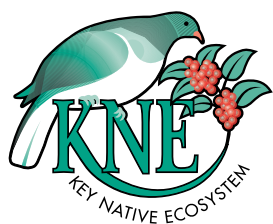


Key Native Ecosystem Plan for Akatarawa Forest

2015-2018



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REGIONAL COUNCIL
Te Pane Matua Taiao



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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 2011-21¹ 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 site 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 site 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. Akatarawa Forest Key Native Ecosystem

The Akatarawa Forest KNE site is a large area (12,430 ha) of mature and regenerating native forest located on hill country at the southern end of the Tararua Ranges. It extends from 1.5 km west of Upper Hutt town centre to 4 km south of Paraparaumu town centre (see Appendix 1, Map 1). The KNE site includes the majority of Akatarawa Forest (managed by the GWRC Parks department), excluding only the commercial forestry plantations located within the park. Akatarawa Forest KNE site has no reserve status.

The KNE site contains a mosaic of forest types that represent vegetation that was once common in the Wellington region. The KNE site comprises part of the largest area of natural vegetation west of the Hutt Valley. It is contiguous with Maungakotukutuku Scenic Reserve and privately-owned indigenous forests to the north, and Tararua Forest Park to the northeast. Kaitoke Regional Park and the Hutt Water Collection Area, both of which contain large forested areas, are located a short distance away to the east. Much of the southern and western boundaries of the KNE site are bounded by plantation forestry. The KNE site includes most of the catchments of the Whakatikei River, Akatarawa River West and Maungakotukutuku Stream, and the headwaters of the main Akatarawa River.

Landowners 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.

Landowners

Most of the land within the KNE site is owned by GWRC and is managed by the GWRC Parks department as part of Akatarawa Forest (see Appendix 1, Map 2). GWRC administers Akatarawa Forest under the Local Government Act 2002 and the Wellington Regional Water Board Act 1972. Akatarawa Forest is part of the regional parks network and its management is guided by the GWRC Parks Network Plan² (PNP). The PNP guides the recreational and amenity uses of the forest, as well as identifying opportunities to protect biodiversity values.

As a future water collection area, the forest is primarily managed to ensure that the water resource remains stable, fresh and clean. Secondary considerations are to protect native forest vegetation, manage production forestry, offer a range of back country recreational experiences (including motorised recreation), and allow wind energy development on selected ridgelines³. This KNE plan is consistent with the wider objectives and policies of the PNP. The Biodiversity and Parks departments will work collaboratively to efficiently deliver the objectives in these plans.

Fifty-seven hectares of the KNE site are privately owned by Martin Bradley under the business name Cannon Point Properties Ltd. Mr Bradley is allowing forested parts of

his land to be included in the KNE site and allowing access to this land for the purposes of ecological weed and pest animal control.

Management partners and key stakeholders

The management partners to this plan within GWRC are the Parks, Biodiversity and Biosecurity departments. The Parks department manages recreational access and maintains assets such as the roads, 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.

Though the majority of the KNE site is within Upper Hutt City, Kapiti Coast District Council (KCDC) has an interest in the management of the KNE site as part of the Wainui catchment, which supplies water for Paekakariki, lies within the KNE site.

Ngāti Toa Rangātira and Wellington-based Taranaki iwi retain mana whenua over the lands and are therefore key stakeholders in the management of the KNE. Their partnership role in Akatarawa Forest is outlined in the PNP.

The KNE site is a popular area for a wide range of recreational activities including mountain biking, walking/tramping, horse riding, running, four wheel driving, quad biking, trail biking, hunting, fishing, and nature study. Motorised recreation is particularly popular and GWRC is working closely with the Akatarawa Recreational Access Committee (ARAC) to develop a Memorandum of Understanding and track protocols for motorised recreation.

Several sports and recreational clubs use the forest for competitions and other activities. The Karapoti Classic mountain bike race is held annually within the KNE site.

All recreational users and organisations holding concessions to run recreational events are considered stakeholders to this plan.

Transpower New Zealand is also a stakeholder as several of their high-voltage AC transmission lines pass through the western half and the southern margin of the KNE site.

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 KNEs within the region.

The Akatarawa Forest KNE site is located within the Tararua Ecological District⁴. The KNE site is characterised by steep, dissected hill country (altitudinal range c.60-722 m asl), high rainfall (1,700-2,400 mm rainfall per annum in the valleys) and strong westerly winds. Several fault lines run through the site in a north-easterly direction. The underlying geology is greywacke and the hilltops are remnants of an eroded peneplain which are now covered in a layer of loess.

The KNE site is drained by the upper Whakatikei River to the west, and the West Akatarawa River to the east. The Akatarawa River passes through the north-eastern block of the KNE site. Both of these large gravel-bed rivers flow into the Hutt River. The smaller Maungakotukutuku Stream forms the KNE site's north-western boundary and drains the north-western slopes, before flowing into the Waikanae River.

Of note in recognising the ecological values at the Akatarawa Forest KNE site are the following:

Naturally uncommon ecosystems: Two ephemeral wetlands (a Naturally Uncommon ecosystem type⁵ classified as Critically Endangered⁶) are present. Freshwater wetlands are a naturally rare habitat type in the Wellington region⁷.

Threatened environments: Some parts the KNE site are classified as Acutely Threatened, Chronically Threatened or At Risk. There is less than 10%, 10-20% and 20-30% respectively of the original cover of these indigenous vegetation types remaining in New Zealand⁸. Areas that are identified as acutely and chronically threatened within the KNE site are mostly located on river terraces. Areas identified as at risk are located on lower slopes and low ridge lines (see Appendix 1, Map 3).

Threatened species: One Threatened, eight At Risk, one Data Deficient, and nine regionally threatened plant species have been recorded in the KNE site. The site also provides habitat for one Threatened and five At Risk bird species, and one Threatened and seven At Risk freshwater fish species. Nationally Threatened and At Risk species are listed in Appendix 2 and regionally threatened plant species are listed in Appendix 3.

The Singers and Rogers (2014)⁹ classification of pre-human vegetation indicates the Akatarawa Forest KNE site comprised a number of differing forest types; kāmahī, broadleaved, podocarp forest (MF8), tawa, kāmahī, podocarp forest (MF7), hard beech forest (MF20), red beech, podocarp forest (CLF9), red beech, silver beech forest (CLF10), Hall's tōtara, pāhautea, kāmahī forest (CDF4), kohekohe, tawa forest (MF6), and tōtara, mataī, ribbonwood forest (WF2). There is only about 2%, 15%, and 22% of the pre-human extents of forest types WF2, MF6, and MF7 remaining in the Wellington region respectively, making them threatened ecosystem types. The other forest types are better represented in the Wellington region¹⁰.

Today, the Akatarawa Forest KNE site contains only remnants of original forest, the remainder being modified by selective logging and fires. The resultant mosaic of old-growth forest, regenerating forest and shrubland has created a variety of habitats for a high diversity of bird and insect life¹¹. The forests form an ecological gradient from coastal to lowland to montane bioclimatic zones.

The forests are dominated by tawa (*Beilschmiedia tawa*) with emergent rimu (*Dacrydium cupressinum*) and northern rātā (*Metrosideros robusta*) up to 400m above sea level (asl), kamahi (*Weinmannia racemosa*) and hīnau (*Elaeocarpus dentatus*) up to 550m asl, and kāmahī, Hall's tōtara (*Podocarpus totara*) and miro (*Prumnopitys ferruginea*) above 550m asl. Hard beech (*Fuscospora truncata*) is present at some sites, usually on poorer soils or in association with rātā-rimu-hīnau-kāmahī forest¹². The montane miro-kāmahī cloud forest and Hall's tōtara-kāmahī forest present in the site

are regionally uncommon habitat types. Smaller areas of indigenous fernland, shrubland, and subalpine vegetation are also present. Within these forests are New Zealand's two largest recorded northern rata (*Metrosideros robusta*) trees, both with trunk diameters of nearly 5m.

Four wetlands occur within the KNE site. Three of these wetlands, Whakatikei Wetland, Martin's River Wetland and Whakatikei Headwater Swamp are identified as significant natural wetlands in the Proposed Natural Resources Plan for the Wellington Region¹³. The latter two of these have also been identified as wetlands of national importance for biodiversity¹⁴. Kahikatea (*Dacrydium dacrydioides*) swamp forest, which is present in these wetlands, is a regionally uncommon ecosystem type. There is now less than 3% of the original extent of wetlands left in the region.

Twenty indigenous bird species have been recorded in the KNE site, including New Zealand falcon (*Falco novaeseelandiae*), red-crowned parakeet (*Cyanoramphus novaezelandiae*) and rifleman (*Acanthisitta chloris granti*). This represents all native forest bird species that have survived naturally in the Wellington region with the sole exception of North Island kākā.

Seven indigenous freshwater fish species and kōura (*Paranephrops planifrons*) have been recorded in the KNE site. Species of fish recorded include longfin eel (*Anguilla dieffenbachii*), lamprey (*Geotria australis*), kōaro (*Galaxias brevipinnis*), dwarf galaxias (*Galaxias divergens*), giant kōkopu (*Galaxias argenteus*), bluegill bully (*Gobiomorphus hubbsi*), redfin bully (*Gobiomorphus huttoni*), and torrentfish (*Cheimarrichthys fosteri*)^{15,16}.

Other species recorded in the Akatarawa ranges and likely to be present in the KNE site are the ngahere gecko (*Mokopirirakau* 'southern North Island')¹⁷ and the land snails; Charopidae sp. 43 (NMNZ M.126198) and Charopidae sp. 226 (NMNZ M.115260)¹⁸.

Key threats to ecological values at the site

Sometimes 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 Akatarawa Forest KNE site come from ecological weeds, pest animals and the adverse effects of some human activities.

Ecological weeds are most commonly found within the KNE site at sites of human activity; previous human habitation (house, mill, and hut sites), transport routes, and on the edges of neighbouring plantation forestry. Control of the worst infestations of ecological weeds has been undertaken annually since 2001. Weeds are now fairly sparse, but some species still prevail. Some of the more persistent weed species are old man's beard (*Clematis vitalba*), Japanese honeysuckle (*Lonicera japonica*), buddleia (*Buddleja davidii*), Darwin's barberry (*Berberis darwinii*), cotoneaster (*Cotoneaster glaucophylla*), and tradescantia (*Tradescantia fluminensis*).

Ecological weeds spread along roads naturally through dispersal by wind and birds. However introduction and dispersal may also occur when weed seeds or fragments are temporarily lodged in and then released from the tyre treads and other parts of

recreation, forestry and management vehicles. There is also a threat of new weed incursions occurring as a result of garden rubbish dumping which occurs occasionally on the edges of Akatarawa Road. Exotic plantation forestry species appear to be spreading into open beech forest from stands of trees within the KNE site that were originally planted to control erosion and trial species for commercial forestry.

Pest animals that could have the greatest potential impact on the ecological values of Akatarawa Forest KNE site are possums (*Trichosurus vulpecula*), feral goats (*Capra hircus*), feral deer (*Cervus elaphus scoticus*), feral pigs (*Sus scrofa*), stoats (*Mustela erminea*) and rats (*Rattus* spp.). Possums are generally present in very low numbers due to an ongoing ground control operation in part of the site and aerial control operations that have been carried out regularly in the past in the rest of the site. If control is not continued, it is likely that possums will increase in numbers over time to levels that will adversely affect forest condition.

Feral goats are present in low numbers across most of the KNE site as a result of ongoing control programmes carried out since 2005. However, higher numbers are present in pockets of favourable habitat. Feral deer are also present throughout the KNE site, although numbers have been reduced slightly through by-kill during goat control operations and recreational hunting. Rats and stoats are thought to be present in moderate numbers.

Some recreational and management activities have the potential to impact the ecological values of the KNE site. Recreational activities such as trail and quad bike riding and four wheel driving are causing sedimentation and vegetation damage in some areas. Vegetation has been cut and cleared and tree trunks and roots damaged during the unauthorised building of tracks.

Activities associated with road and track management may impact native plant and animal communities if adequate levels of control are not placed upon them. Harvesting operations of the commercial forests neighbouring the KNE site also have the potential to impact the site if not carried out in an appropriate manner. Recreational and management activities also present the risks of fire, rubbish discharge, and pollution of soil and water through discharge of vehicle and machinery fluids.

Whilst 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 they impact ecological values, and whether they will be addressed by the proposed management activities.

Table 1: Threats to ecological values present at the Akatarawa Forest 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 Map 4 & 5).

Threat code	Threat and impact on biodiversity in the KNE	Operational area/location
Ecological weeds		
EW-1	Ground covering and scrambling ecological weeds smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species for control include: tradescantia (see full list in Appendix 4).	A,C,G
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include: buddleia, Darwin's barberry, cotoneaster, sycamore (<i>Acer pseudoplatanus</i>), alder (<i>Alnus glutinosa</i>), strawberry dogwood (<i>Dendrobenthamia capitata</i>), (see full list in Appendix 4).	A,B,C,D,E,F
EW-3	Climbing weeds smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include: old man's beard, Japanese honeysuckle and everlasting pea (<i>Lathyrus latifolius</i>) (see full list in Appendix 4).	A,C,D,F
EW-4	Exotic plantation forest species such as western red cedar (<i>Thuja plicata</i>), Douglas fir (<i>Pseudotsuga menziesii</i>), and Lawson's cypress (<i>Chamaecyparis lawsoniana</i>) appear to be spreading into open beech forest of the KNE site where they could displace indigenous vegetation.	Adjacent to historic plantations planted for erosion control and forestry trials
Pest animals		
PA-1	Possoms browse palatable canopy vegetation (e.g. palatable perching kōhūhū, northern rātā) until it can no longer recover ^{19,20} . This destroys the forest's structure, diversity and function. Possoms may also prey on native birds ²¹ and invertebrates.	Entire KNE site
PA-2	Browsing by goats 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 ²² .	Entire KNE site, but particularly goat favoured habitat
PA-3	Red deer browse the forest understory and can significantly change vegetation composition by preferential browsing and preventing regeneration ^{23,24,25} .	Entire KNE site
PA-4	Feral pigs root up the soil and eat roots, invertebrates, seeds and native plants preventing forest regeneration ²⁶ .	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE	Operational area/location
PA-5	Rats 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 ^{27,28} .	Entire KNE site
PA-6	Mustelids (stoats ^{29,30} (<i>Mustela erminea</i>), ferrets ^{31,32} (<i>M. furo</i>) and weasels ^{33,34} (<i>M. nivalis</i>)) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions.	Entire KNE site
PA-7*	Hedgehogs (<i>Erinaceus europaeus</i>) prey on native invertebrates ³⁵ , lizards ³⁶ and the eggs ³⁷ and chicks of ground-nesting birds ³⁸ .	Entire KNE site
PA-8*	Feral and domestic cats (<i>Felis catus</i>) prey on native birds ³⁹ , lizards ⁴⁰ and invertebrates ⁴¹ , reducing native fauna breeding success and potentially causing local extinctions ⁴² .	Entire KNE site
PA-9*	Rabbits (<i>Oryctolagus cuniculus</i>) and hares (<i>Lepus europaeus</i>) are known to graze on palatable native vegetation and prevent natural regeneration in some environments ⁴³	Entire KNE site
PA-10*	Brown trout (<i>Salmo trutta</i>) and rainbow trout (<i>Oncorhynchus mykiss</i>) prey on native fish and compete with them for food resources ⁴⁴ .	Waterways
PA-11*	House mouse (<i>Mus musculus</i>) browse native fruit, seeds and vegetation, and prey on invertebrates. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and small eggs and nestlings ^{45,46} .	
Human activities		
HA-1	Garden waste dumping often leads to ecological weed invasions into natural areas. Common weed species introduced at this KNE site include: montbretia (<i>Crocsmia × crocosmiiflora</i>), aluminium plant (<i>Lamium galeobdolon</i>), and tradescantia.	G
HA-2	Recreational use such as trail and quad bike riding and four wheel driving can cause erosion, sedimentation and damage vegetation and habitats of native species.	Main roads, designated tracks, unofficial tracks
HA-3	Recreational and commercial activities can introduce weed species through the carriage of seeds and plant fragments on machinery, equipment and clothing.	Entire KNE site
HA-4	The unauthorised construction of tracks damages native plants and habitat for native invertebrates, and can introduce and spread weed species through the carriage of seeds and plant fragments on equipment and clothing. This problem is exacerbated by the creation of canopy gaps which help ecological weeds to establish.	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE	Operational area/location
HA-5	Management activities such as road and track maintenance, pest control, ecological monitoring and the installation of structures can cause the accidental introduction of weed species through the carriage of seeds and plant fragments on machinery, equipment and clothing. This problem is exacerbated by the creation of canopy gaps which help ecological weeds to establish.	Entire KNE site
HA-6	Management activities such as the maintenance and upgrading of roads and tracks and the installation of structures can cause damage to native plant and invertebrate communities and the local elimination of species.	Entire KNE site
HA-7	Neighbouring plantation forestry operations can cause sedimentation of waterways and damage native vegetation within the KNE site. They can also cause the accidental introduction of weed species to the KNE site through the carriage of seeds and plant fragments on machinery and equipment.	Areas adjacent to and downstream of plantation forestry
HA-8*	Over-spray or spray-drift of herbicides can occur during herbicide application in neighbouring plantation forest blocks which can damage or destroy native vegetation in the KNE site.	Plantation forestry margins
HA-9	Barriers to fish passage, such as poorly installed or degraded culverts, may block fish migration pathways.	Waterways
HA-10	Fire can be destructive to native flora and fauna and create conditions for ecological weed invasion.	Entire KNE site, but centred on roads
HA-11	Illegal removal of plants such as orchids and tree ferns, and animals such as lizards can cause the local elimination of species.	Entire KNE site

*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 Akatarawa Forest KNE site.

1. To improve the structure* and function† of native plant communities
2. To protect threatened native forest plants
3. To improve the habitat for native birds
4. To improve the habitat for native freshwater fish

5. To raise community awareness of the ecological values of the KNE site

6. To engage the community 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 Akatarawa Forest KNE site comprise of ecological weed control, pest animal control, and review of recreational and management activities.

Ecological weed control

The purpose of weed control is to limit the spread of existing weed populations, eradicate weed populations where possible, and prevent the establishment of new weed species to improve habitat quality and facilitate natural regeneration.

The ecological weeds listed as priority 1 and 2 in Appendix 4 will be controlled at seven different locations within the KNE site (see ecological weed operational areas in Appendix 1, Map 4). These are the locations of what were or still are the worst infestations of the more invasive ecological weeds within the KNE site. Control has previously been carried out at most of these sites over many years, but further work is required to ensure that ecological weeds do not regenerate at these locations. The intention is to eliminate infestations of priority 1 and 2 species within the operational areas within the term of this plan, or as soon as possible thereafter. Additionally, the control of ecological weeds in the Whakatikei Headwater Swamp will be made a priority as it is both a significant wetland and very vulnerable to degradation by weeds. Whenever it is possible and practicable to do so, all plants in identified operational areas will be controlled annually before they set seed. By doing so the seed bank will be exhausted over time as existing seed germinates and the resulting plants are controlled prior to them seeding.

Priority 1 species will also be controlled in any other part of the KNE site if encountered by Biosecurity department staff or contractors travelling to and from operational areas, or when the presence of these species is reported. Priority 4 species listed in Appendix 4 won't be controlled during the term of this plan but have been identified for possible control in the future.

During the first year of the plan a survey of western red cedar, Douglas fir and Lawson's Cyprus (priority 3 species) will be undertaken in the vicinity of historic

plantations of these species. These species were originally planted to control erosion and to trial the species' value for commercial forestry. The aim of the survey will be to quantify the extent, density and age classes of cohort trees around each site so that the impact of these species on the surrounding native forest can be assessed and possible future management can be strategically planned. The location of all of the plantation sites will be identified through examination of historical forestry maps. There is currently good knowledge of four sites but it is likely that there are more. Stands of trees in the four known sites are spread across several kilometres of ridgelines in three different parts of the KNE site.

Pest animal control

The purpose of pest animal control is to increase native plant regeneration and the abundance of threatened plants through the control of mammalian browsers, and increase populations of native birds through the control of mammalian predators.

Possums will be controlled on a regular basis to keep the overall possum population density below 5% residual trap catch (RTC). This will be achieved by continuing the current cyclic use of aerially-sown 1080 (sodium fluoroacetate) in operational area H (the majority of the KNE site), and dispensing brodifacoum, or a similar toxin from bait stations within operational area I (which is too close to residential areas for aerially sown 1080 to be safely used). This area includes the land privately owned by Martin Bradley (see pest animal operational areas map, Appendix 1, Map 5).

An aerial possum control operation was carried out in operational area H in July 2013. A subsequent operation will be carried out in this area when monitoring indicates that possum populations have grown to 5% RTC or above, or the equivalent BMI (bite mark index). Past monitoring results have shown that this is likely to occur around five years after the last operation, so it is anticipated that the next operation will be required in 2018.

This operation will be carried out in winter and consequently will run over two financial years, with the planning and purchase of materials being undertaken in the third year of this plan and the sowing of both the pre-feed and toxic baits in the first part of the following year. This timing will be used as it has been proven that poisoning operations are most effective when carried out around the middle of winter. Possum population monitoring will be carried out soon after the completion of the poisoning operations to assess its effectiveness.

Research has shown that aerial 1080 possum control operations also control rats and mustelids (ferrets, stoats and weasels) to very low levels. However this control is short lived with populations returning to pre-control levels within eighteen months⁴⁷. It is hoped that native plants and animals will receive some benefit from these periods of reduced threats. No additional targeted rat or mustelid control will be undertaken in this operational area.

Options for methods of controlling possums in operational area J (see Appendix 1, Map 5) will be explored in conjunction with planning for the above aerial possum control operation. No possum or rat control has previously been undertaken in this small portion of the KNE site as it has been considered that the planning required to use

aerially-sown 1080 in this location would be a challenging process, and the topography and remoteness would make ground based control methods very difficult to carry out.

The network of bait stations in operational area I will continue to be replenished with brodifacoum (or a similar toxin) at three-monthly intervals to control possums. It is likely that this poisoning regime will also control rats to low levels in this area, as has been shown by monitoring of rat populations at similar forest sites where similar regimes are being used. This ground control work around the popular Cannon Point Walkway also reduces the risk to dogs from poisoned possum carcasses when the aerial 1080 operations occur.

Feral goats will be culled annually. The target of the culling operations will be to reduce and keep populations to a level at which a professional hunter can find and destroy no more than one goat per eight hours of hunting. It is considered that populations at this level will have little impact on native plant regeneration and survival. The current approach to culling operations will continue to be used. This involves strategic deployment of most resources to those areas of the KNE site that experience has shown are most favoured by goats, while still checking other less favourable areas intermittently to ensure that any unanticipated population increases are managed. The annual budget allocated to this work allows for 60 days of hunting per year. Current resources don't allow for any targeted culling of feral deer or pigs to be undertaken. However any feral deer or pigs encountered during goat culling operations will be destroyed.

Revegetation

No revegetation is currently planned within the KNE site, however it is likely that planting would accelerate the regeneration of native forest in some areas. ARAC has undertaken two restoration plantings in the Whakatikei River wetland in the past for this purpose. If revegetation is planned in the future for either biodiversity protection or amenity development purposes, species will be chosen from the indigenous plant species list contained in the Resource Statement for the site⁴⁸. Plant selection could favour threatened species or species uncommon within the site to increase numbers of these species. Examples of these are Kirk's daisy (*Brachyglottis kirkii*), large leaved milk tree (*Streblus banksii*) and raukawa (*Raukawa edgerleyi*). Additionally, species that are thought to have originally been present in the KNE site but have since been eliminated could also be planted.

Community engagement

The objectives of community engagement are to raise recreational users' awareness of the ecological values present in the KNE site, and how they can avoid impacting on these values. GWRC will seek to achieve this through our relationships with ARAC, Kapiti Mana Motorcycle Club (KMMC) and other recreational and community groups. GWRC will also include biodiversity content in the GWRC Great Outdoors Summer Events programme and through the use of local media when opportunities arise.

Vehicle use

The impacts of four wheel driving and trail and quad bike riding are managed through the implementation of the Parks Network Plan⁴⁹. GWRC is working with ARAC to develop a protocol for managing the track network within the site which will further define management approaches to minimise impacts on biodiversity values such as sedimentation. GWRC works with ARAC and KMMC to promote self-regulation of the agreed rules and the Park Ranger undertakes regular surveillance for users not adhering to rules.

The building of unauthorised new tracks by members of the public is prohibited and the Park Ranger carries out surveillance for this activity. From early 2016, the Forest Ranger (who has primary responsibility for the plantation forests) will assist the Park Ranger in monitoring visitor activity and achieving higher levels of compliance.

GWRC is especially focussed on how to avoid impacts on sensitive sites such as the Whakatikei wetland, e.g. through identifying alternative vehicle access routes and securing agreement to close current ones.

Fish passage barriers

There are many man-made structures in watercourses throughout the KNE site associated with the road, track and drainage networks. Structures in watercourses can be barriers to native fish migration. During programmed upgrading or maintenance projects, Parks staff will work with the Biodiversity department to identify potential barriers to fish migration within the works area and remediate where ever practicable.

In addition, the Biodiversity department provides training for Parks staff through GWRC's Fish Passage Programme to enable Park Rangers to undertake field assessments of structures in watercourses. These assessments are used to identify potential fish barriers across the park and will help inform future asset upgrade and maintenance programmes.

Best practices for biosecurity

Biosecurity guidelines⁵⁰ are used by all GWRC personnel when entering and working in the KNE site. Procedures involve checking for and removing seeds and plant fragments from vehicles, equipment and clothing before entering the site. Operators working in the adjacent plantation forests and needing to travel through the KNE site, such as silviculture crews, harvesters and trucking company personnel will also be requested to follow these guidelines.

A condensed and more specific version of the guidelines will be developed and distributed to recreational and commercial users of the KNE site. These guidelines will be issued with permits and provided to other users when the opportunity arises.

Environmental care

GWRC operational staff 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 planning and carrying out the construction and maintenance of assets, and when permitting the use of the KNE site by other users.

Fire

To reduce the risk of uncontrolled fires occurring in the KNE site, the present policy of no open fires will be continued. This policy will be communicated to users through the park information brochure, park signage and the Parks Network Plan⁵¹. Wilderness camping is permitted with cooking on gas cookers only.

Collection of native plants and animals

The collection of natural materials and research activities in the KNE site is managed by a GWRC permit system. However, illegal collection of native plants occurs occasionally. This includes the mass harvesting of some native tree species such as tree ferns and manuka for decorative fence construction and firewood, as well as some rare plants which are sought after by collectors and traders. The Park Ranger will watch for this activity while carrying out other duties within the KNE site.

4. Operational plan

The operational plan shows the actions planned to achieve the stated objectives for the Akatarawa Forest 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. Maps of the operational areas can be found in Appendix 1 (see Maps 4 and 5).

Table 2: Three-year operational plan for the Akatarawa Forest KNE site.

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
1,2,3	EW-1-3, HA-1	Ecological weed control	A,B,C,D,E,F, G	GWRC Biosecurity department	Control priority 1 and 2 species at current infestation sites	All plants controlled prior to seeding	\$16,500	\$16,500	\$16,500
1,2,3	EW-1-3	Ecological weed control	Entire KNE site	GWRC Biosecurity department	Control priority 1 species when discovered while carrying out other ecological weed control work and when reported by staff or members of the public	All observed and reported plants controlled	\$1,000	\$1,000	\$1,000
1,2,3	EW-4	Ecological weed control	Historic exotic plantation forestry sites	GWRC Biosecurity department	Survey sites and report extent, density and age classes of cohort trees in the vicinity of historical stands	Survey completed and results reported	\$10,000	Nil	Nil
1,2,3	PA-1	Pest animal control	H	GWRC Environmental Science department	Carry out possum population monitoring to assess need for a control operation	Monitoring completed and reported	Nil	Nil	\$13,000
1,2,3	PA-1	Pest animal control	H	GWRC Biosecurity department	Control possums using aerial 1080 (planning and purchase of materials only; operation to be carried out in the following year).	Possums < 5% RTC* or equivalent BMI**	Nil	Nil	\$165,000

Key Native Ecosystem Plan

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
1,2,3	PA-1, PA-5	Pest animal control	I	GWRC Biosecurity department	Control possums and rats using brodifacoum or a similar bait dispensed from bait stations	Possums < 5% RTC and rats < 5% TTI [#]	\$12,500	\$12,500	\$12,500
1,2,3	PA-2, PA-3, PA-4	Pest animal control	H,I,J	GWRC Biosecurity department	Control feral goats targeting goat preferred habitat using ground hunting, and control any feral deer and pigs encountered in the process	Maintain feral goat populations to below 1 goat culled per 8 hours of hunting	\$23,500	\$23,500	\$23,500
1,2,4,5,6	HA-2	Human activities	Entire KNE site	GWRC Parks department, ARAC and KMMC	Complete and implement protocols for managing vehicle tracks	Documents finalised during year 2 of plan and rules regarding recreational motorised vehicle use are adhered to by most users	Nil	Nil	Nil
1,2,5,6	HA-3	Human activities	Entire KNE site	GWRC Biodiversity & Parks departments	Distribute ecological weed biosecurity guidelines to all permit holders through the existing permit systems, and to other users such as tramping groups when opportunities arise	Biosecurity guidelines distributed to all permit holders, and to other users when possible	Nil	Nil	Nil
1,2	HA-4	Human activities	Entire KNE site	GWRC Parks department	Prohibit unauthorised new track building and undertake surveillance for this activity	No new un- authorised tracks constructed	Nil	Nil	Nil
1,2	HA-5	Human activities	Entire KNE site	GWRC Parks, Biodiversity, Biosecurity & Environmental Science departments	Ensure 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
1,2,3,4	HA-6	Human activities	Human activities	GWRC Parks department	Environmental impact assessment procedures are adhered to when carrying out construction and maintenance of assets, and allowing use by others	Procedures available and adhered to in all cases	Nil	Nil	Nil
1,2	HA-7	Human activities	Plantation forestry margins	GWRC Parks and Biodiversity departments	Request commercial forestry operators to follow ecological weed biosecurity guidelines	Guidelines supplied to commercial forestry operators	Nil	Nil	Nil
4	HA-9	Human activities	Entire KNE site	GWRC Parks department	Assess culverts for fish passage issues when upgrading or maintaining roads. Where barriers to fish passage are likely, replace or modify culverts, or install new structures to reinstate passage for all native fish species present.	Reduced number of human made barriers to fish passage in the KNE site	†	†	†
1,2,3,5,6	HA-10	Human activities	Entire KNE site	GWRC Parks department	Continue to communicate policy of no open fires being allowed in the KNE site through the park brochure and signage	No human induced wild fires occur	Nil	Nil	Nil
1,2,5	HA-11	Human activities	Entire KNE site	GWRC Parks department	Park Ranger is alert to illegal plant collecting activities during patrols	No illegal collection occurs	Nil	Nil	Nil
5,6		Community engagement	Entire KNE site	GWRC Communications and Marketing, and Biodiversity departments	Incorporate biodiversity information into community events and media	Increased community awareness of the values of the KNE	Nil	Nil	Nil

Key Native Ecosystem Plan

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
						Total	\$63,500	\$53,500	\$231,500

*RTC=residual trap catch

**BMI=bite mark index

#TTI=tracking tunnel index

† This cost will be variable so cannot be determined at this time

5. Funding summary

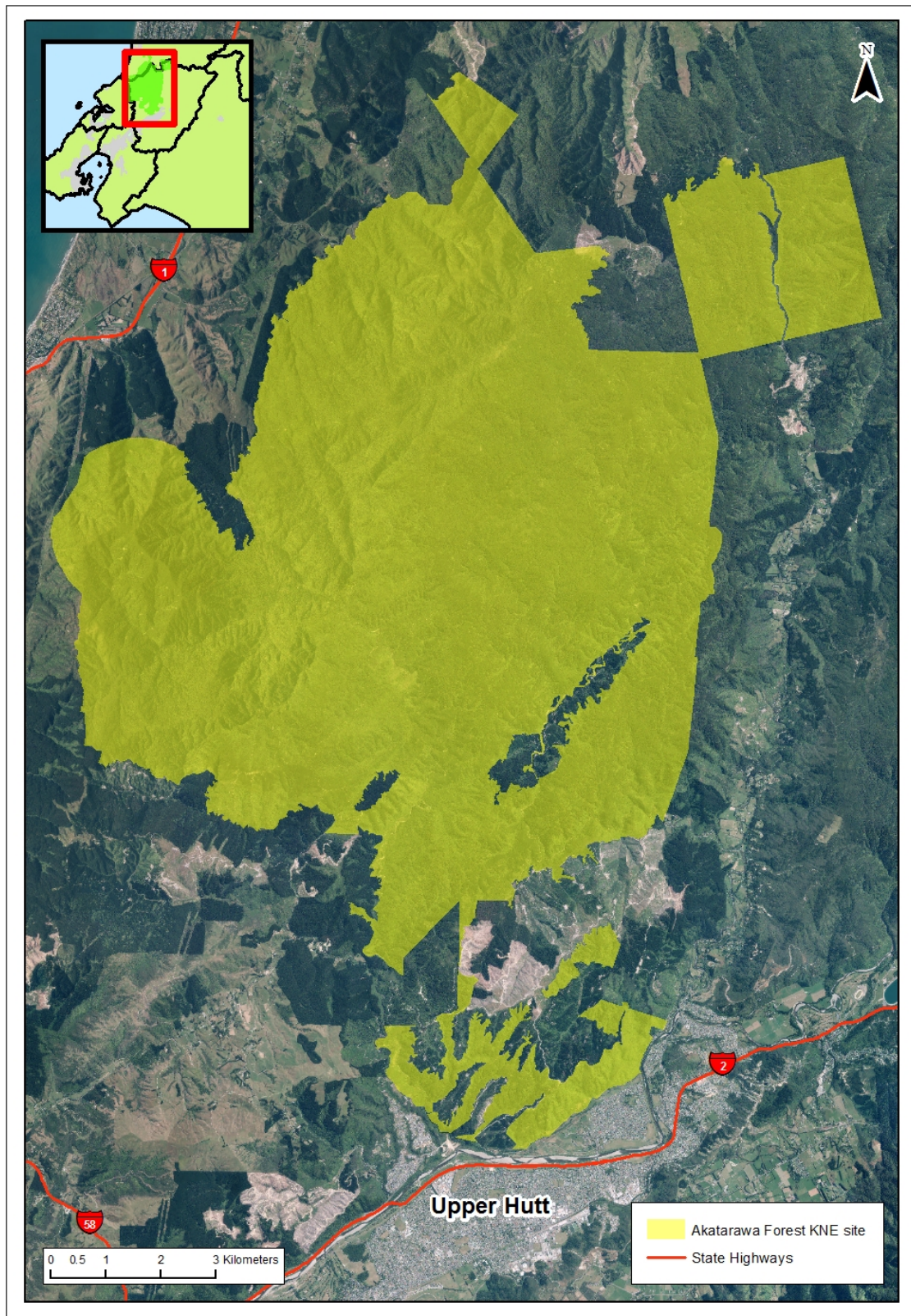
GWRC budget

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

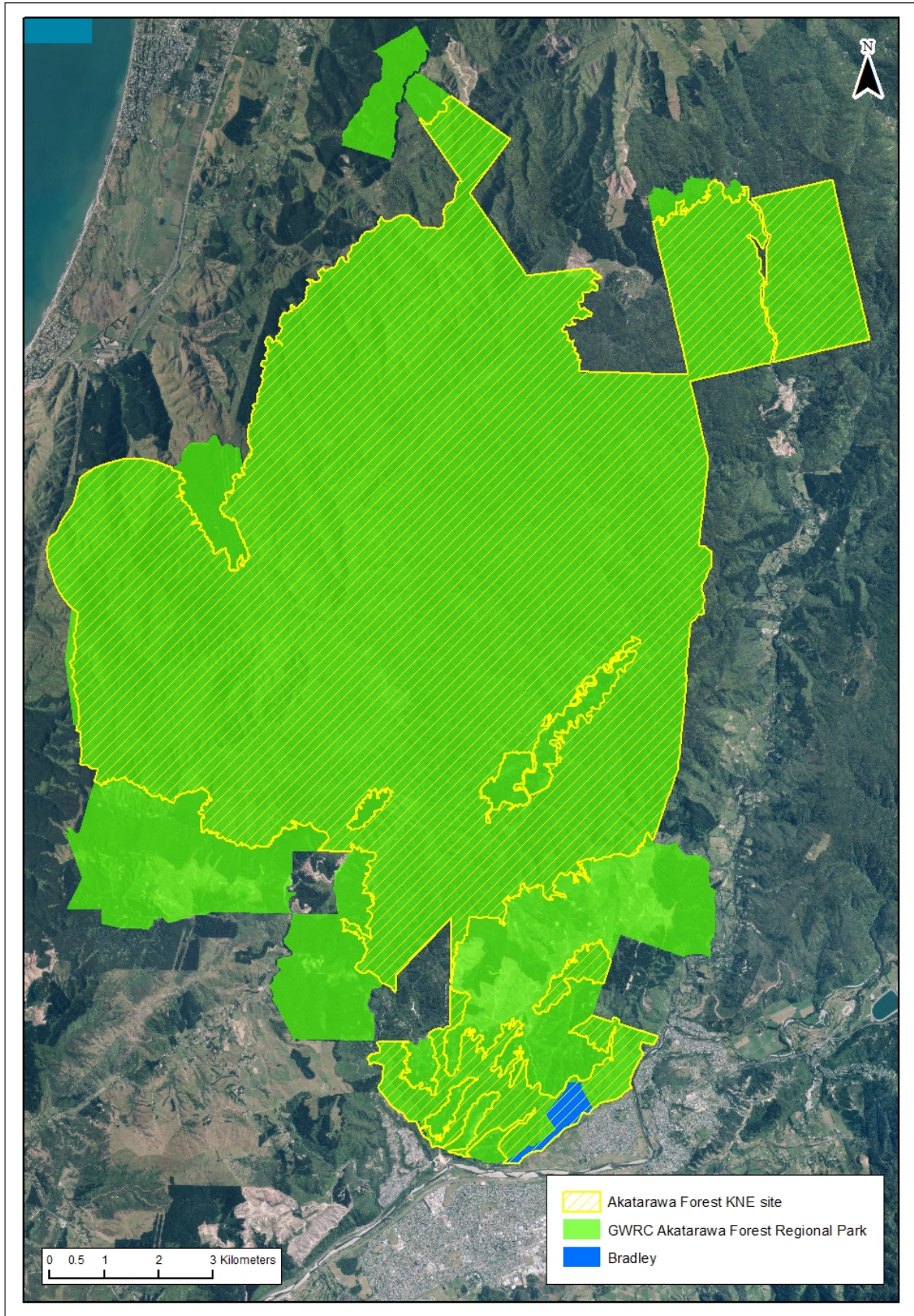
Table 3: GWRC Allocated budget for the Akatarawa Forest KNE site.

Management activity	Timetable and resourcing		
	2015/16	2016/17	2017/18
Ecological weed control	\$27,500	\$17,500	\$17,500
Pest animal control	\$36,000	\$36,000	\$201,000
Possum monitoring	Nil	Nil	\$13,000
Total	\$63,500	\$53,500	\$231,500

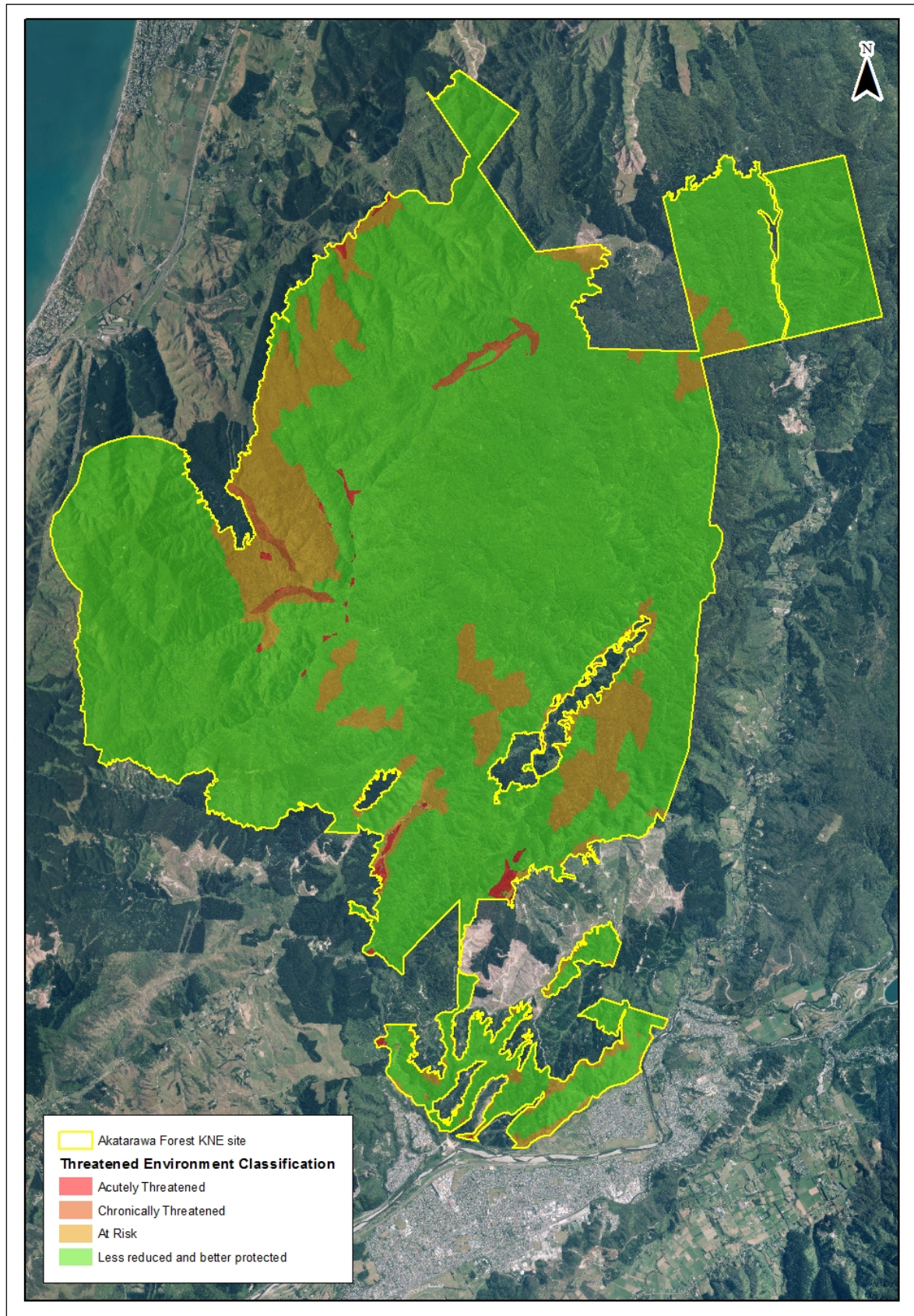
Appendix 1: Site maps



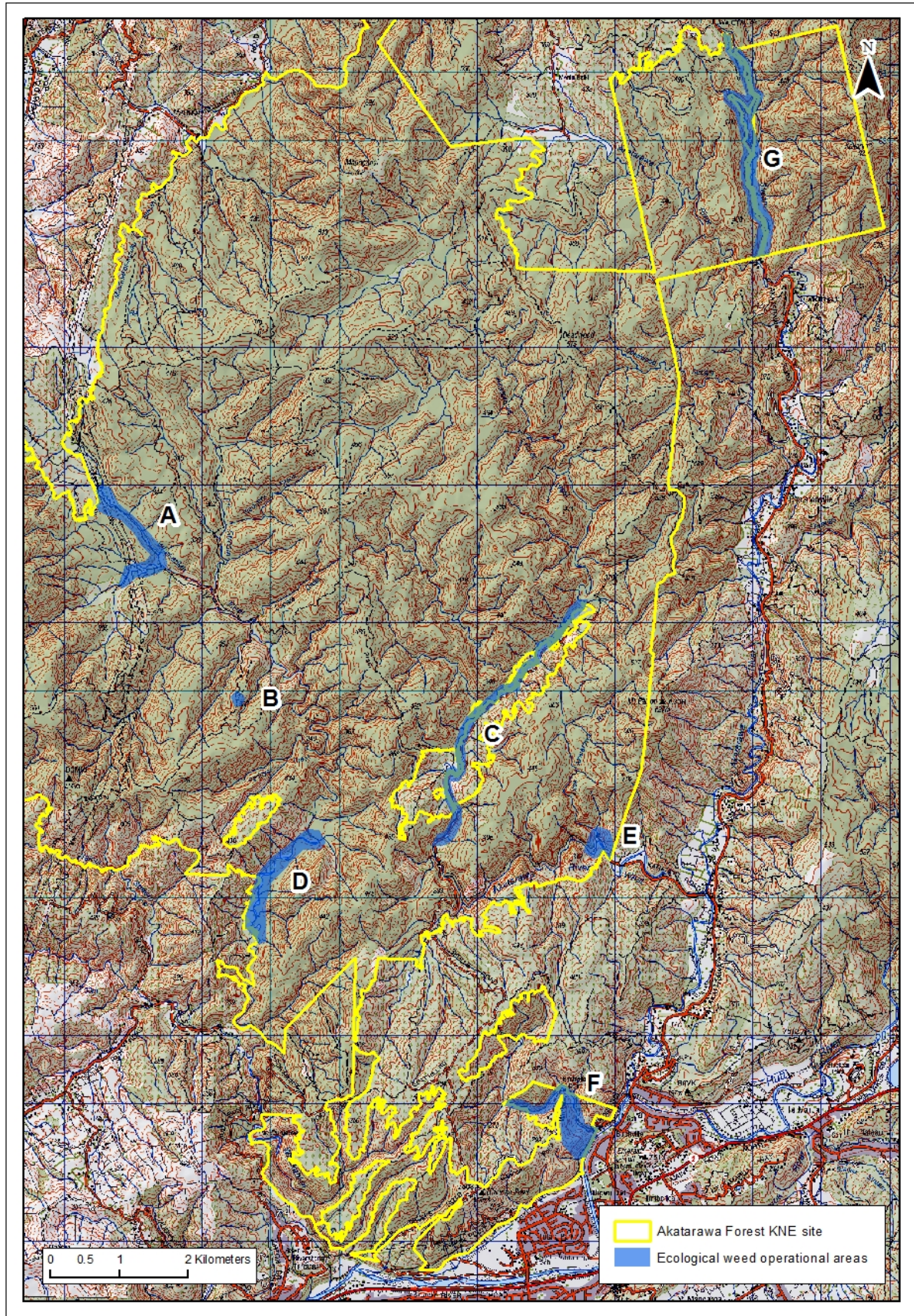
Map 1: Akatarawa Forest KNE site boundary.



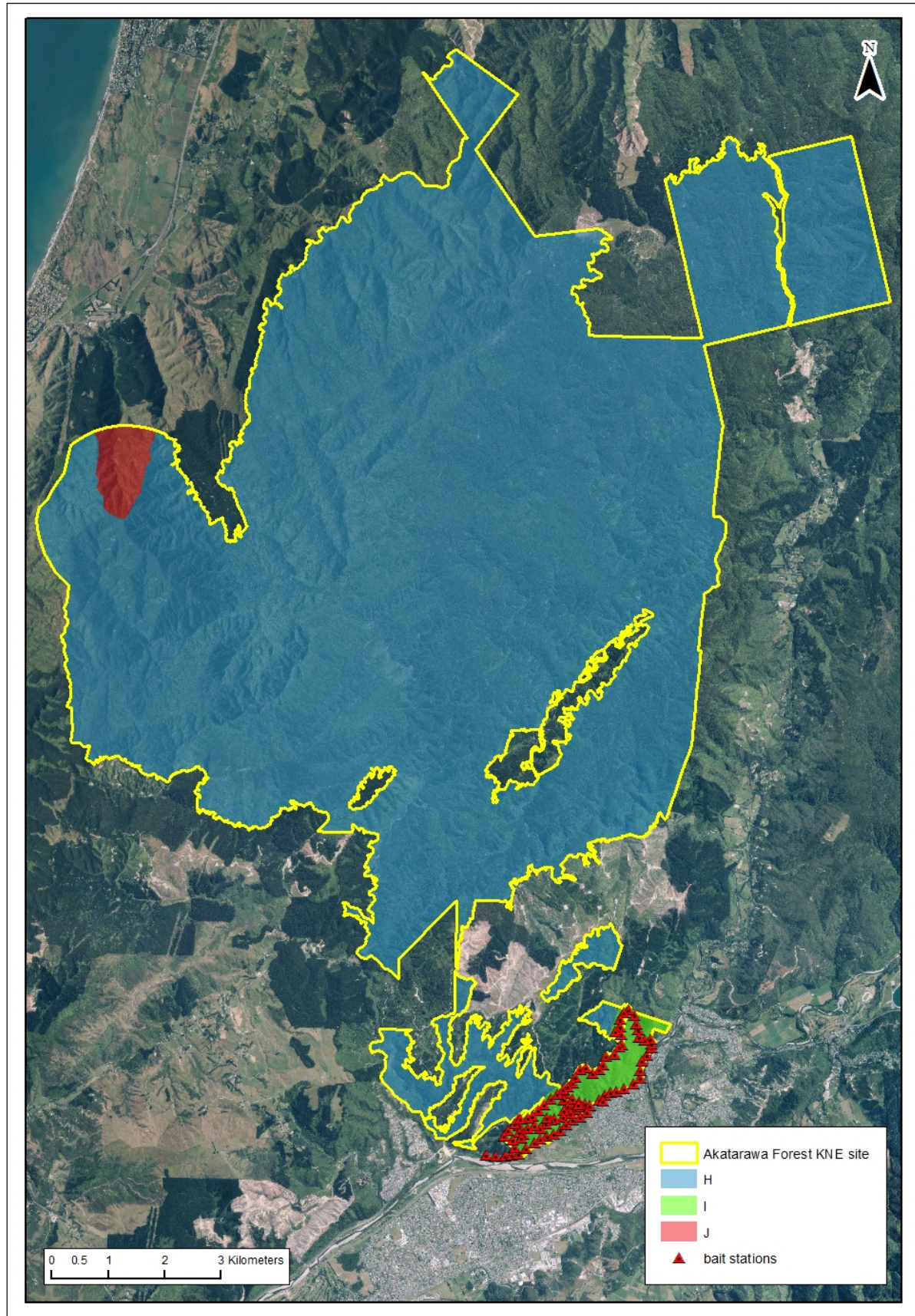
Map 2: Akatarawa Forest KNE site property boundaries.



Map 3: Land Environment New Zealand threat classification map for the Akatarawa Forest KNE site (LENZ copyright Ministry for the Environment/Landcare Research).



Map 4: Ecological weed control operational areas in the Akatarawa Forest KNE site.



Map 5: Pest animal control in the Akatarawa Forest 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 cycle⁵² with the exception of birds that are assessed on a five-year cycle⁵³. 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 Akatarawa Forest KNE site.

Table 4: Threatened, At Risk, and Data Deficient species recorded in the Akatarawa Forest KNE site.

Scientific name	Common name	Threat status	Source
Plants(vascular)⁵⁴(lichens)⁵⁵(bryophytes)⁵⁶			
<i>Dactylanthus taylorii</i>	Dactylanthus, woodrose	Threatened-Nationally Vulnerable	GWRC 2008 ⁵⁷
<i>Polyphlebium colensoi</i>	Bristle fern	At Risk-Naturally Uncommon	GWRC 2011 ⁵⁸ (as <i>Trichomanes colensoi</i>)
<i>Hymenophyllum australe</i>	Filmy fern	At Risk-Naturally Uncommon	GWRC 2011 (as <i>Hymenophyllum atrovirens</i>)
<i>Brachyglottis kirkii</i> var. <i>kirkii</i>	Kirk's daisy	At Risk-Declining	GWRC 2008, 2011
<i>Leptinella tenella</i>		At Risk-Declining	DOC 2013 ⁵⁹
<i>Mazus novaezeelandiae</i> subsp. <i>novaezeelandiae</i>	Dwarf musk	At Risk-Declining	GWRC 2008
<i>Peraxilla colensoi</i>	Scarlet mistletoe	At Risk-Declining	GWRC 2008
<i>Peraxilla tetrapetala</i>	Red mistletoe	At Risk-Declining	GWRC 2008
<i>Streblus banksii</i>	Large-leaved milk tree, turepo	At Risk-Relict	GWRC 2008
<i>Anthosachne multiflora</i> subsp. <i>multiflora</i>		Data Deficient	DOC 2013 ⁶⁰ (as <i>Elymus multiflorus</i>)
Birds⁶¹			
<i>Acanthisitta chloris granti</i>	Rifleman	At Risk-Declining	http://ebird.org/content/newzealand/ (accessed 22/01/2014)

Scientific name	Common name	Threat status	Source
<i>Anthus novaeseelandiae</i>	New Zealand pipit	At Risk-Declining	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Cyanoramphus novaezelandiae</i>	Red-crowned parakeet	At Risk-Relict	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Eudynamys taitensis</i>	Long-tailed cuckoo	At Risk-Naturally Uncommon	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Falco novaeseelandiae</i>	New Zealand falcon	Threatened-Nationally Vulnerable	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
<i>Phalacrocorax carbo novaehollandiae</i>	Black shag	At Risk-Naturally Uncommon	http://ebird.org/content/newzealand/ (accessed 22/01/2014)
Freshwater fish ⁶²			
<i>Geotria australis</i>	Lamprey	Threatened-Nationally Vulnerable	GWRC 2008
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk-Declining	NIWA 2014 ⁶³
<i>Cheimarrichthys fosteri</i>	Torrentfish	At Risk-Declining	GWRC 2008
<i>Galaxias argenteus</i>	Giant kokopu	At Risk-Declining	GWRC 2008
<i>Galaxias brevipinnis</i>	Koaro	At Risk-Declining	NIWA 2014
<i>Galaxias divergens</i>	Dwarf galaxias	At Risk-Declining	NIWA 2014
<i>Gobiomorphus hubbsi</i>	Bluegill bully	At Risk-Declining	NIWA 2014
<i>Gobiomorphus huttoni</i>	Redfin bully	At Risk-Declining	NIWA 2014

Appendix 3: Regionally threatened plant species list

The following table lists regionally threatened plant species that have been recorded in the Akatarawa Forest KNE site.

Table 6: Regionally threatened plant species recorded in the Akatarawa Forest KNE site.

Scientific name	Common name	Threat status ⁶⁴	Source
<i>Abrodictyum elongatum</i>	Bristle fern	Regionally critical	GWRC 2011 (as <i>Trichomanes elongatum</i>)
<i>Abrodictyum strictum</i>	Erect bristle fern	Data Deficient	GWRC 2011 (as <i>Trichomanes strictum</i>)
<i>Adiantum diaphanum</i>	Tuberous maidenhair	Data Deficient	GWRC 2008
<i>Adiantum fulvum</i>	Maidenhair	Sparse	GWRC 2008, 2011
<i>Adiantum viridescens</i>	Maidenhair	Sparse	GWRC 2008, 2011
<i>Botrychium bifforme</i>	Parsley fern	Gradual Decline	DOC 2013
<i>Notogrammitis pseudociliata</i>	Strapfern	Data Deficient	GWRC 2011 (as <i>Grammitis pseudociliata</i>)
<i>Pittosporum cornifolium</i>	Perching kohuhu	Sparse	GWRC 2008
<i>Raukawa edgerleyi</i>	Raukawa	Sparse	GWRC 2008

The liverwort *Drucella integrispula* which is only known from a few sites in New Zealand has also been recorded in the KNE site⁶⁵.

Appendix 4: Ecological weed species

Ecological weeds recorded within the Akatarawa Forest KNE site are identified below with a priority classification assigned to each species for their control. The GWRC Biodiversity Officer has prioritised the species based on the known impact of the weeds in forested ecosystems and how practical they are to control.⁶⁶

Table 7: Ecological weeds recorded in the Akatarawa Forest KNE site.

Scientific name	Common name	Priority	Operational area
<i>Acer pseudoplatanus</i>	Sycamore	1	C
<i>Alnus glutinosa</i>	Alder	1	C, E
<i>Berberis darwinii</i>	Darwin's barberry	1	C
<i>Berberis glaucocarpa</i>	Barberry	1	F
<i>Buddleia davidii</i>	Buddleia	1	A, C, D, E, F
<i>Cestrum elegans</i>	Red cestrum	1	E
<i>Clematis vitalba</i>	Old man's beard	1	A, D, F
<i>Cortaderia selloana</i>	Pampas	1	C
<i>Cotoneaster glaucophylla</i>	Cotoneaster	1	B, E, F
<i>Crocsmia × crocosmiiflora</i>	Montbretia	1	G
<i>Dendrobenthamia capitata</i>	Strawberry dogwood	1	C
<i>Fraxinus excelsior</i>	Narrow leaved ash	1	C
<i>Humulus lupulus</i> var. <i>lupulus</i>	Hops	1	C
<i>Hydrangea macrophylla</i>	Hydrangea	1	C, E
<i>Hypericum androsaemum</i>	Tutsan	1	C
<i>Ilex aquifolium</i>	Holly	1	C
<i>Lamium galeobdolon</i>	Aluminium plant	1	G
<i>Lathyrus latifolius</i>	Everlasting pea	1	A
<i>Lonicera japonica</i>	Japanese honeysuckle	1	C
<i>Pinus radiata</i>	Radiata pine	1	A
<i>Salix fragilis</i>	Crack willow	1	A, D
<i>Selaginella kraussiana</i>	African club moss	2	C
<i>Tradescantia fluminensis</i>	Tradescantia	2	C, G
<i>Ulex europaeus</i>	Gorse	2	A
<i>Chamaecyparis lawsoniana</i>	Lawson's cypress	1 & 3	1: Operational area A 3: Spreading from abandoned forestry trial sites
<i>Pseudotsuga menziesii</i>	Douglas fir	3	Spreading from abandoned forestry trial sites

Scientific name	Common name	Priority	Operational area
<i>Thuja plicata</i>	Western red cedar	3	Spreading from abandoned forestry trial sites
<i>Allium triquetrum</i>	Onion weed	4	Scattered throughout KNE site
<i>Arctium minus</i>	Burdock	4	Scattered throughout KNE site
<i>Calystegia sepium</i>	Pink bindweed	4	Scattered throughout KNE site
<i>Camellia</i> sp.	Camellia	4	Scattered throughout KNE site
<i>Conium maculatum</i>	Hemlock	4	Scattered throughout KNE site
<i>Cytisus scoparius</i>	Broom	4	Scattered throughout KNE site
<i>Kerria japonica</i>	Japanese kerria	4	Scattered throughout KNE site
<i>Foeniculum vulgare</i>	Fennel	4	Scattered throughout KNE site
<i>Leycestearia formosa</i>	Himalayan honeysuckle	4	Scattered throughout KNE site
<i>Lupinus arboreus</i>	Tree Lupin	4	Scattered throughout KNE site
<i>Phytolacca octandra</i>	Inkweed	4	Scattered throughout KNE site
<i>Rubus fruticosus</i>	Blackberry	4	Scattered throughout KNE site
<i>Teline monspessulana</i>	Montpellier broom	4	Scattered throughout KNE site

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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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