Key Native Ecosystem Plan for Battle Hill Bush

2015-18

KNE
KEY NATIVE ECOSYSTEM

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Contents

1. Key Native Ecosystem plans

New Zealand's indigenous biodiversity continues to decline nationally, and in the Wellington region. Major reasons for the decline are that native species are preyed on or outcompeted by invasive species and ecosystems and habitats are lost or degraded through human resource use and development. Active management to control threats is required to protect indigenous biodiversity. Regional councils have responsibility to maintain indigenous biodiversity, as well as to protect significant vegetation and habitats of threatened species, under the Resource Management Act 1991 (RMA).

Greater Wellington Regional Council's (GWRC's) vision for biodiversity is:

"The Wellington region contains a full range of naturally occurring habitats and ecosystems that are in a healthy functioning state and supporting indigenous biodiversity"

GWRC's Biodiversity Strategy 2011-21[1] provides a common focus across the council's departments, and guides activities relating to biodiversity. One of its goals is: High value biodiversity areas are protected.

In order to achieve this vision and goal, the Key Native Ecosystem (KNE) programme seeks to protect some of the best examples of ecosystem types in the Wellington region by managing, reducing, or removing threats to their values. Sites with the highest biodiversity values have been identified and then prioritised for management. Active management of KNE sites can involve control of ecological weeds and pest animals, fencing to exclude stock, restoration planting and helping landowners to legally protect these areas.

KNE sites are managed in accordance with three-year KNE plans, such as this one, prepared for each area by the GWRC's Biodiversity department in collaboration with the landowners and other stakeholders. These plans outline the ecological values and threats specific to each KNE site, set out objectives for biodiversity management, and prescribe the operational actions and budget required to work towards achieving the objectives.

Much of the work planned in KNE sites will be carried out by GWRC staff or contractors engaged by GWRC. For example, the Biosecurity department carries out ecological weed and pest animal control to achieve the objectives set out in KNE plans.

GWRC also recognizes that working relationships between the management partners are critical for achieving the objectives for the KNE site. Under the KNE programme, GWRC staff also work with landowners and volunteer community groups involved in protection or restoration work within KNE sites.

KNE site plans are reviewed regularly to ensure the activities undertaken to protect and restore the KNE site are informed by experience and improved knowledge about the site.

2. Battle Hill Bush Key Native Ecosystem

The Battle Hill Bush KNE site covers an area of approximately 40 ha and comprises remnants of semi-coastal forest and a section of a tributary of Horokiri Stream (see Appendix 1, Map 1). Most of the KNE site (26.5 ha) lies within the western margins of Battle Hill Farm Forest Park and is gazetted as Scenic Reserve. Also included in the KNE site is 13.5 ha of private land of which 8.5 ha is legally protected by an open space covenant issued by the Queen Elizabeth II National Trust. The KNE site is bisected by Paekākāriki Hill Road approximately 5km north of Pāuatahanui and 13km south of Paekākāriki (see Appendix 1, Map 1). Habitats surrounding the KNE site comprise indigenous and plantation forest, and farmland.

Landowner and stakeholders

GWRC works in collaboration with landowners and other interested parties (management partners and stakeholders) where appropriate to achieve shared objectives for the site. In preparing this plan, GWRC has sought input from landowners and relevant stakeholders, and will continue to involve them as the plan is implemented.

Landowner

Most of the site (26.5 ha) is owned by GWRC as part of Battle Hill Farm Forest Park (see Appendix 1, Map 2). Management of Battle Hill Farm Forest Park as a whole is guided by GWRC's Parks Network Plan[2] and Battle Hill Farm Forest Park Sustainable Land Use Plan[3]. These plans guide the recreational and amenity uses of the park as well as identifying opportunities to protect and enhance biodiversity values. This KNE plan is consistent with the wider objectives and policies of these park management plans. The Biodiversity and Parks departments work collaboratively to efficiently deliver the activities in these plans.

The remaining land within the KNE site is privately owned by two separate owners; Jeremy Collyns (8.5 ha) and Stephen and Bronwyn Scott (5 ha). These landowners are allowing native forest on their land to be included in the KNE site and allowing access to their land for the purposes of ecological weed and pest animal control. Mr Collyns will continue to take an active role in ecological weed and pest animal control on his land.

Management partners and key stakeholders

The management partners to this plan within GWRC are the Parks, Biodiversity and Biosecurity departments of GWRC. The Parks department manages recreational access and maintains assets such as the road, tracks and amenity areas. The Biodiversity department plans and coordinates biodiversity management activities and provides biodiversity advice. The Biosecurity department carries out pest control activities.

GWRC operational staff will give due consideration to procedures, which may include assessments of environmental effects, to identify and avoid damage to biodiversity values such as plant and animal communities. This will limit risks to these values that could occur while carrying out the construction and maintenance of assets, ecological

weed and pest animal control, and when permitting the use of the KNE site for recreational and commercial purposes.

QEII National Trust (QEII) is a management partner at the site, as the block owned by Jeremy Collyns is legally protected with an open space covenant under the QEII Act. GWRC and QEII work in partnership to protect biodiversity at a number of sites, including this one, as outlined in a MOU[4] between the organisations.

Ngāti Toa Rangatira hold mana whenua of the KNE site. Areas adjacent to the KNE site, within Battle Hill Farm Forest Park, are significant to Māori as an historic battle between Ngāti Toa Rangatira and New Zealand Government forces was fought here. The partnership between Ngāti Toa Rangatira and GWRC in regard to the management of Battle Hill Farm Forest Park is outlined in the Parks Network Plan.

Members of the Mana Lions Club have been helping protect the KNE site by trapping predators in surrounding areas of Battle Hill Farm Forest Park since September 2006, and will continue to do so.

The manager of the farming operation on adjacent areas of Battle Hill Farm Forest Park is involved in protecting the KNE site through the ongoing exclusion of his stock.

Battle Hill Farm Forest Park has high recreational use and the KNE site contains public walking tracks. The stream is used for swimming and there is a campground immediately adjacent to the KNE site. Visitors to the KNE site and wider area may also be interested in the management of the KNE site and are therefore also considered stakeholders.

Ecological values

Ecological values are a way to describe indigenous biodiversity found at a site, and what makes it special. These ecological values can be various components or attributes of ecosystems that determine an area's importance for the maintenance of regional biodiversity. Examples of values are the provision of important habitat for a threatened species, or particularly intact remnant vegetation typical of the ecosystem type. The ecological values of a site are used to prioritise allocation of resources to manage KNE sites within the region.

The Battle Hill Bush KNE site is located in a valley formed by a fault line running between Pāuatahanui and Paekākāriki, creating the straight-flowing Horokiri Stream which flows into the Pāuatahanui Inlet approximately 5.5 km downstream of the KNE site.

The geology of the catchment is fractured greywacke and alluvial gravels. The topography is characterised by steep, strongly faulted hills. The KNE site has an altitudinal range of 70m to 260m above sea level. It is within Wellington Ecological District[5] and the Western Temperate Foothills Eco-domain which has a mild climate and a mean annual rainfall of 1150-1400mm[6].

Of note in recognising the ecological values at the Battle Hill Bush KNE site are the following:

Threatened environments: The Threatened Environment Classification system (LENZ)[7] is a broad classification system which shows how much indigenous

vegetation remains within land environments, how much is legally protected and how past vegetation loss and legal protection are distributed across New Zealand's landscape. Six threat categories cover New Zealand. Within the KNE site are areas that fall within the following categories (see Appendix 1, Map 3):

- Acutely Threatened (Environments with less than 10% indigenous vegetation remaining nationally); found on stream margins and the valley floor.
- Chronically Threatened (Environments with 10-20% indigenous vegetation remaining nationally); found on the valley floor and lower slopes.
- At Risk (Environments with 20-30% indigenous vegetation remaining nationally); found on lower slopes.

Threatened species: One nationally At Risk[8] and five regionally uncommon plant species are found here, including the only self-sustaining population of taurepo (*Rhabdothamnus solandri*) in the Wellington region. This species is near its southern distribution limit within the KNE site (see Appendices 2 and 3). The KNE site provides habitat for one nationally Threatened and one At Risk bird species and five At Risk fish species (Appendices 2).

The Singers and Rogers (2014)[9] classification of pre-human vegetation indicates the Battle Hill Bush KNE site comprised kohekohe, tawa forest (MF6), and kāmahi, broadleaved podocarp forest (MF8). There is only 15% of the original extent of kohekohe, tawa forest remaining in the Wellington region, making it a regionally threatened ecosystem type[10].

The vegetation within Battle Hill Bush KNE site today generally comprises regionally uncommon semi-coastal forest with a canopy of kohekohe (*Dysoxylum spectabile*) tawa (*Beilschmiedia tawa*) and occasional podocarp species.

Vegetation in the Battle Hill Farm Forest Park portion of the KNE site comprises forest dominated by tawa and tītoki (*Alectryon excelsus* subsp*. excelsus*) on lower hill slopes, grading into kohekohe forest on upper slopes. Swampy areas support kahikatea (*Dacrycarpus dacrydioides*), pukatea (*Laurelia novae-zelandiae*) and swamp maire (*Syzygium maire*). Occasional rimu (*Dacrydium cupressinum*), tōtara (*Podocarpus totara*), mataī (*Prumnopitys taxifolia*) and miro (*Prumnopitys ferruginea*) are present. The understorey contains māhoe (*Melicytus ramiflorus*), kaikōmako (*Pennantia corybosa*), nīkau (*Rhopalostylis sapida*), *Coprosma* spp., and other tree and shrub species[11]. There is an area of rank pasture in the north of the site and an area of plantation pine (*Pinus radiata*) forest on the south-eastern margins of the site.

Uncommon species present include the maidenhair ferns (*Adiantum diaphanum* and *A. viridescens*), gully tree fern (*Cyathea cunninghamii*), perching kōhūhū (*Pittosporum cornifolium*), greenhood orchid (*Pterostylis foliata*), and four mosses (*Trichostomum brachydontium*, *Porotrichum oblongofolium*, *Leptodon smithii* and *Echinodium umbrosum*)[12,13] (see Appendices 2 and 3).

The QEII covenant area is dominated by kohekohe and tawa, with kahikatea, tōtara, and mataī alongside the road. Elsewhere there is nīkau, māhoe, kaikōmako, treeferns, kāmahi (*Weinmannia racemosa*), kawakawa (*Piper excelsum* subsp*. excelsum*),

rewarewa (*Knightia excelsa*), houhere (*Hoheria sextylosa*), lancewood (*Pseudopanax crassifolius*), lemonwood (*Pittosporum eugenioides*) and regenerating broadleaf (*Griselinia littoralis*)[14]. The remaining privately-owned land contains forest that appears to be of a similar composition to that found in the adjoining QEII covenant.

Most of the native forest bird species that have survived naturally in the Wellington Region are present, including New Zealand falcon (*Falco novaeseelandiae*), red-crowned parakeet (*Cyanoramphus novaezelandiae*), bellbird (*Anthornis melanura*), whitehead (*Mohoua albicilla*) and pied tomtit (*Petroica macrocephala toitoi*)[15,16]. Some bird species are likely to use the habitat seasonally to feed on ripe fruits or flowers and/or to breed. There are ecological links with the Hutt Valley and Pukerua Bay (through vegetated corridors)[17] and Pāuatahanui Inlet (via the Horokiri Stream) which are likely to allow the movement of mobile species.

The Horokiri Stream provides habitat for several fish species, including five threatened species: giant kōkopu (*Galaxias argenteus*), kōaro (*Galaxias* brevipinnis), lamprey (*Geotria australis*), redfin bully (*Gobiomorphus huttoni*) and longfin eel (*Anguilla dieffenbachia)*[18]*.* Migratory fish can reach the sea via Horokiri Stream and Pāuatahanui Inlet. An unidentified gecko species has been recorded in the northern part of the KNE site[19]. No nationally threatened or at risk invertebrates are known from the KNE site.

Key threats to ecological values at the site

Ecological values can be threatened by human activities, and by introduced animals and plants, that change the natural balance of native ecosystems. The key to protecting and restoring biodiversity as part of the KNE programme is to manage the threats to the ecological values at the site.

The main threats to Battle Hill Bush KNE site are from ecological weeds (see Appendix 4). Without control weeds will continue to spread within the site, displacing indigenous vegetation, inhibiting indigenous regeneration, and altering vegetation structure and composition. Dense infestations of ground covers, scramblers and climbers are present on the stream terraces, the road sides and the banks between the two. Woody weeds are dispersed sparsely throughout but are present in greater densities on adjoining land, posing a threat of incursion.

Pest animals are also adversely affecting the condition of the vegetation and fauna habitats. Possums (*Trichosurus vulpecula*) and rats (*Rattus* spp.) are generally present in low numbers due to intermittent control carried out in the past. However, if control isn't continued, it is likely that possums and rats will increase in numbers through reproduction and immigration to levels that will impact forest vitality. Goats (*Capra hircus*) are not resident in the KNE site but frequently enter from neighbouring properties, either passing through fences or via the road, and have severely browsed understory plant species at times.

Predators such as cats (*Felis catus*) and hedgehogs (*Erinaceus europaeus*) that prey on birds, bird eggs and invertebrates, are likely to be present in moderate numbers. Stoats (*Mustela erminea*) may be present in lower than usual numbers due to control in adjacent areas.

While the key threats discussed in this section are recognised as the most significant, a number of other threats to the KNE site have also been identified. Table 1 presents a summary of all known threats to the KNE site (including those discussed above), detailing which operational areas they affect, how the threat impacts on ecological values, and whether they will be addressed by the proposed management activities.

Table 1: Threats to ecological values present at the Battle Hill Bush KNE site.

The codes alongside each threat correspond to activities listed in the operational plan (Table 2) and are used to ensure that actions taken are targeted to specific threats. A map of operational areas can be found in Appendix 1 (see Maps 4 and 5).

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Ecological weeds (see Appendix 4)		
EW-1	A range of woody weeds are displacing native vegetation, inhibiting regeneration, and altering vegetation structure and composition. Key species include holly (*Ilex aquifolium*), hawthorn (*Crataegus monogyna*), Himalayan honeysuckle (*Leycesteria formosa*) and sycamore (*Acer pseudoplatanus*).	A,B,C,D,E
EW-2	A range of ground covering, scrambling and climbing weeds are smothering and displacing native vegetation, inhibiting regeneration, and altering vegetation structure and composition. Key species include tradescantia (*Tradescantia fluminensis*), African club moss (*Selaginella kraussiana*), blackberry (*Rubus fruiticosus*) and German ivy (*Senecio mikanioides*).	C
EW-3	Holly and hawthorn on adjacent farmland in Battle Hill Farm Forest Park provides a seed source for dispersal of these species into the KNE site.	F
EW-4*	Pine plantations within and adjacent to the KNE site are a source of seed which could result in wilding pine spread.	B and western boundaries
Pest animals		
PA-1	Possums browse indigenous vegetation (e.g. palatable perching kōhūhū) and prey on indigenous fauna.	Entire KNE site
PA-2	Goat incursions from neighbouring properties are intermittent. Goats browse native vegetation, preventing regeneration of the most palatable species and reducing species diversity.	Entire KNE site
PA-3	Mustelids (*Mustela* spp.) prey on native birds, lizards and invertebrates, reducing breeding success and potentially causing local extinctions.	Entire KNE site
PA-4(*)	Rats and mice* (*Mus musculus*) browse native fruit, seeds and vegetation. They compete with native fauna for food and, if they eat too many seeds or flowers, can reduce forest regeneration. Rats are known to predate on invertebrates, lizards and native birds[20].	Entire KNE site
PA-5	Hedgehogs prey on native invertebrates, lizards[21] and the eggs[22] and chicks of ground-nesting birds.	Entire KNE site
PA-6	Cats prey on native birds, lizards and invertebrates, reducing native fauna breeding success and potentially causing local extinctions.	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-7*	Rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus*) disturb the ground through burrowing and browse native vegetation.	Entire KNE site
PA-8*	Pigs (*Sus scrofa*) disturb the ground through rooting and consume native vegetation and fauna.	Entire KNE site
PA-9*	Introduced brown trout (*Salmo trutta*) prey on native fish[23] and compete for food resources.	C - Horokiri Stream
Human activities		
HA-1	Grazing by escaped stock from adjoining farmland will inhibit natural regeneration, reduce indigenous plant species richness, and may cause local extinctions of palatable indigenous shrubs, terrestrial orchids and ferns[24].	KNE site boundaries
HA-2	Recreational activities such as orienteering, commercial activities such as filming, and management activities such as track maintenance and upgrading can cause damage to native plants and invertebrates, sedimentation of waterways, and introduction/spread of weed species.	Entire KNE site
HA-3*	Plantation forestry operations on adjoining lands have the potential to damage fences and vegetation, and increase sedimentation in waterways when harvested.	KNE site boundaries, Horokiri Stream
HA-4*	Land uses such as stock grazing and land development up-stream of the KNE site could discharge sediment and pollution into waterways which could impact native aquatic plants, invertebrates and fish.	Horokiri Stream
Other threats		
OT-1*	A portion of the KNE site is not legally protected meaning ecological values could be damaged or lost.	E

***Threats marked with an asterisk are not addressed by actions in the operational plan.**

3. Objectives and management activities

Objectives help to ensure that management activities carried out are actually contributing to improving the ecological condition of the site.

Objectives

The following objectives will guide the management activities at Battle Hill Bush KNE site.

1. **To improve the structure* and function† of native plant communities**
2. **To protect threatened native plants (forest species)**
3. **To improve the habitat for native birds**
4. **To raise community awareness of the ecological values of the KNE site**
5. **To engage and support the landowner in the management of the KNE site**

* The living and non-living physical features of an ecosystem. This includes the size, shape, complexity, condition and the diversity of species and habitats within the ecosystem.

† The biological processes that occur in an ecosystem. This includes seed dispersal, natural regeneration and the provisioning of food and habitat for animal species.

Management activities

Management activities are targeted to work towards the objectives above by responding to the threats outlined in Section 2. The broad approach to management activities is described briefly below, and specific actions, with budget figures attached, are set out in the Operational Plan (Table 2).

It is important to note that not all threats identified in Section 2 can be adequately addressed. This can be for a number of reasons including financial, legal, or capacity restrictions. This is discussed in the broad management approach.

The main management activities that will be undertaken in the KNE site are ecological weed and pest animal control. These activities are crucial to achieving the objectives of this plan and will consume the entire available budget for the KNE site. Some additional activities that will assist in achieving the objectives will also be undertaken. These activities generally only require the implementation of robust procedures rather than budgetary resources.

Ecological weed control

The objectives of weed control are to increase native plant dominance and regeneration, and maintain the abundance of threatened plants.

Intensive ecological weed control has been ongoing within much of the KNE site (operational areas A, B and C, see Appendix 1, Map 4) since 2002. This work had been guided by a pest plant control plan prepared for Battle Hill Farm Forest Park[25]. Woody and climbing weeds are now in low densities in these areas. Additionally, Jeremy Collyns, the land owner of operational area D has been carrying out control of some of the more invasive weed species on his land for many years. Little weed control has been carried out in operational area E.

Ecological weed control work will be continued using approaches that will continue to suppress woody and climbing weeds throughout the KNE site, and progressively control large infestations of ground covering weeds that are mostly isolated to operational area C. Only ecological weed species listed in Appendix 4 as priority 1 will be controlled during the term of this plan. Priority 2 species will be controlled in future years.

Operational areas A and B

Woody and climbing weeds will be controlled in these areas by carrying out three-yearly searches for weed plants on the main spurs/ridgelines within operational area A and throughout operational area B. As weeds are already in low densities across most of these areas it is considered that this level of input should achieve further decreases in density. Any ground covering weeds observed in this area will be controlled in conjunction with ground cover control work in operational area C.

Operational area C

Ground covering and climbing weeds in operational area C will be progressively controlled annually. Each year previous sprayed areas will be checked and re-sprayed if necessary, and initial spray work will be carried out on as much new area as resources allow.

Operational area D

Jeremy Collyns will continue to carry out control of ecological weeds in operational area D. If Mr Collyns isn't able to achieve a similar level of control as in other operational areas then some resourcing may be redirected to that area.

Operational area E

An initial search of this area for woody, climbing and ground covering weeds will be carried out and all plants found will be controlled. All infestations likely to re-generate after control will be checked and re-controlled where necessary in subsequent years.

Operational area F

This area of farmland adjacent to the KNE site has harboured many holly and hawthorn plants in the past which had provided seed sources for new infestations of these species in the KNE site. Control of many plants of these species has been carried out in past years. This area will be checked for re-sprouting and new plants to prevent these species spreading back into the KNE site.

The farmer managing the farming operation on Battle Hill Farm Forest Park is required by the Parks department to control gorse on the farm which will help to prevent this weed from spreading into the KNE site as well.

Pest animal control

The objectives of pest animal control are to increase native plant regeneration, maintain the abundance of threatened plants, and increase populations of native birds.

Possum and rat control will be continued with a regular routine of poisoning using brodifacoum dispensed from a network of bait stations. Bait stations are currently in place in operational areas A, B, C and D (see Appendix 1, map 5). Bait stations will be installed in operational area E during the first year of this plan. Jeremy Collyns will continue to carry out the refilling of bait stations on his land (operational area D), with materials supplied by GWRC, while GWRC Biosecurity staff will regularly refill the bait stations in all of the other operational areas.

Possum control is currently being carried out on surrounding land by GWRC as part of their Regional Possum Predator Control Programme and in the nearby Akatarawa Forest KNE. This work will reduce migration of possums into Battle Hill Bush and therefore assist the control within the KNE site to keep the possum population suppressed to low levels.

Predator control will be carried out in operational areas A, B and C using a network of kill-traps which has recently been restored. These traps will be checked and re-baited regularly by Biosecurity staff in conjunction with bait station servicing. Predator trapping carried out by volunteers in nearby areas of Battle Hill Farm Forest Park is

likely to prevent some predators from moving into the KNE site from surrounding areas.

Monitoring of possum rat and mustelid populations is not carried out at this KNE site, however monitoring at other similar sites has shown that the control regime being used is likely to reduce the possum and rat populations to levels that will allow forest habitat regeneration.

Small mobs of goats occasionally move in and out of the site from various directions. The very transient nature of goats within the site makes them very difficult to control. The Battle Hill Farm Forest Park ranging staff and Jeremy Collyns will shoot goats when opportunities arise.

Revegetation

The aim of revegetation at the KNE site will be to establish a continuity of native habitat from the stream to the existing forest edge in areas that have been and are currently highly degraded by ecological weeds. This will provide suitable riparian habitat and shading along the stream and reduce weed incursions.

Native plantings that have been completed in recent years on the true left of the stream within operational area C will be maintained (i.e. released from grasses and kept free of weeds) by the GWRC Parks department.

Revegetation on the true right of the stream will be carried out in the future if funding becomes available. The Horokiri Stream West Restoration Plan prepared in 2011 will be used to guide any future work.

The 1.5 hectare stand of radiata pines located at the southern end of the KNE will be harvested at some point beyond the term of this plan. This area will be allowed to naturally regenerate back to native bush after the pines have been harvested.

Community engagement

An effort will be made to increase local community awareness of the site's biodiversity values. This will be achieved by providing information about the KNE site during events held at or in the vicinity of the site as part of the GWRC's Great Outdoors Summer Events programme. Local media will also be used to promote the site when opportunities arise.

Other activities

Incursions of stock in to the KNE site from the adjacent farming operation on Battle Hill Farm Forest Park will be minimised by the programmed maintenance of farm boundary fences through the Parks asset management programme.

GWRC Parks Department staff will respond appropriately to stream-born rubbish such as tyres, oil and paint, removing them when possible.

Potential impacts of commercial activities such as filming, and organised recreation such as orienteering will be managed by GWRC Parks department through a concessions process.

Biosecurity guidelines[26] will be used by all GWRC personnel when entering and working in the KNE site. Procedures involve checking for and removing seeds and plant fragments from clothing, equipment and vehicles.

4. Operational plan

The operational plan shows the actions planned to achieve the stated objectives for Battle Hill Bush KNE site, and their timing and cost over the three-year period from 1 July 2015 to 30 June 2018. The budget for the 2016/17 and 2017/18 years are indicative only and subject to change. A map of operational areas can be found in Appendix 1 (see Maps 4 and 5).

Table 2: Three year operational plan for the Battle Hill Bush KNE site.

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
1,2	EW-1, EW-2	Ecological weed control	A	GWRC Biosecurity department	Control woody and climbing weeds, focusing searches on main spurs/ridgelines. Identify locations of any ground covering weeds	Reduce density and distribution of target species	$3,200	Nil	Nil
1,2	EW-1, EW-2	Ecological weed control	B	GWRC Biosecurity department	Search entire area and control all woody and climbing weeds found. Identify locations of any ground covering weeds	Reduce density and distribution of target species	Nil	Nil	$5,000
1,2	EW-1, EW-2	Ecological weed control	A, B, C, D & E	GWRC Biosecurity department	Control ground covering and climbing weeds in area C, checking and re-working previous control, and increasing the extent of control as resources allow. Control ground covering weeds identified in areas A, B, D and E	Reduce density and distribution of target species	$4,000	$10,600	$5,500
1,2,5	EW-1, EW-2	Ecological weed control	D	Landowner – Jeremy Collyns	Control woody and climbing weeds. Identify locations of ground-covering weeds	Reduce density and distribution of target species	Nil	Nil	Nil
1,2,5	EW-1, EW-2	Ecological weed control	E	GWRC Biosecurity department	Search for and control woody and climbing weeds through as much of the area as resources allow. Identify locations of ground-covering weeds	Reduce density and distribution of target species	$5,000	$1,600	Nil

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
1,2	EW-3	Ecological weed control	F	GWRC Biosecurity department	Control holly and hawthorn plants	Reduce density and distribution of target species	Nil	Nil	$1,700
1,2,3	PA-1, PA-4	Pest animal control	A, B & C	GWRC Biosecurity department	Control possums and rats by maintaining and re-filling bait stations at three month intervals	Possums: < 5% RTC* Rats: < 10% TTI**	$2,000	$2,000	$2,000
1,2,3,5	PA-1, PA-4	Pest animal control	D	Landowner – Jeremy Collyns	Control possums and rats by maintaining and re-filling bait stations at three month intervals	Possums: < 5% RTC* Rats: < 10% TTI**	$250	$250	$250
1,2,3,5	PA-1, PA-4	Pest animal control	E	GWRC Biosecurity department	Control possums and rats by installing and re-filling bait stations at three month intervals	Possums: < 5% RTC* Rats: < 10% TTI**	$450	$450	$450
3	PA-3, PA-5, PA-6	Pest animal control	A, B & C	GWRC Biosecurity department	Control predators by maintaining and re-baiting traps at three monthly intervals	Mustelids: < 5% TTI**	$800	$800	$800
1,2,3,5	PA-2	Pest animal control	A, B, C & D	GWRC Parks department and private land owners	Control feral goats by shooting when possible	Little to no impact on the KNE site by feral goats	Nil††	Nil††	Nil††
1,2,3	HA-1	Human activities	A, B & C	GWRC Parks department	Boundary fence with rest of Battle Hill Farm Forest Park is maintained to prevent access to the KNE site by stock	Little to no impact on the KNE site by stock	†	†	†
1,2,3	HA-2	Human activities	Entire KNE	GWRC Parks, Biodiversity, Biosecurity & Environmental Science departments	Ecological weed biosecurity guidelines are adhered to while carrying out all management activities	Guidelines available and adhered to in all cases	Nil††	Nil††	Nil††

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
5	HA-2	Community engagement	Entire KNE site	GWRC Parks and Biodiversity departments	Incorporate information about the biodiversity values of the KNE site into community events and media	Increased community awareness of the values of the KNE	Nil††	Nil††	Nil††
Total							**$15,700**	**$15,700**	**$15,700**

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

**TTI = Tracking Tunnel Index. The control regime has been created to control rats/mustelids to this level but monitoring will not be undertaken. Previous rat monitoring at this site indicates the target for rats will be met[27].

† This cost varies annually and cannot be predicted at this time. Funded by GWRC Parks department.

†† No operational resource is required to carry out this activity. Staff time only is required.

5. Funding summary

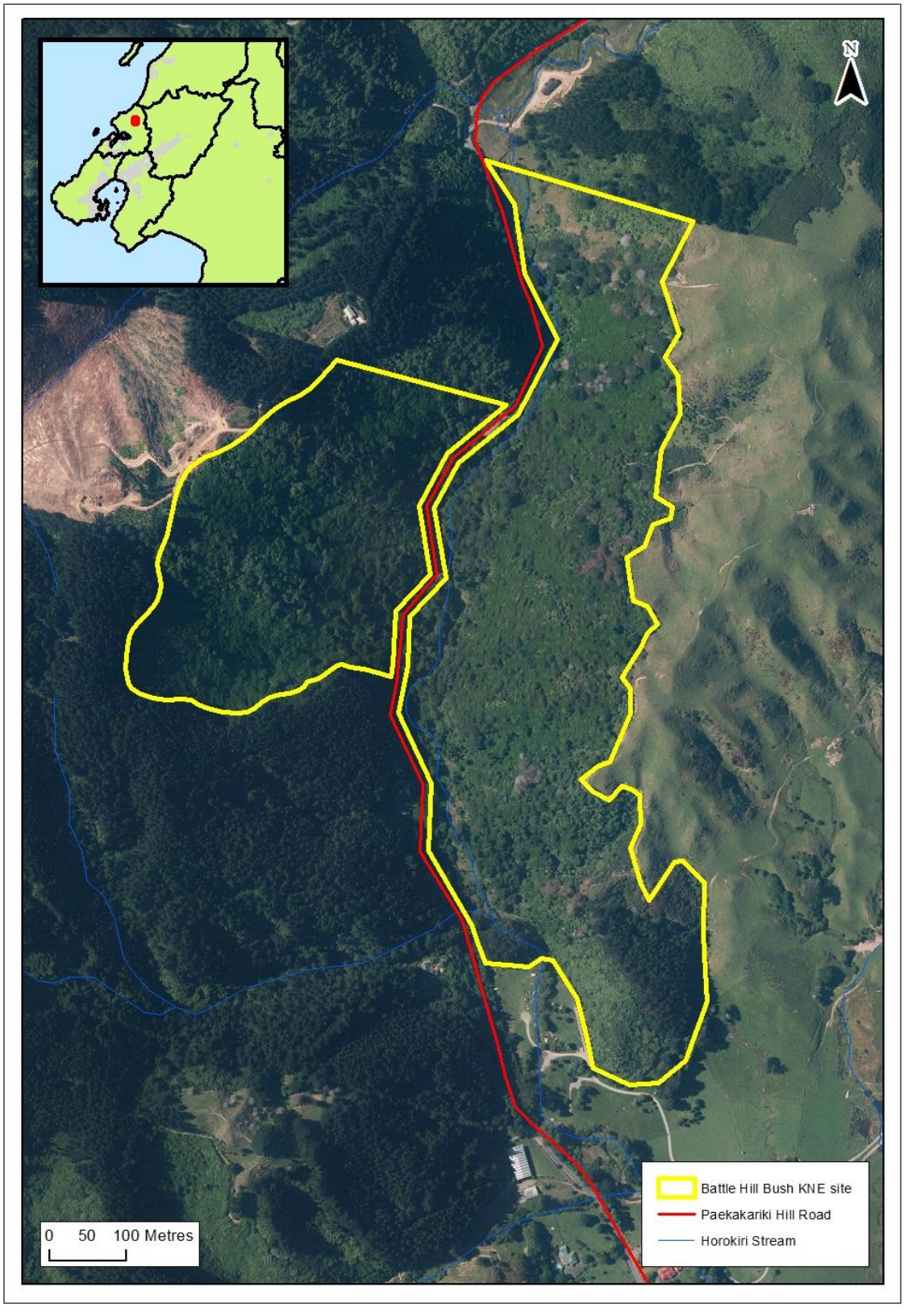
GWRC budget

The budget for the 2016/17 and 2017/18 years are indicative only and subject to change.

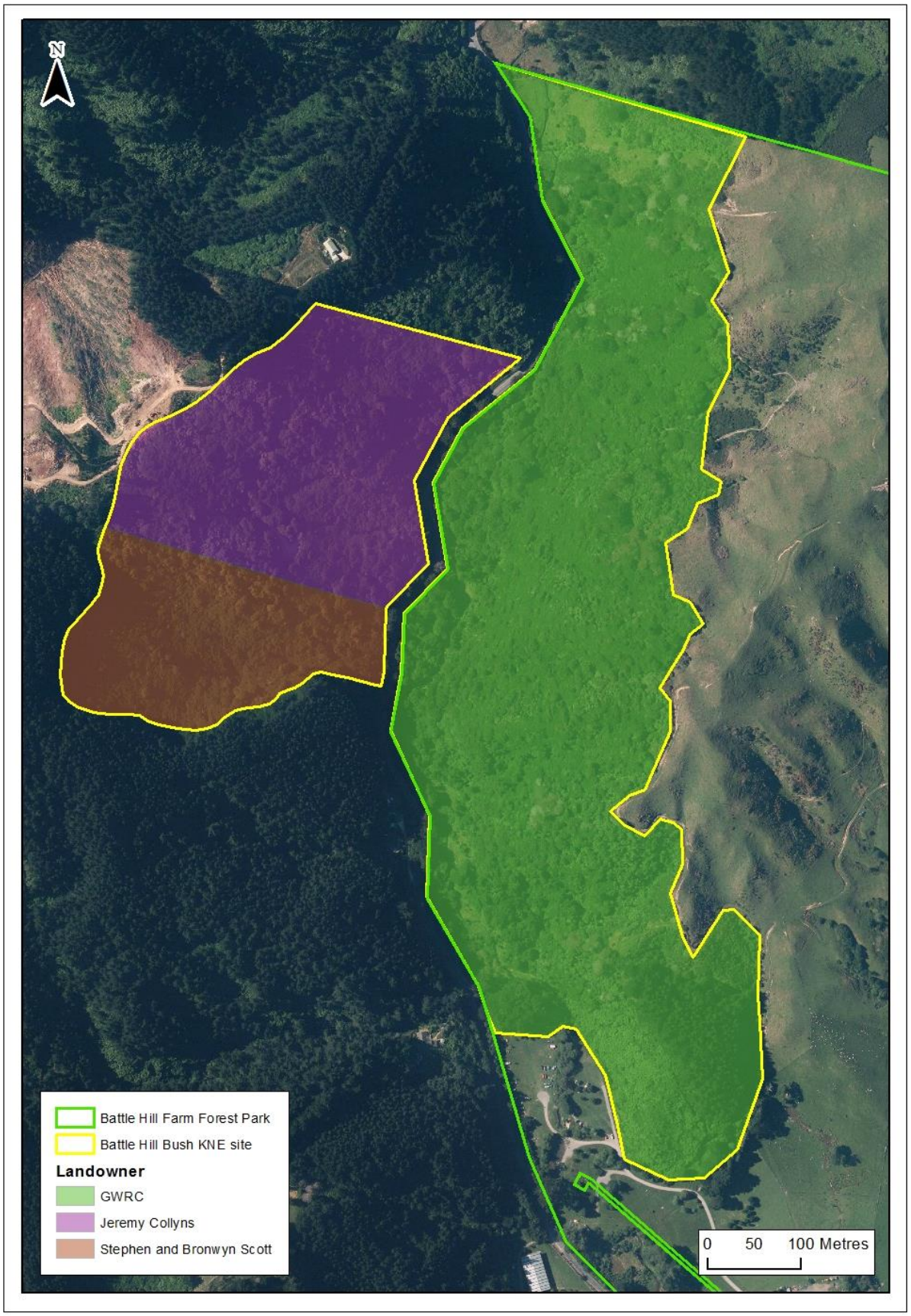
Table 3: GWRC Allocated budget for the Battle Hill Bush KNE site.

Management activity	Timetable and resourcing		
	2015/16	**2016/17**	**2017/18**
Ecological weed control	$12,200	$12,200	$12,200
Pest animal control	$3,500	$3,500	$3,500
Total	**$15,700**	**$15,700**	**$15,700**

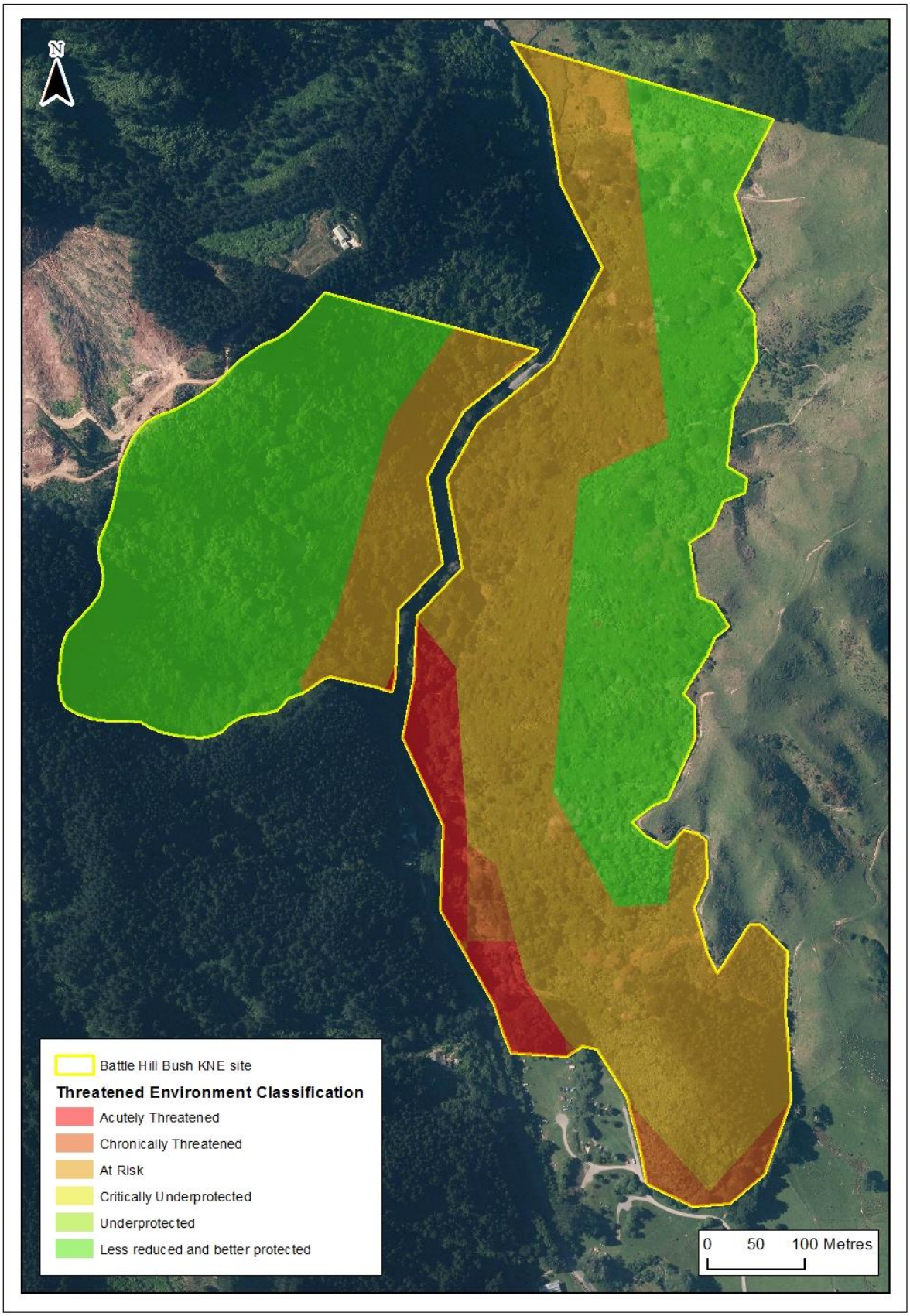
Appendix 1: Site maps



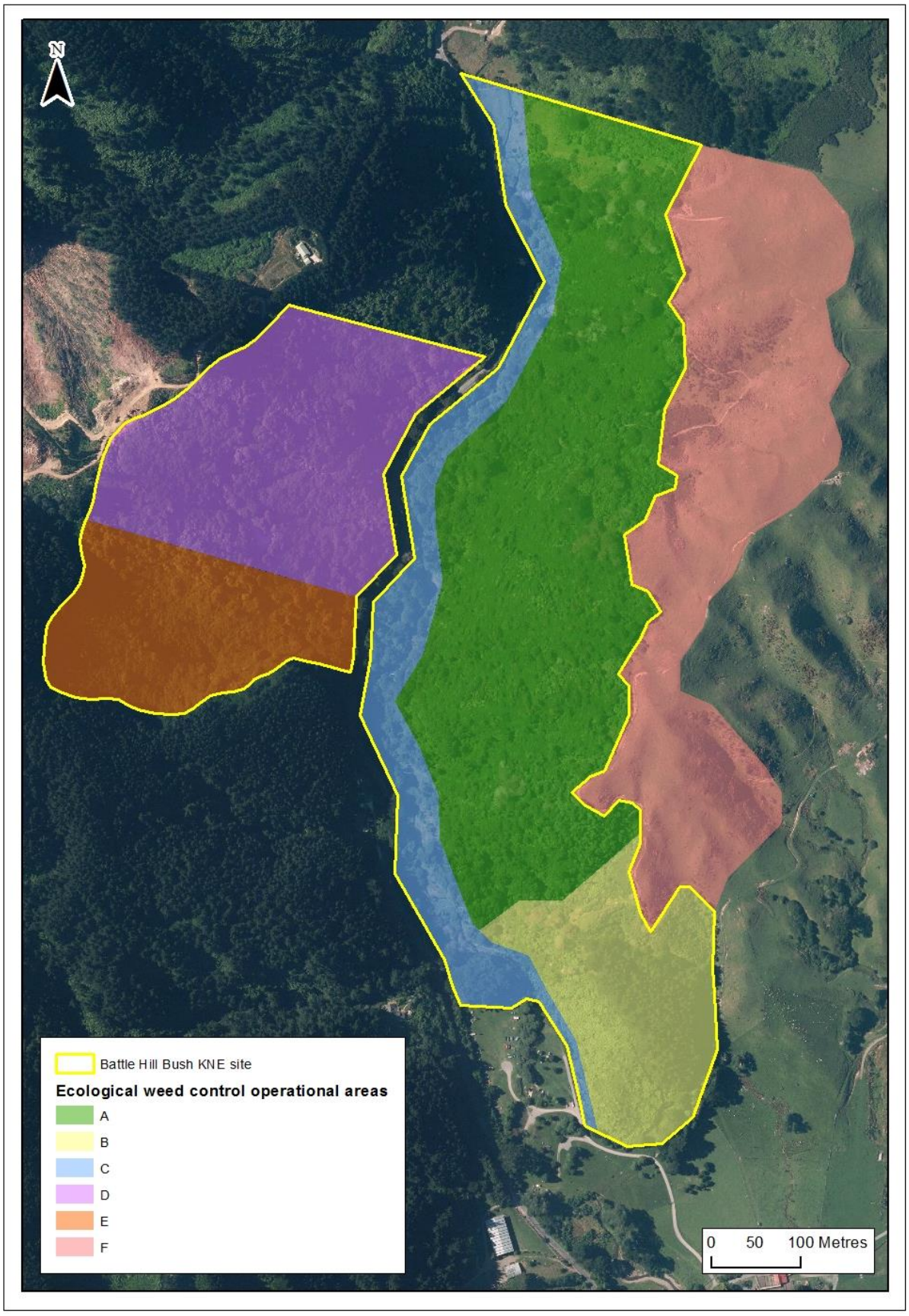
Map 1: Battle Hill Bush KNE site boundary.



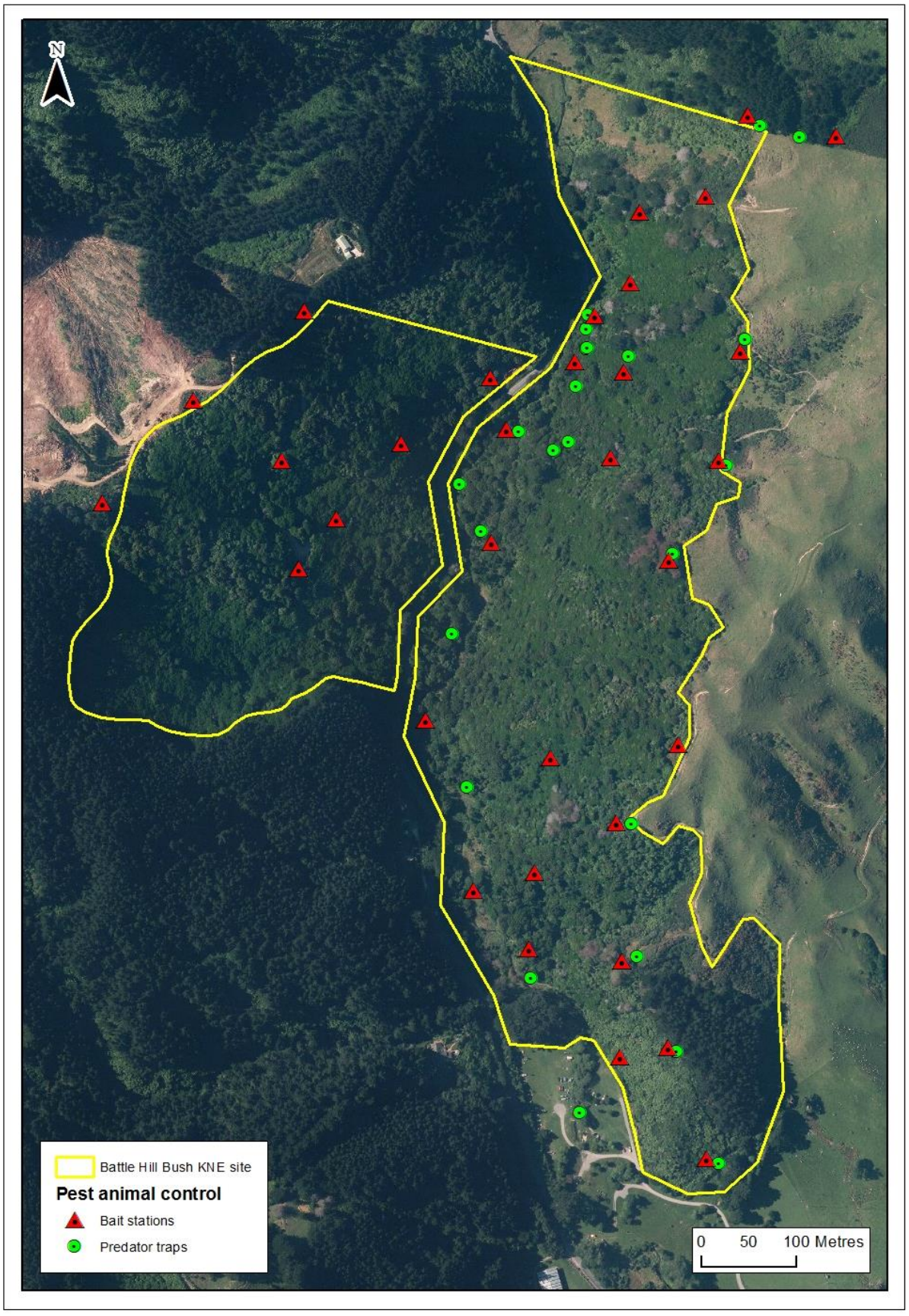
Map 2: Battle Hill Bush KNE site landowners.



Map 3: Threatened Environment Classification map for Battle Hill Bush KNE site.



Map 4: Ecological weed control operational areas in Battle Hill Bush KNE site.



Map 5: Pest animal control in Battle Hill Bush KNE site.

Appendix 2: Threatened species list

The New Zealand Threat Classification System lists extant species according to their threat of extinction. The status of each species group (plants, reptiles, etc.) is assessed over a three-year cycle[28] with the exception of birds that are assessed on 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 KNE site.

Table 4: Threatened and At Risk species recorded at the Battle Hill Bush KNE site.

Scientific name	Common name	Threat status	Observation
Plants(vascular)[30]			
Pterostylus foliata	Greenhood orchid	At Risk-Naturally Uncommon	Greater Wellington Regional Council 2006[31]
Birds[32]			
Cyanoramphus novaezelandiae	Red-crowned parakeet, kākāriki	At Risk-Relict	Ebird database http://ebird.org/content/newzealand/ (accessed April 2015)
Falco novaeseelandiae	New Zealand falcon, kārearea	Threatened-Nationally Vulnerable	Greater Wellington Regional Council 2006
Freshwater fish[33]			
Anguilla diefendachii	Longfin eel	At Risk-Declining	NZ Freshwater Fish Database
Galaxias argenteus	Giant kōkopu	At Risk-Declining	NZ Freshwater Fish Database
Galaxias brevipinnis	Kōaro	At Risk-Declining	NZ Freshwater Fish Database
Geotria australis	Lamprey	At Risk-Declining	NZ Freshwater Fish Database
Gobiomorphus huttoni	Redfin bully	At Risk-Declining	NZ Freshwater Fish Database

Appendix 3: Regionally threatened species list

The following table lists regionally threatened species that have been recorded in the Battle Hill Bush KNE site. Native plant species have been identified in the Plant Conservation Strategy, Wellington Conservancy 2004-2010[34].

Table 6: Regionally threatened species recorded at Battle Hill Bush KNE site.

Scientific name	Common name	Threat status	Observation
Plants [35]			
Adiantum diaphanum	Tuberous maidenhair	Data deficient	Greater Wellington Regional Council 2006[36]
Adiantum viridescens	Maidenhair	Sparse	Greater Wellington Regional Council 2006
Cyathea cunninghamii	Gully tree fern	Sparse	Greater Wellington Regional Council 2006
Pittosporum cornifolium	Perching kōhūhū	Sparse	Greater Wellington Regional Council 2006
Rhabdothamnus solandri	Taurepo	Regionally Critical	Greater Wellington Regional Council 2006

Appendix 4: Ecological weeds

Ecological weed species recorded in Battle Hill Bush KNE site are listed in table 1 in order of priority for control. Species have been prioritised for control according to their weedy-ness and the practicality of control[37]. The distribution and density of individual species is described for operational areas A, B and C. Three levels of distribution (localised, patchy and widespread) and density (sparse, abundant and dense) are used to describe these aspects of the infestations of each species. Distribution and density information is not known for operational areas D and E at this time.

Table 7: Environmental weeds recorded in the Battle Hill Bush KNE site.

Scientific Name	Common Name	Priority	Area A (GWRC mature forest)	Area B (GWRC regenerating forest)	Area C (GWRC stream terraces, road edges and slopes below road)
Acer pseudoplatanus	Sycamore	1	Localised and sparse	Localised and sparse	Localised and sparse
Buddleia davidii	Buddleia	1		Localised and sparse	Localised and sparse
Chamaecytisus palmensis	Tree lucerne	1		Patchy and sparse	Patchy and sparse
Convolvulus arvensis	Convolvulus	1			Patchy and abundant
Cornus sp.	Strawberry dogwood	1		Localised and sparse	
Cortaderia selloana	Pampas	1		Patchy and sparse	
Crataegus monogyna	Hawthorn	1	Patchy and sparse	Patchy and sparse	Patchy and sparse
Cupressus macrocarpa	Macrocarpa	1	Localised and sparse	Localised and sparse	Localised and sparse
Hedera helix	Ivy	1			Localised and sparse
Ilex aquifolium	Holly	1	Patchy and sparse	Widespread and sparse	Patchy and sparse
Leycesteria formosa	Himalayan honeysuckle	1		Widespread and sparse	Patchy and sparse
Lonicera japonica	Japanese honeysuckle	1			Localised and sparse
Pinus sp.	Wilding pines	1	Localised and sparse	Localised and sparse	Localised and sparse
Salix sp.	Willow	1			Patchy and sparse
Selaginella kraussiana	African club moss	1		Localised and sparse	Widespread and abundant
Senecio mikanioides	German ivy	1			Patchy and dense

Scientific Name	Common Name	Priority	Area A (GWRC mature forest)	Area B (GWRC regenerating forest)	Area C (GWRC stream terraces, road edges and slopes below road)
Tradescantia fluminensis	Tradescantia	1	Localised and sparse	Localised and sparse	Widespread and dense
Vinca major	Periwinkle	1	Localised and abundant		
Allium triquetrum	Onion weed	2			Patchy and abundant
Crocosmia × crocosmiiflora	Montbretia	2		Patchy and sparse	Patchy and dense
Cytisus scoparius	Broom	2		Patchy and sparse	Patchy and abundant
Lathyrus latifolius	Everlasting pea	2			Localised and sparse
Rubus fruticosus	Blackberry	2		Localised and sparse	Widespread and dense
Teline monspessulana	Montpellier broom	*2*		Patchy and sparse	Patchy and dense
Ulex europaeus	Gorse	2		Localised and sparse	Localised and abundant
Zantedeschia aethiopica	Arum lily	2			Localised and sparse

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The Greater Wellington Regional Council's purpose is to enrich life in the Wellington Region by building resilient, connected and prosperous communities, protecting and enhancing our natural assets, and inspiring pride in what makes us unique

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