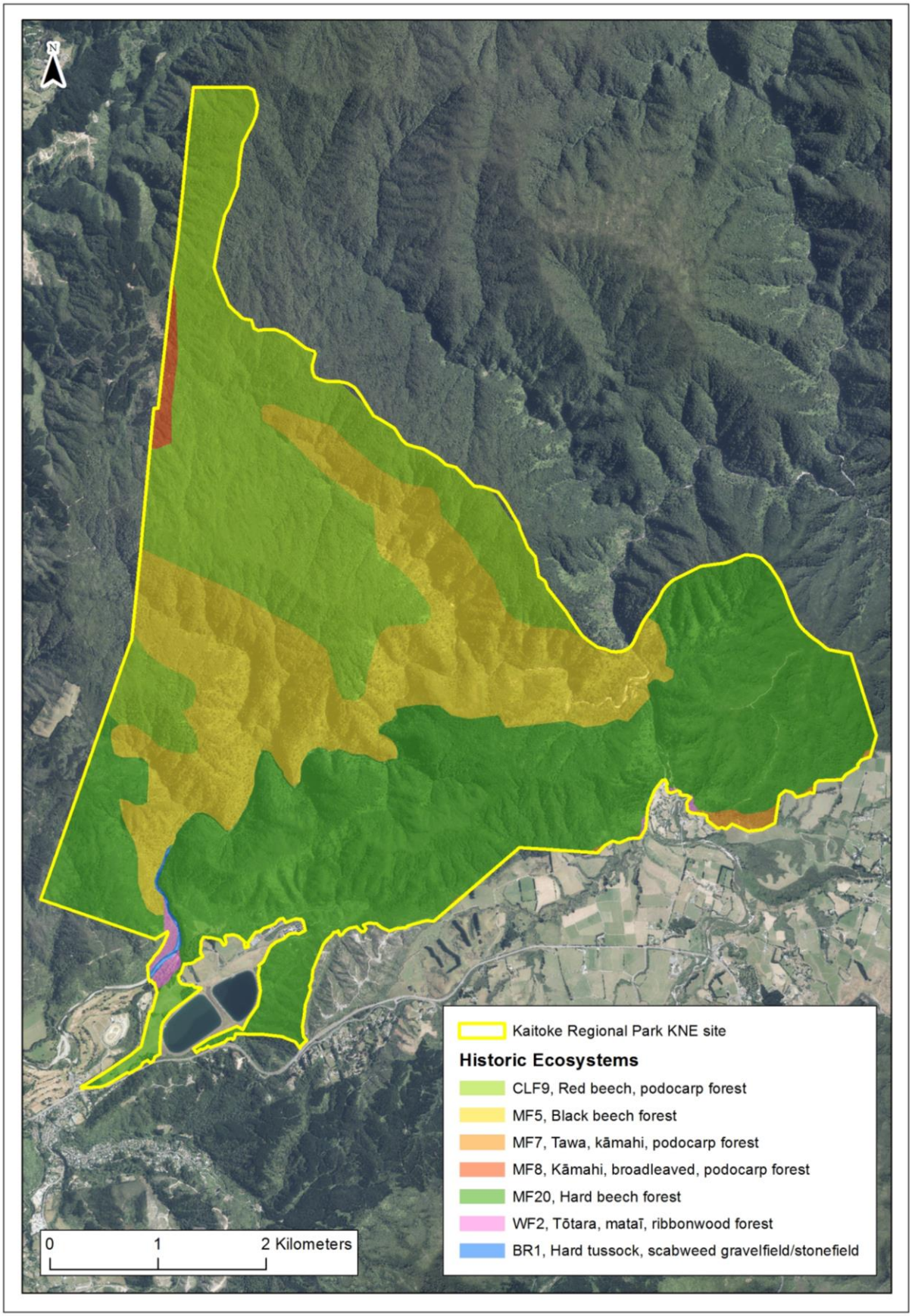
Management activity	Timetable and resourcing				
	2022/23	2023/24	2024/25	2025/26	2026/27
Ecological weed control	$8,400	$8,400	$8,400	$8,400	$8,400
Aerial 1080 possum control	--	--	--	--	$140,000*
Pest animal control	$17,000†	$14,000	$14,000	$14,000	$14,000
Revegetation	$250	$250	$250	$250	$250
Total	**$25,650**	**$22,650**	**$22,650**	**$22,650**	**$162,650**

*Includes pre-operation possum population monitoring.
†Includes $3,000 funded by the Parks department for traps for the volunteer group project.

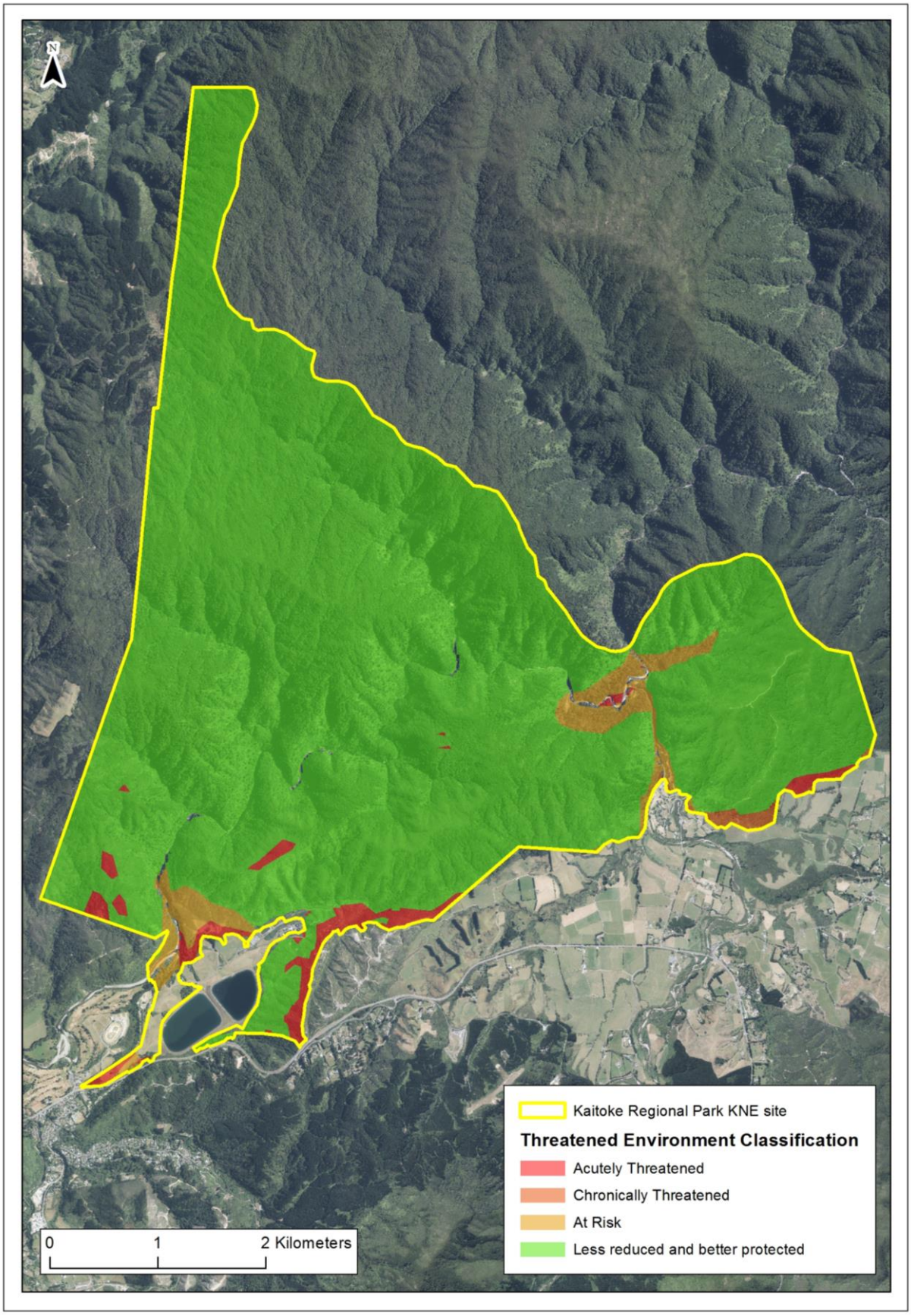
Appendix 1: Kaitoke Regional Park KNE site maps



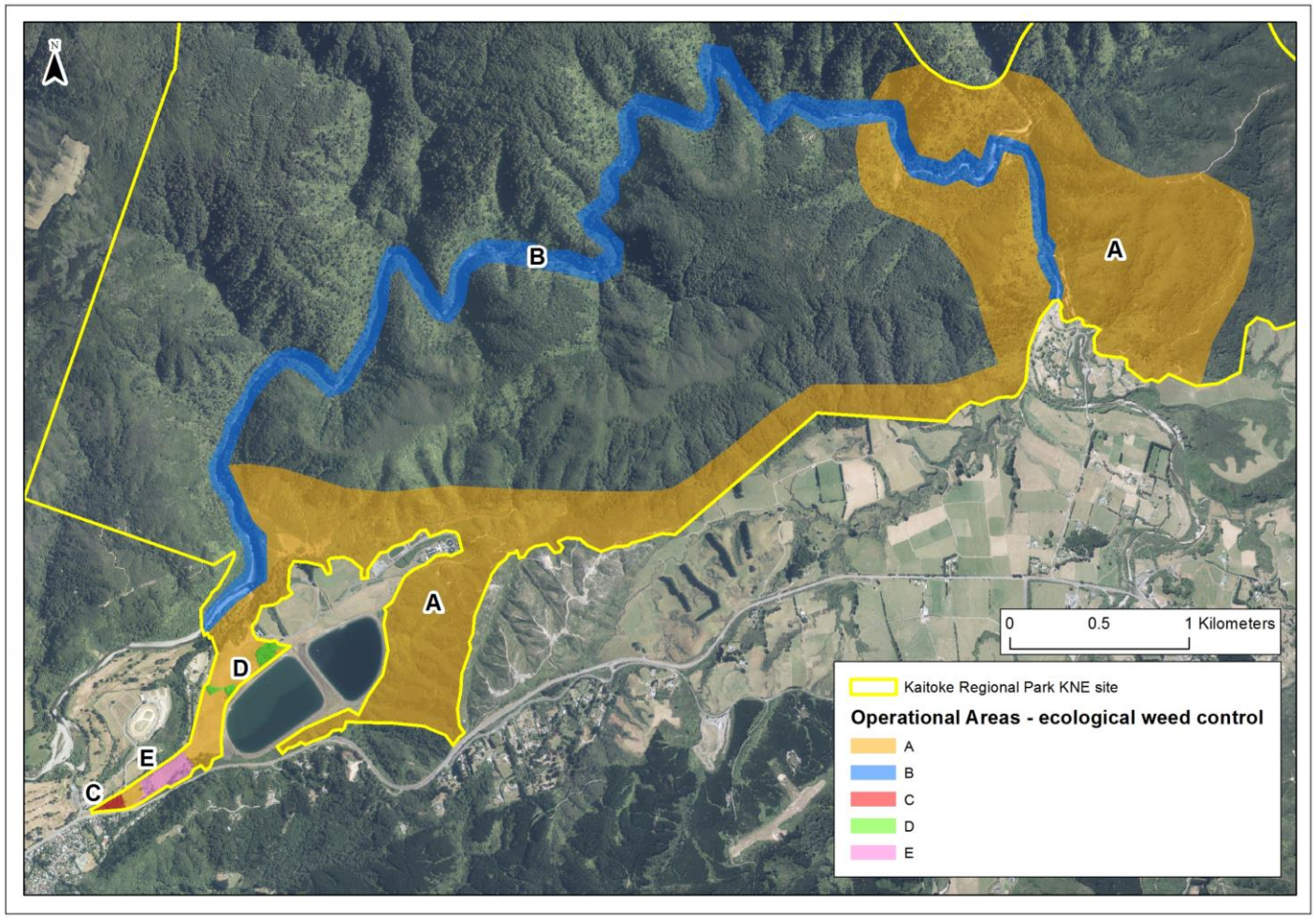
Map 1: The Kaitoke Regional Park KNE site boundary



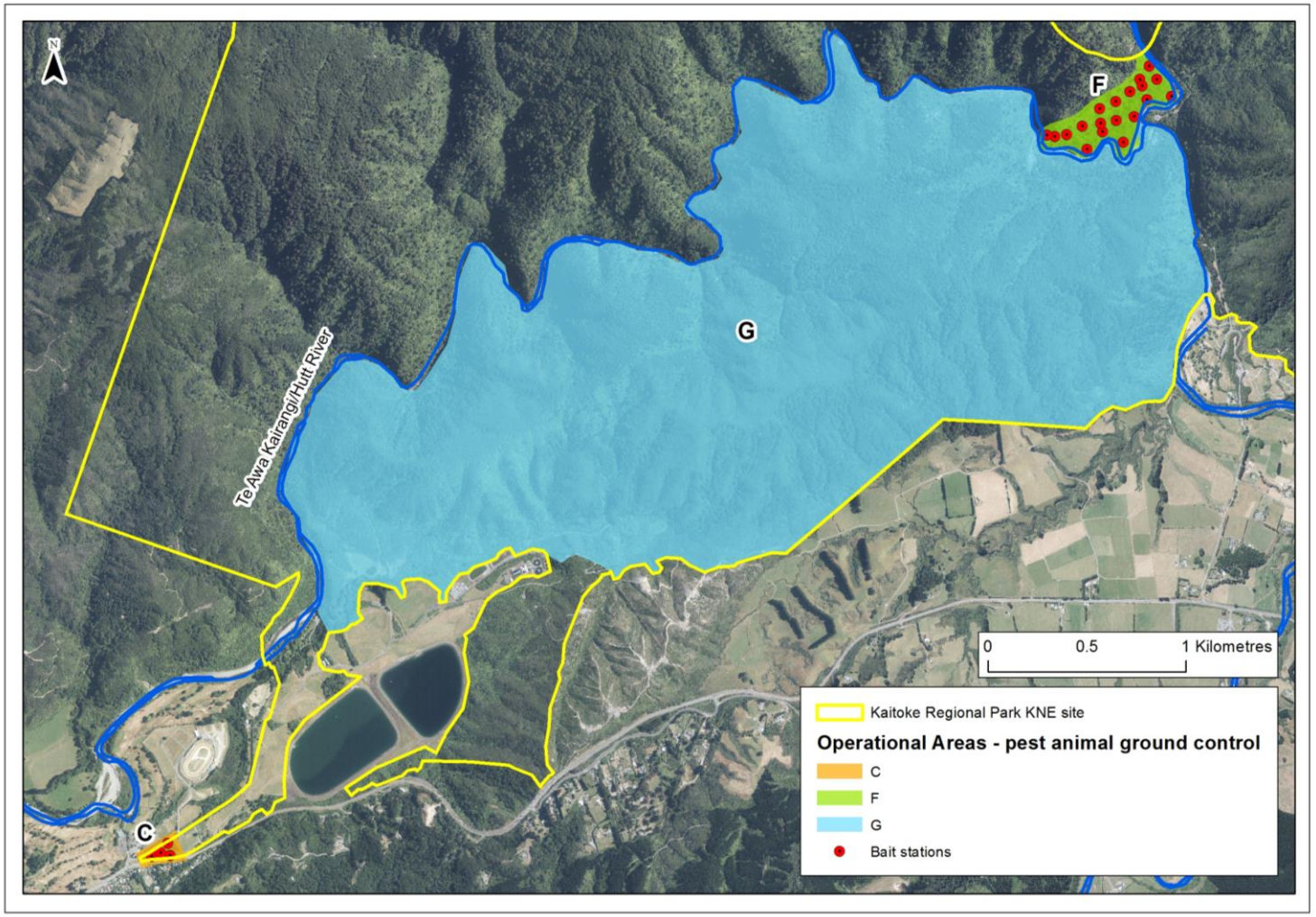
Map 2: Ecosystem types historically present in the Kaitoke Regional Park KNE site



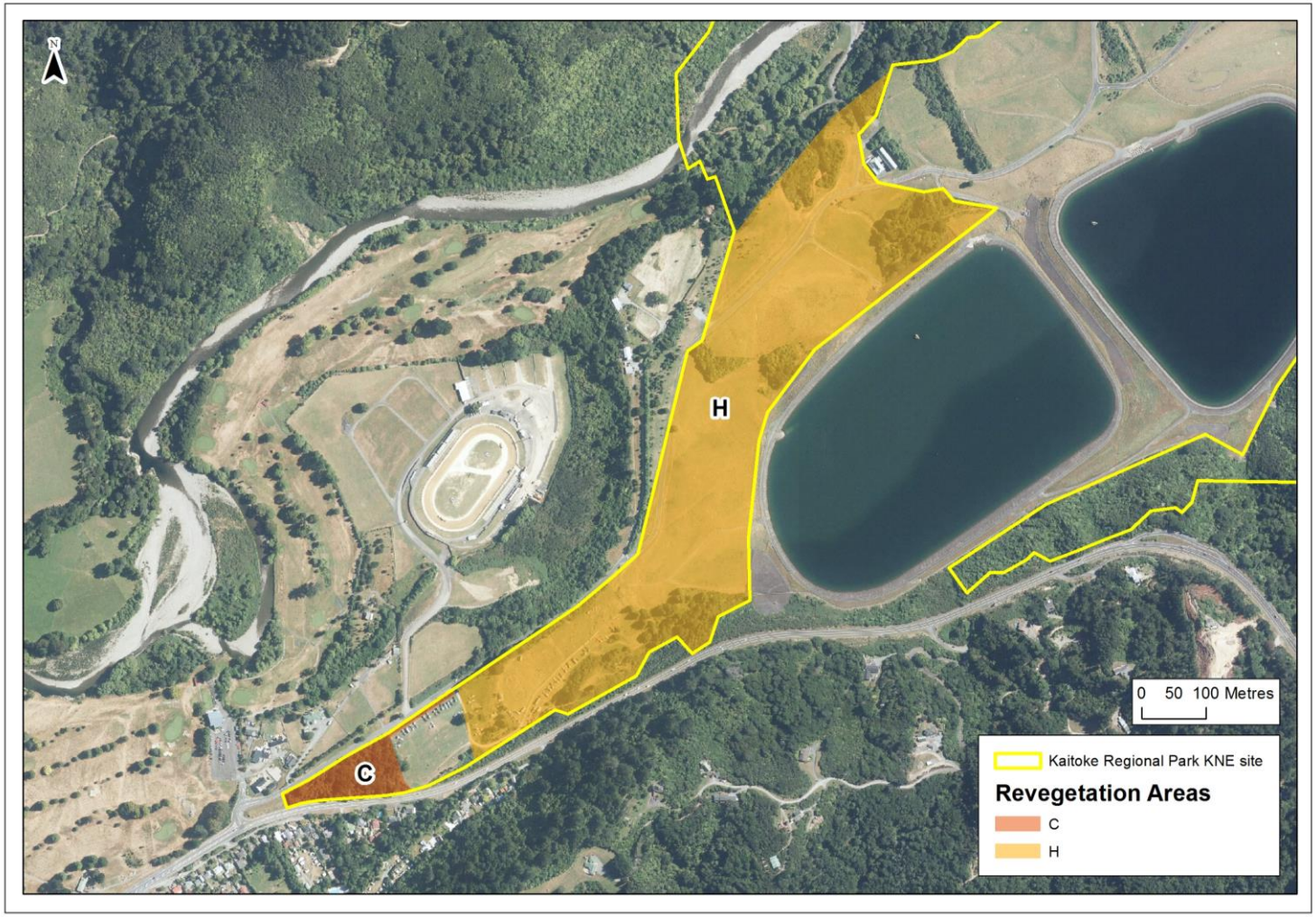
Map 3: Forest cover classifications for the Kaitoke Regional Park KNE site



Map 4: Operational areas for ecological weed control in the Kaitoke Regional Park KNE site



Map 5: Operational areas for ground-based pest animal control in the Kaitoke Regional Park KNE site



Map 6: Revegetation areas in the Kaitoke Regional Park 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[29]. 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 Kaitoke Regional Park KNE site.

Table 6: Threatened and At Risk species at the Kaitoke Regional Park KNE site

Scientific name	Common name	Threat status	Observation
Plants(vascular)[30]			
Brachyglottis kirkii var. kirkii	Kirk's daisy/kohurangi	Threatened – Nationally Vulnerable	Greater Wellington 2007[31]
Peraxilla colensoi	Scarlet mistletoe/korukoru	At Risk – Declining	Greater Wellington 2007
Peraxilla tetrapetala	Red mistletoe/pikirangi	At Risk – Declining	Greater Wellington 2007
Pterostylis tasmanica	Plumed greenhood orchid	Threatened – Nationally Vulnerable	Greater Wellington 2007
Birds[32]			
Acanthisitta chloris	Rifleman/titipounamu	At Risk – Declining	McArthur N. 2021[33]
Andea modesta	White heron/kōtuku	Threatened – Critical	McArthur N. 2021
Anthus novaeseelandiae	New Zealand pipit/pīhoihoi	At Risk – Declining	McArthur N. 2021
Eudynamys taitensis	Long tailed cuckoo/koekoeā	Threatened – Vulnerable	McArthur N. 2021
Falco novaeseelandiae	New Zealand falcon/kārearea	Threatened – Vulnerable	McArthur N. 2021
Phatacrocorax carbo	Black shag/kawau	At Risk – Relict	McArthur N. 2021
Reptiles[34]			
Mokopirirakau "southern North Island"	Ngahere gecko/moko pirirākau	At Risk – Declining	Romijn R. 2021[35]
Freshwater fish[36]			
Anguilla dieffenbachii	Longfin eel/tuna	At Risk – Declining	NIWA 2021[37]
Galaxias brevipinnis	Koaro	At Risk – Declining	NIWA 2021
Galaxias divergens	Dwarf galaxias/kakawai	At Risk – Declining	NIWA 2021
Galaxias hubbsi	Bluegill bully/kakawai	At Risk – Declining	NIWA 2021

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, (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 Kaitoke Regional Park KNE site.

Table 7: Regionally threatened species recorded in the Kaitoke Regional Park KNE site

Scientific name	Common name	Threat status	Observation
Plants[38]			
Brachyglottis kirkii var. *kirkii*	Kirk's daisy/kohurangi	Endangered	Greater Wellington 2007[39]
Korthalsella lindsayi	Dwarf mistletoe	Naturally uncommon	Greater Wellington 2007
Peraxilla tetrapetala	Red mistletoe/pirirangi	Critical	Greater Wellington 2007
Pittosporum cornifolium	Perching kohukohu/tawhirikaro	Naturally uncommon	Greater Wellington 2007
Raukaua edgerleyi	Raukawa/raukaua	Naturally uncommon	Greater Wellington 2007
Peraxilla colensoi	Scarlet mistletoe/korukoru	Critical	Greater Wellington 2007
Lycopodiella lateralis		Critical	Crisp P. 2020[40]
Trichomanes colensoi	Bristle fern	Critical	Crisp P. 2020
Birds[41]			
Acanthisitta chloris	Rifleman/titipounamu	At Risk – Declining	McArthur N. 2021[42]
Anthus novaeseelandiae	New Zealand pipit/pīhoihoi	Threatened – Vulnerable	McArthur N. 2021
Eudynamys taitensis	Long tailed cuckoo/koekoeā	At Risk – Naturally Uncommon	McArthur N. 2021
Falco novaeseelandiae	New Zealand falcon/kārearea	Threatened – Critical	McArthur N. 2021
Hemiphaga novaeseelandiae	New Zealand pigeon/kererū	At Risk – Recovering	McArthur N. 2021
Himantopus	Pied stilt/poaka	Threatened – Vulnerable	McArthur N. 2021
Phalacrocorax carbo	Black shag/kawau	Threatened – Critical	McArthur N. 2021

Scientific name	Common name	Threat status	Observation
Lizards[43]			
Mokopirirakau "southern North Island"	Ngahere gecko/moko pirirākau	At Risk – Declining	Romijn R. 2021[44]

Appendix 4: Threat table

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

Table 8: Threats to the Kaitoke Regional Park 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 this KNE site include African club moss (*Selaginella kraussiana*) and wandering willie (*Tradescantia fluminensis*), (see full list in Appendix 5).	A, B, C, D, E
EW-2	Woody ecological weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species for this KNE site include barberry (*Berberis glaucarpa*), hawthorn (*Crataegus monogyna*) and holly (*Ilex aquifolium*), (see full list in Appendix 5).	A, B, C, D, E
EW-3	Climbing ecological weeds smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition. Key climbing ecological weed species for this KNE site include old man's beard (*Clematis vitalba*), Japanese honeysuckle (*Lonicera japonica*) and climbing asparagus (*Asparagus scandens*), (see full list in Appendix 5).	A, B, C, D, E
Pest animals		
PA-1	Possums (*Trichosurus vulpecula*) browse palatable canopy vegetation until it can no longer recover[45,46]. This destroys the forest's structure, diversity and function. Possums may also prey on native birds and invertebrates[47].	Entire KNE site
PA-2*	Rats (*Rattus* 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[48,49] .	Entire KNE site
PA-3*	Mustelids (stoats[50,51] (*Mustela erminea*), ferrets[52,53] (*M. furo*) and weasels[54,55] (*M. nivalis*)) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions.	Entire KNE site
PA-4*	Hedgehogs (*Erinaceus europaeus*) prey on native invertebrates[56], lizards[57] and the eggs[58] and chicks of ground-nesting birds[59] .	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-5*	House mice (*Mus musculus)* 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[60,61].	Entire KNE site
PA-6*	Pest and domestic cats (*Felis catus*) prey on native birds[62], lizards[63] and invertebrates[64], reducing native fauna breeding success and potentially causing local extinctions[65].	Entire KNE site
PA-7*	Rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus*) graze on palatable native vegetation and prevent natural regeneration in some environments[66]. Rabbits and hares penetrate into forest areas browsing and reducing regenerating native seedlings.	Forest edges
PA-8*	Wasps (*Vespula* spp.) adversely impact native invertebrates and birds through predation and competition for food resources. They also affect nutrient cycles in beech forests[67].	Entire KNE site
PA-9	Red deer (*Cervus elaphus*) and fallow deer (*Dama dama*) browse the forest understory and can significantly change vegetation composition by preferential browsing and preventing regeneration[68,69,70].	Entire KNE site
PA-10	Feral pigs (*Sus scrofa*) root up the soil and eat roots, invertebrates, seeds and native plants preventing forest regeneration[71].	Entire KNE site
PA-11	Goats (*Capra hircus*) 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[72].	Entire KNE site
PA-12*	Brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) prey on native fish and compete with them for food resources[73].	All rivers and streams
PA-13*	Eastern rosella (*Platycercus eximius*) 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[74,75].	Entire KNE site
Human activities		
HA-1	Garden waste dumping and ecological weeds growing on private property upstream of the KNE site often lead to ecological weed invasions into natural areas.	B, C
HA-2*	Recreational use such as walking and tramping off track can cause damage and disturbance of the native ecosystem. It can also disturb native fauna and introduce ecological weeds.	Entire KNE site
HA-3*	Dogs (*Canis lupus familiaris*), if uncontrolled/unleashed can disturb or kill nesting birds and chicks, and lizards within the KNE site, particularly near walking tracks[76].	High public use areas

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
HA-4*	Freshwater activities such as boating and fishing can introduce aquatic weed species to waterways.	Main rivers
Other threats		
OT-1	Small forest remnants are affected by environmental impacts on their edges such as changing environmental conditions (eg, soil moisture or temperature levels), changing physical environment (eg, different plant assemblages compared to the interior) and changing species interactions (eg, increased predation by invasive species)[77,78].	C, D

*Threats marked with an asterisk are not comprehensively 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 Kaitoke Regional Park KNE site. This list has been compiled through many years of surveying, observation and management by GW staff.

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 Kaitoke Regional Park KNE site

Scientific name	Common name	Priority	Level of distribution	Management aim
Acacia melanoxylon	Tasmanian blackwood	1	Localised and sparse	Suppression
Acer pseudoplatanus	Sycamore	1	Localised and sparse	Suppression
Asparagus scandens	Climbing asparagus	1	Localised and sparse	Eradication
Banksia integrifolia	Banksia	1	Localised and sparse	Suppression
Berberis glaucarpa	Barberry	1	Localised and sparse	Suppression
Clematis vitalba	Old man's beard	1	Localised and sparse	Suppression
Cotoneaster glaucophyllus	Cotoneaster	1	Localised and sparse	Suppression
Crataegus monogyna	Hawthorn	1	Localised and sparse	Suppression
Gunnera tinctoria	Chilean rhubarb	1	Localised and sparse	Eradication
Hedera helix	English ivy	1	Localised and sparse	Suppression
*Hoheria populea**	Lacebark	1	Localised and sparse	Suppression
Humulus lupulus	Hops	1	Localised and sparse	Eradication
Ilex aquifolium	Holly	1	Patchy and abundant	Suppression
Lonicera japonica	Japanese honeysuckle	1	Localised and sparse	Suppression
Pinus radiata	Pine	1	Localised and sparse	Suppression
*Pittosporum crassifolium**	Karo	1	Localised and sparse	Suppression
Prunus spp.	Cherry	1	Localised and sparse	Suppression
Salix spp.	Willow	1	Localised and sparse	Suppression
Selaginella kraussiana	African club moss	1	Localised and sparse	Eradication
Tradescantia fluminensis	Wandering willie	1	Localised and sparse	Suppression
Jasminum polyanthum	Jasmine	1	Localised and sparse	Suppression
Chamaecyparis lawsoniana	Lawson's cypress	1	Localised and sparse	Suppression
Allium veneale	Wild onion	2	Localised and sparse	Suppression
Alstroemeria ligtu	Peruvian lily	2	Patchy and abundant	Suppression
Calystegia silvatica	Convolvulus	2	Localised and sparse	Suppression

Scientific name	Common name	Priority	Level of distribution	Management aim
Crocosmia x *crocosmiiflora*	Montbretia	2	Localised and sparse	Suppression
Cytisus scoparius	Broom	2	Localised and sparse	Suppression
Fragaria virginiana	Wild strawberry	2	Localised and sparse	Suppression
Iris foetidissima	Stinking iris	2	Localised and sparse	Suppression
Leycesteria formosa	Himalayan honeysuckle	2	Localised and sparse	Suppression
Ranunculus ficaria	Celandine	2	Localised and sparse	Eradication
Rose spp.	Briar rose	2	Localised and sparse	Eradication
Rubus fruiticosus	Blackberry	2	Localised and sparse	Suppression
Solanum diflorum	Jerusalem cherry	2	Localised and sparse	Suppression
Solanum nigrum	Black nightshade	2	Localised and sparse	Suppression
Teline monspessullana	Montpellier broom	2	Localised and sparse	Suppression
Ulex europaeus	Gorse	2	Patchy and abundant	Suppression
Zantedeschia aethiopica	Arum lily	2	Localised and sparse	Suppression

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

Appendix 6: Revegetation plant list

Plants from the following table will be used in any revegetation planting as per Section 9.3.

Table 10: Revegetation plant list for use within the Kaitoke Regional Park KNE site

Scientific name	Common name
Cordyline australis	cabbage tree
Coprosma robusta	karamū
Dacrycarpus dacrydioides	kahikatea
Hebe stricta var. *stricta*	koromiko
Kunzea ericoides	kānuka
*Leptospermum scorparium**	mānuka
*Phormium tenax**	harakeke/flax
Pittosporum eugenioides	tarata/lemonwood
Podocarpus totara	tōtara
Prumnopitys taxifolia	mataī
Pseudopanax arboreus	five-finger

* These species are not appropriate for planting in Te Mārua Bush

References

[1] New Zealand legislation. 1991. Resource Management Act 1991.
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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

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info@gw.govt.nz
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July 2022
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