

Key Native Ecosystem Plan for Western Wellington Forests

2015-18



greater WELLINGTON
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 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.

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 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. Western Wellington Forests Key Native Ecosystem

The Western Wellington Forests KNE site is located on the eastern slopes of the Skyline Ridgeway, immediately north-west of Wellington City (see Appendix 1, Map 1). The KNE site comprises a number of large regenerating native forest reserves and parks in the city's outer greenbelt owned or managed by Wellington City Council (WCC). The highest ecological values within the KNE site are found in Johnston Hill Scenic Reserve, Otari-Wilton's Bush, Huntleigh Park, Khandallah Park and Johnsonville Park. The KNE site is an important wildlife corridor in the broader Wellington peninsula landscape, connecting Wellington's south coast with bush reserves near Porirua City.

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 will continue to involve them as the plan is implemented.

Landowners

WCC own or administer the majority of lands (as public land) within the KNE site, including the forested reserves that have the highest ecological values (a full list of the WCC reserves contained within the KNE boundary is provided in Appendix 2). WCC manage these reserves in line with the objectives set out within Our Natural Capital – Wellington's Biodiversity Strategy and Action Plan², the Wellington Town Belt Management Plan³, the Botanic Gardens of Wellington Management Plan⁴ and the Suburban Reserves Management Plan⁵.

The Department of Conservation (DoC) own the Otari Conservation Area, however this area is administered by WCC through the Botanic Gardens of Wellington Management Plan.

Other landowners include the Girl Guides Association NZ (who own part of Huntleigh Park), Kordia, formally Broadcast Communications Limited (who own lands associated with the summit of Mount Kaukau), and John Hume (who owns and farms a parcel of land adjacent to the summit of Mount Kaukau).

Land ownership boundaries and WCC owned/administered lands are provided in Appendix 1, Map 2.

Management partners and key stakeholders

WCC are responsible for coordinating most of the biodiversity management activities within the KNE site including the ecological weed control, restoration planting, ground-hunting of animal pests and are the primary contact for community groups.

Within GWRC, the Biodiversity department and the Biosecurity department are actively involved within the management of the KNE site and carrying out the pest

animal control, funding some ecological weed control and providing biodiversity management advice.

A number of active community groups are present within the KNE site and undertake a range of biodiversity management activities including ecological weed control, pest animal control, pest animal monitoring and restoration planting. These community groups are:

- The Friends of Khandallah Park
- Otari-Wilton's Bush Trust
- Rodent and Mustelid Blitzing at Otari (RAMBO)
- Bells Track Working Group
- Royal Forest & Bird Protection Society – Wellington Branch Chartwell Group
- Crofton Downs Predator Free Community
- Katch 22 (Makara Peak Supporters)
- Silversky Track
- Ngaio and Crofton Downs Residents Association
- The Green Belters
- Makererua Reserve Group*

*This group works outside the KNE area but within the pest animal buffer zone

WCC support these groups and direct their work plans where required. GWRC provide support and advice as necessary.

Transpower New Zealand has the right of access through the KNE site to service electricity pylons located along the Skyline ridgeline. This may require vegetation management within the KNE site that will be managed in accordance with the principles of this plan. Transpower New Zealand have supported community groups within the KNE site through the provision of grant money that has funded restoration activities.

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 KNE site is the largest continuous area of indigenous vegetation in Wellington City. The lower slopes are largely regenerating indigenous broadleaved and podocarp forest, with remnants of primary forest remaining in the gullies⁶. The upper slopes consist of grey scrub (an ecosystem type consisting of small-leaved divaricating

indigenous shrubs with climbing plants⁷) developing through the dominant exotic scrub mix. The top of the ridgeline is maintained as an open landscape and is grazed.

The KNE site lies within the Wellington Ecological District⁸ on steep, strongly faulted hills. The climate is warm, very windy with frequent gales and an annual rainfall ranging between 900-1400mm⁹.

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

Threatened environments: The Threatened Environment Classification¹⁰ indicates that a small area of this KNE site is classified as Acutely Threatened. However, this is not considered representative of the KNE site which predominately consists of habitat that is either At Risk or Well Protected (see Appendix 1, Map 3).

Threatened species: A number of threatened species are present within the KNE site including; five At Risk plant species, three Threatened or At Risk bird species, a nationally Threatened land-snail and four At Risk lizard species. Nationally threatened species are listed in Appendix 3 and regionally threatened species in Appendix 4.

The Singers and Rogers (2014)¹¹ classification of pre-human vegetation indicates the KNE site comprised three forest types. These were kohekohe - tawa forest (MF6); tawa - kāmahī - podocarp forest (MF7); kāmahī – broadleaf - podocarp forest (and MF8). There is 15%, 22% and 85% of the original cover remaining respectively of these forest types in the Wellington region¹². This makes MF6 and MF7, regionally Threatened and At Risk ecosystem types respectively.

The KNE site is currently comprised of regenerating native forest dominated by māhoe (*Melicytus ramiflorus*) and rewarewa (*Knightia excelsa*). The site also contains remnants of podocarp-tawa-kohekohe forest, regenerating mataī forest, ngaio forest and mamaku treefernland. These forest areas are buffered by exotic scrub, indigenous grey scrub and secondary grey scrub¹³ (grey scrub cover is now considered to be reduced nationally from its previous extent¹⁴).

More than 70 species of indigenous trees and shrubs, nearly 60 species of ferns, and 14 species of orchids have been recorded at the site¹⁵. Notable tree species present within the KNE site include large-leaved milk tree (*Streblus banksii*), northern rātā (*Metrosideros robusta*), hīnau (*Elaeocarpus dentatus*), rimu (*Dacrydium cupressinum*), tōtara (*Podocarpus totara*), kahikatea (*Dacrydium dacrydioides*), miro (*Prumnopitys ferruginea*), matai (*Prumnopitys taxifolia*), pukatea (*Laurelia novae-zelandiae*), and large tree fuchsia (*Fuchsia excorticata*).

The KNE site provides significant habitat for a range of native forest bird species. The nationally Threatened New Zealand falcon (kārearea; *Falco novaeseelandiae*), North Island kākā (*Nestor meridionalis septentrionalis*) and red-crowned kākārīki (*Cyanoramphus novaezelandiae novaezelandiae*) have been recorded at the KNE site. Other more common native species present include the fantail (*Rhipidura fuliginosa*), tūī (*Prothemadera novaeseelandiae*), bellbird (*Anthornis melanura*), kererū (*Hemiphaga novaeseelandiae*), grey warbler (*Gerygone igata*), and whitehead (*Mohoua albicilla*)¹⁶.

Five species of lizard; the barking gecko (*Naultinus punctatus*), glossy brown skink (*Oligosoma zelandicum*), ornate skink (*Oligosoma ornatum*), the ngahere gecko (*Mokopirirakau* 'southern North Island') and the northern grass skink (*Oligosoma polychroma*) have been recorded within the KNE site¹⁷.

The KNE site contains the headwaters of several streams, including Kaiwharawhara Stream, Koromako Stream and Tyers Stream. These streams support a variety of native fish such as the longfin eel (*Anguilla dieffenbachii*), giant kōkopu (*Galaxias argenteus*), kōaro (*Galaxias brevipinnis*), and banded kōkopu (*Galaxias fasciatus*)¹⁸.

The KNE site has a high diversity of invertebrates with over 600 species recorded during the most recent Bioblitz (2007) within Otari-Wilton's Bush reserve alone¹⁹. Khandallah Park was the location for a translocation of a population of native land-snail, the *Powelliphanta traversi latizona* in 1944. This population is still present²⁰.

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 primary threats to the biodiversity values of the KNE site are from the impacts of ecological weeds and pest animals.

Ecological weeds are widespread throughout the KNE site ranging from mature pine trees to ground-covering plant species (see Table 1). The largest infestations are known to be present on the urban-edge of the KNE site and along tracks where the canopy is open. The presence of ecological weeds can affect the biodiversity values of a habitat by out-competing native plants to such an extent that the weeds become infestations. This hinders the natural regeneration of forest understory and reduces species diversity and the availability of food resources for native animals. Ecological weed control is undertaken to allow native plants to regenerate without the competition provided by ecological weed species. This enables native species to become more dominant which in itself becomes a natural suppressor of weeds.

Pest animals affect the forest habitat by over-browsing native foliage, out-competing native species for food and resources, and through direct predation. Possums (*Trichosurus vulpecula*), rats (*Rattus* spp.) and mustelids (*Mustela* spp.) are the biggest threat to the identified ecological values. These species are known to compete for food resources, consume large quantities of canopy foliage, and to eat birds, bird's eggs and invertebrates.

Additional pest animal threats, including goats (*Capra hircus*), pigs (*Sus scrofa*), hedgehogs (*Erinaceus europeaeus*), rabbits (*Oryctolagus cuniculus*), and cats (*Felis catus*) have been identified within the KNE site.

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 Western Wellington Forests 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).

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Ecological weeds (refer to Appendix 4)		
EW-1	Ground covering ecological weeds smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species for control include tradescantia (<i>Tradescantia fluminensis</i>), selaginella (<i>Selaginella kraussiana</i>), kahili ginger (<i>Hedychium gardnerianum</i>), artillery plant (<i>Galeobdolon luteum</i>), montbretia (<i>Crocasmia × crocosmiiflora</i>), pampas (<i>Cortaderia selloana</i>), and fairy crassula (<i>Crassula multicava</i>).	Entire KNE site
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include holly (<i>Ilex aquifolium</i>), hawthorn (<i>Crataegus monogyna</i>), boneseed (<i>Chrysanthemoides monilifera</i>), elaeagnus (<i>Elaeagnus × reflexa</i>), sycamore (<i>Acer pseudoplatanus</i>), buddleia (<i>Buddleja davidii</i>), Spanish heath (<i>Erica lusitanica</i>), Darwin's barberry (<i>Berberis darwinii</i>), ornamental cherry (<i>Prunus</i> sp.), cotoneaster (<i>Cotoneaster glaucophylla</i>), Douglas fir (<i>Pseudotsuga menziesii</i>), macrocarpa (<i>Cupressus macrocarpa</i>), and broom (<i>Cytisus scoparius</i>). Radiata pine (<i>Pinus radiata</i>) is present in the site and a source of wildings.	Entire KNE site
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 (<i>Clematis vitalba</i>), cathedral bells (<i>Cobaea scandens</i>), banana passionfruit (<i>Passiflora tripartita</i> var. <i>mollissima</i>), English ivy (<i>Hedera helix</i> subsp. <i>helix</i>), Japanese honeysuckle (<i>Lonicera japonica</i>), jasmine (<i>Jasminum polyanthum</i>), and climbing asparagus (<i>Asparagus scandens</i>).	Entire KNE site
EW-4	Non-local native tree species have been planted and are dominating regeneration in places. These include karaka (<i>Corynocarpus laevigatus</i>), karo (two species; <i>Pittosporum crassifolium</i> and <i>P. ralphii</i>), lacebark (<i>Hoheria populnea</i>), pōhutukawa (<i>Metrosideros excelsa</i>), and <i>Pseudopanax</i> hybrids.	Entire KNE site
Pest animals		
PA-1	Possums and rats browse indigenous vegetation, fruits and seeds, and prey on indigenous fauna ²¹ .	Entire KNE site & buffer zones
PA-2	Mustelids prey on native insects, lizards and birds and their eggs. Mustelids pose a particular threat to cavity-nesting and ground-dwelling bird species preventing populations from establishing in the KNE site.	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-3	Hedgehogs prey on native invertebrates, lizards ²² and the eggs ²³ and chicks of ground-nesting birds.	Entire KNE site
PA-4	Feral goats browse native vegetation, preventing regeneration of palatable species and reducing species diversity.	Entire KNE site
PA-5	Feral pigs eat native invertebrates and damage native vegetation.	Entire KNE site
PA-6*	Mice (<i>Mus musculus</i>) browse native fruit, seeds and vegetation, and prey on invertebrates. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates and lizards ^{24,25} .	Entire KNE site
PA-7	Domestic, stray and feral cats prey on native birds, lizards and invertebrates, reducing native fauna breeding success and potentially causing local extinctions.	Entire KNE site
PA- 8*	Brown trout (<i>Salmo trutta</i>) are present ²⁶ and prey on native fish ²⁷ and compete for food resources.	Watercourses
PA - 9	Rabbits browse native vegetation, preventing regeneration of palatable species and reducing species diversity.	Khandallah Park/Skyline ridge pasture lands, Otari Block
Human activities		
HA-1	Garden waste dumping can lead to pest plant invasions. Common species include tradescantia (<i>Tradescantia fluminensis</i>), plectranthus (<i>Plectranthus ciliatus</i>), agapanthus (<i>Agapanthus praecox</i>), Japanese aralia (<i>Fatsia japonica</i>), lily of the valley tree (<i>Clethra arborea</i>) and montbretia (<i>Crocsmia × crocosmiiiflora</i>).	Edges of all operational areas
HA-2	Farm livestock browse and trample native vegetation. Stock incursions inhibit regeneration of native plant species and in some cases cause local extinctions of palatable indigenous shrubs, terrestrial orchids and ferns ²⁸ .	KNE site boundary
HA-3	Recreational use such as tramping, mountain biking and horse riding can cause damage and disturbance of the native forest. It is also likely to disturb native fauna and introduce ecological weeds.	Entire KNE site
HA-4*	Encroachment of residential gardens into the KNE site from urban areas may occur causing habitat loss and introducing ecological weeds.	Edges of all operational areas
HA-5	Barriers to native fish passage are likely to be present in streams within the KNE site.	Watercourses

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Other threats		
OT-1	A lack of legal protection can leave a site at risk of development or destruction in the future and resources invested in the site may be wasted. Part of this KNE site is private property and thus has no protection status.	Unprotected privately owned areas
OT-2*	Fire causes loss of habitat and species. It also provides an ideal platform for ecological weed reinvasion.	KNE site urban-edge

***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 the Western Wellington Forests KNE site.

1. To improve the structure* and function† of native plant communities
2. To improve the habitat for native birds
3. To improve the habitat for native lizards
4. To improve the habitat for native invertebrates
5. To improve the habitat for native freshwater fish
6. To legally protect the KNE site

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

† 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 contribute to 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.

The management activities undertaken within the KNE site aim to control pest plants and animals to sufficiently low levels enabling effective regeneration and succession of the native forest cover, supporting viable populations of native birds, lizards and invertebrates. These activities are jointly funded by WCC and GWRC, with significant levels of investment provided by WCC in the coordination of the ecological weed control, restoration planting, ground-hunting of feral pest animals and community engagement.

GWRC's role is primarily focused on the servicing and maintenance of the large pest animal control network within this KNE site including advising on community-led pest animal control. GWRC provides some funding for the ecological weed control strategy, recently used by WCC to control exotic wildings in Johnsonville Park.

Ecological weed control

Ecological weed control is undertaken by WCC within the KNE site based on the species and operational areas identified by the Weed Survey Report 2013 - Western

Wellington Forest²⁹ and the Weed Control and Restoration Planting in Khandallah and Johnsonville Parks (2010)³⁰, and in accordance with GWRC's Regional Pest Management Strategy³¹ and WCC's Our Natural Capital – Wellington's Biodiversity Strategy and Action Plan.

While the broad approach to weed control is outlined below and some of the key weed species for control are provided in Appendix 5 of this document, the reports cited above should be referred to when implementing, assessing or amending the ecological weed control strategy as they provide greater detail of the species and areas for control than is covered in this document.

Given the scale of the KNE site, ecological weed control cannot feasibly be undertaken across the whole area. Therefore, ecological weed control is targeted within five operational areas. These are:

- A. Johnsonville Park
- B. Khandallah Park
- C. Huntleigh Park
- D. Otari Block, and
- E. Johnston Hill Scenic Reserve

The ecological weed control strategies will vary between each operational area but, the approaches used will be guided by the following management principles:

- Keeping high value core forested areas weed free
- Undertaking ecological weed control of the urban-edge
- Undertaking broad-scale ecological weed control in the regenerating forest
- Reduce the spread of satellite infestations of ecological weeds
- Start ecological weed control from the edge of infestations and work towards the core

GWRC supports WCC's ecological weed control strategy by funding the control of exotic wilding trees, such as cherry and holly within operational area A (Johnsonville Park). This targeted management activity is likely to continue for the duration of this plan but, should a higher priority be identified by the management partners within the three-year cycle of this plan, GWRC's budgeted contribution could be channelled towards alternative management activities.

Biocontrol (controlling one living thing using another), of Darwin's Barberry could occur within the life-cycle of this KNE plan. WCC, GWRC and the National Biocontrol Collective will work collectively to trial biocontrol organisms that are approved for release in the wild.

Management partners review the effectiveness of ecological weed control strategies and priorities annually.

Pest animal control

A large-scale network of pest animal control has been developed across the KNE site and buffer zone areas since 1998 to prevent over-browsing of the native forest cover and protect native fauna. This activity also encourages natural regeneration of the native forest and improves food supply and nesting opportunities available.

The primary focus of the pest animal control network is on protecting native ecosystems and species from the effects of possums, rats and mustelids. A combination of Pelifeed poison bait-stations, DOC 200 kill-traps, Timms kill-traps and Goodnature A24 gas-traps have been installed across the entire KNE site. This work is jointly funded and delivered by GWRC and WCC (using community groups).

A brief outline of each control method is provided below:

- A large network of poison bait-stations using anticoagulant bait has been installed across the whole KNE and buffer zone areas that control possums and rats to low levels and reduces the risk of re-invasion into the KNE site of these species. The bait stations are serviced every three months by GWRC.
- DOC 200 kill-traps are used to control small mammals such as, mustelids, rats and hedgehogs. These traps have been installed in all operational areas and are serviced monthly by community group volunteers everywhere except Johnston's Hill where they are serviced three monthly by GWRC. Note: not all DOC 200 kill-traps are shown in Appendix 1, Map 5 given the expansion of the community group's network (see below).
- Timms kill-traps have been installed on the skyline ridge to reduce the risk of possum re-invasion into the KNE site from the Ohariu Valley. The traps are serviced monthly by a volunteer, with bait provided by GWRC.
- Goodnature A24 gas-traps have been installed within operational area A targeting rats. These traps are being used on a trial basis to test gas-traps in field conditions and are serviced every three months by GWRC.

Community groups have secured funding for the expansion of the DOC 200 kill-trap network across the KNE site. The implementation of this expansion is currently being developed by the community groups and management partners. If installed, the traps would primarily target mustelids across a greater area of the KNE site, providing benefits to native birds and lizards. WCC and GWRC are advising the community groups involved on the most effective way to install and service the extended trap network.

GWRC will install a large bait-station network throughout the Ohariu Valley, which is immediately adjacent to the KNE site, within the three-year cycle of this plan. This work will be funded by GWRC's Regional Pest and Predator Control Programme (RPPCP) that aims to control possums across the greater Wellington landscape to low levels³². This activity will benefit the KNE site by controlling possums in the wider landscape and reducing the risk of re-invasion into the KNE site.

Feral goats and pigs are present in the Wellington peninsula and are occasional visitors to the KNE via the Skyline Ridge. Goats and pigs are most effectively controlled using

ground-hunters given the dense vegetation cover and high mobility of these animals. WCC undertake regular control of goats and pigs using contracted hunters.

WCC will continue to fund regular control of feral cats in the Chartwell/Crofton Downs (where a significant feral population has been established) and rabbits in the pasture lands above Khandallah Park throughout the three-year cycle of this plan.

Restoration Planting

WCC coordinates all restoration planting activities within the KNE site with assistance from community groups. These activities are undertaken in line with the restoration objectives set out in the Our Natural Capital - Draft Biodiversity Strategy and Action Plan³³ and the Weed Control and Restoration Planting in Khandallah and Johnsonville Parks³⁴.

Restoration planting is an important part of the management of the KNE site, supporting the regeneration and dominance of the forest cover and providing additional food resources for native animals. Only locally sourced (eco-sourced) native plant species, grown at WCC's nursery are used in restoration planting. The principles guiding restoration planting in the KNE are to:

- Increase species diversity
- Plant key 'missing' species (i.e. podocarp species)
- In-fill canopy gaps with native species, and
- Restore areas following ecological weed control work

WCC will continue to monitor and record the condition of the restoration plantings.

Mammal monitoring

GWRC fund small mammal monitoring undertaken bi-annually in Johnsonville Park, and Otari-Wilton's Bush. Tracking tunnels are used to monitor the presence of small mammal species, primarily mustelids, mice, rats and hedgehogs to indicate the effectiveness of the pest animal control network. Monitoring is undertaken in Johnsonville Park to assess the effectiveness of the Goodnature A24 Gas-traps.

In 2015/16 GWRC will commence monitoring of possums within the KNE site. Monitoring will continue on a four-yearly cycle, with the results used to provide an indication of the effectiveness of the control regime (see pest animals section) and overall forest canopy health.

Community groups undertaking biodiversity management activities within the KNE site have expressed an interest in undertaking small mammal monitoring. WCC are currently working with these groups to develop effective monitoring systems.

Bird monitoring

WCC funds bird monitoring within the KNE site as part of their city-wide bird monitoring programme. Five-minute bird counts are undertaken annually to assess trends in abundance, diversity and distribution of native birds across Wellington City parks and reserves.

Fish passage assessment

WCC have commissioned an assessment and prioritisation of barriers to fish migration on the Kaiwharawhara stream. Field surveys will be undertaken in 2015/16 with restoration of high priority barriers due to commence from 2016/17.

Fencing

WCC have prioritised fencing along the grazed margins adjacent to Otari-Wilton's Bush and Khandallah Park³⁵. Fencing is an effective tool for excluding feral goats, pigs, deer and livestock from sites with high biodiversity values or where natural regeneration of native vegetation is the management objective. This activity may also have additional benefits in preventing recreational access to high biodiversity value areas.

Private land encroachments

The cumulative effect of encroachments into open space is a significant issue for the management of reserve land. Encroachments are a prohibited activity and WCC has a programme to identify and resolve existing encroachments and protect the KNE from new encroachment.

Community engagement

As well as offering extensive support to community restoration groups working within the KNE site, WCC engage with the wider community by coordinating and delivering public open days and educational programmes. Otari-Wilton's Bush is the main facility utilised for this purpose. WCC will continue their programme of community engagement and education, with existing community restoration group support, during the three-years of this plan encouraging greater public participation.

Veteranisation

Veteranisation is a term used to describe the pruning methods used as a management tool to accelerate the ageing process of trees. Veteranisation of trees creates habitat for birds, lizards and insects. This work is carried out by WCC, and will be continued within the KNE site on exotic species where appropriate.

4. Operational plan

The operational plan shows the actions planned to achieve the stated objectives for Western Wellington Forests 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 Map 4).

Table 2: Three-year operational plan for Western Wellington Forests KNE site.

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
1	EW- 2	Ecological weed control	B	WCC [‡]	Annual wilding control operation targeting cherry, holly and sycamore	Reduction in density and distribution wilding tree species	\$5,000	\$5,000	\$5,000
1	EW – 1,2,3,4	Ecological weed control	A,B,C,D,E	WCC	Targeted weed control	Reduction in density and distribution of targeted weed species	\$61,000***	\$61,000***	\$61,000***
1,2,4	PA – 1,2,3,4,5	Pest animal control	KNE site-wide and adjacent buffer zone areas	Biosecurity department	Service all Pelifeed bait-stations every three months with anticoagulant bait	Possums <5%RTC* Rats <10% TTI**	\$46,850 (all operations are jointly funded by WCC/GWRC)	\$46,850 (all operations are jointly funded by WCC/GWRC)	\$46,850 (all operations are jointly funded by WCC/GWRC)
1,2,3,4,5	PA – 1,2,3,4,5	Pest animal control	B,C,D,	WCC using volunteer community groups	Service DOC 200 kill-traps monthly	Mustelids <2% TTI** Rats <10% TTI**			
1,2,3,4	PA – 1,2,3,4,5	Pest animal control	A	Biosecurity department	Service A24 Goodnature gas traps every three months	Mustelids <2% TTI** Rats <10% TTI**			

Key Native Ecosystem Plan

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
1,2	PA - 1	Pest animal control	Skyline ridge	Biosecurity department using volunteer assistance	Service Timms kill-traps monthly	Possums <5%RTC*			
1,2,3	PA – 4,5,7,9	Pest animal control	Entire KNE site	WCC	Control of pest species including rabbits, goats, pigs, and feral cats throughout the KNE site using contracted ground hunters	Sustained control to maintain current low density	\$10,000***	\$10,000***	\$10,000***
1,2	EW – 1,2,3,4 HA - 1	Restoration planting	A,B,D	WCC	Coordination of community group working bees and provision of planting stock	>75% planting survival rate	\$7,000	\$7,000	\$7,000
1	EW – 1,2,3,4 HA - 1	Restoration Planting	A,B,D,E	WCC	Planting of missing species, such as podocarps and planting following weed control, monitoring growth podocarps	>75% planting survival rate	\$7,000	\$7,000	\$7,000
1	HA – 2,3	Fencing	A, C	WCC	Stock-proof fencing monitored and maintained as necessary in upland pasture areas	No stock incursions into the KNE site	\$1,000***	\$1,000***	\$1,000***

Objective	Threat	Activity	Operational area	Delivery	Description/detail	Target	Timetable and resourcing		
							2015/16	2016/17	2017/18
1,2,3,5	PA – 1,2,3,4,5	Mammal monitoring	A,D	GWRC	Small mammal monitoring and reporting. Monitoring and reporting completed bi-annually	Rats <10% TTI**	\$6,370	\$6,370	\$6,370
1	PA-1	Possum monitoring	D	GWRC	Possum monitoring and reporting	Possums <5%RTC*	\$3,940	Nil	Nil
1,2	PA – 1,2,3,7	Bird monitoring	D	WCC	Five minute bird count	Surveying and reporting completed annually	\$2,500***	\$2,500***	\$2,500***
5	HA-5	Fish Passage	Kaiwharawhara Stream	WCC	Assessment and prioritisation of barrier to fish migration. Restoration commencing in 2016/17.	Assessment and prioritisation completed in 2015/16.	****	****	****
6	OT-1	Private land assessment	Privately owned areas of the KNE site	WCC	Review/audit of private land boundaries to assess encroachment	Review completed in 2015/16	****	Nil	Nil
						Total	\$150,660	\$146,720	\$146,720

*RTC = Residual Trap Catch. The control regime has been created designed to control possums to this level. Experience in the use of this control method indicates this target will be met.

**TTI = Tracking Tunnel Index. The control regime has been created designed to control rats and mustelids to this level. Experience in the use of this control method indicates this target will be met.

***Variable costs determined annually by WCC. Figures given are based on 2014-15 expenditure or averaged out expenditure across multiple sites/years.

****Costs cannot be detailed at this time.

¥ funded by GWRC but delivered by WCC. Activity to be reviewed annually.

5. Funding summary

GWRC budget

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

Table 4: GWRC Allocated budget for the Western Wellington Forests KNE site.

Management activity	Timetable and resourcing		
	2015/16	2016/17	2017/18
Ecological weed control	\$5,000	\$5,000	\$5,000
Pest animal control	\$25,000	\$25,000	\$25,000
Mammal monitoring	\$10,310	\$6,370	\$6370
Total	\$40,310	\$36,370	\$36,370

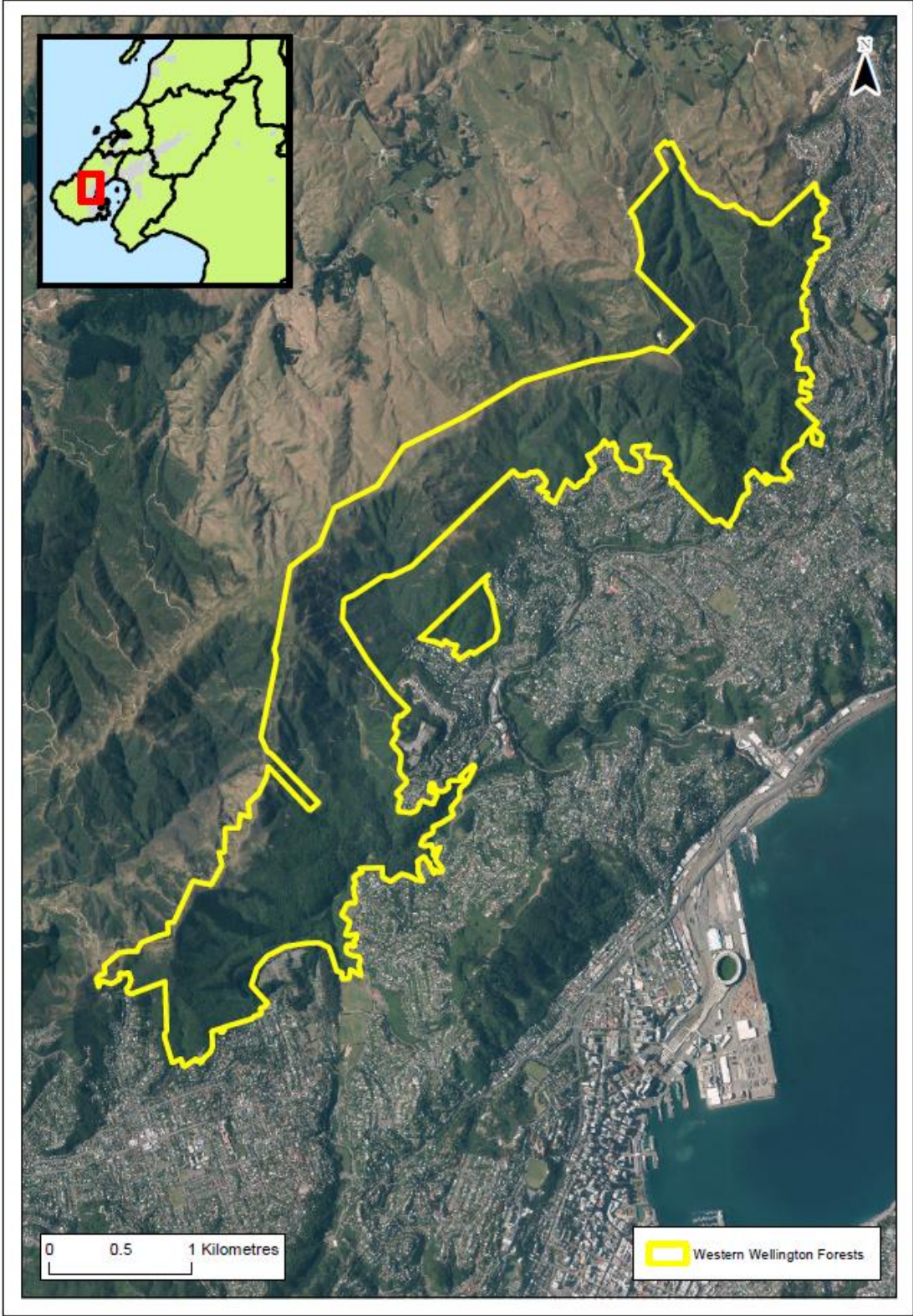
Other contributions

The budget is subject to confirmation through WCC annual plan and long term planning process.

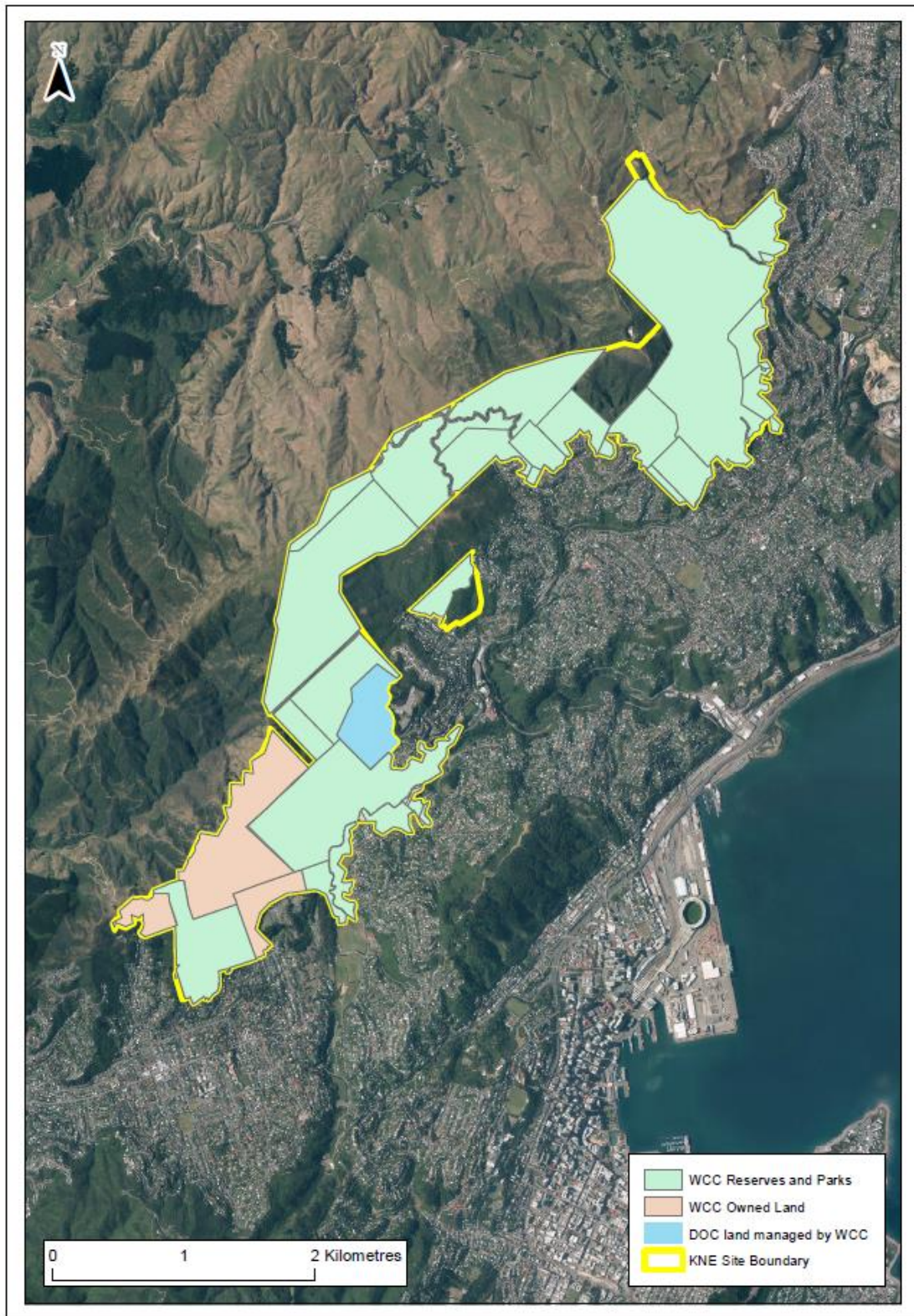
Table 5: Additional allocated budget for the Western Wellington Forests KNE site from WCC.

Management activity	Timetable and resourcing		
	2015/16	2016/17	2017/18
Ecological weed control	\$61,000	\$61,000	\$61,000
Pest animal control	\$31,850	\$31,850	\$31,850
Restoration planting	\$14,000	\$14,000	\$14,000
Fencing	\$1,000	\$1,000	\$1,000
Bird monitoring	\$2,500	\$2,500	\$2,500
Total	\$110,350	\$110,350	\$110,350

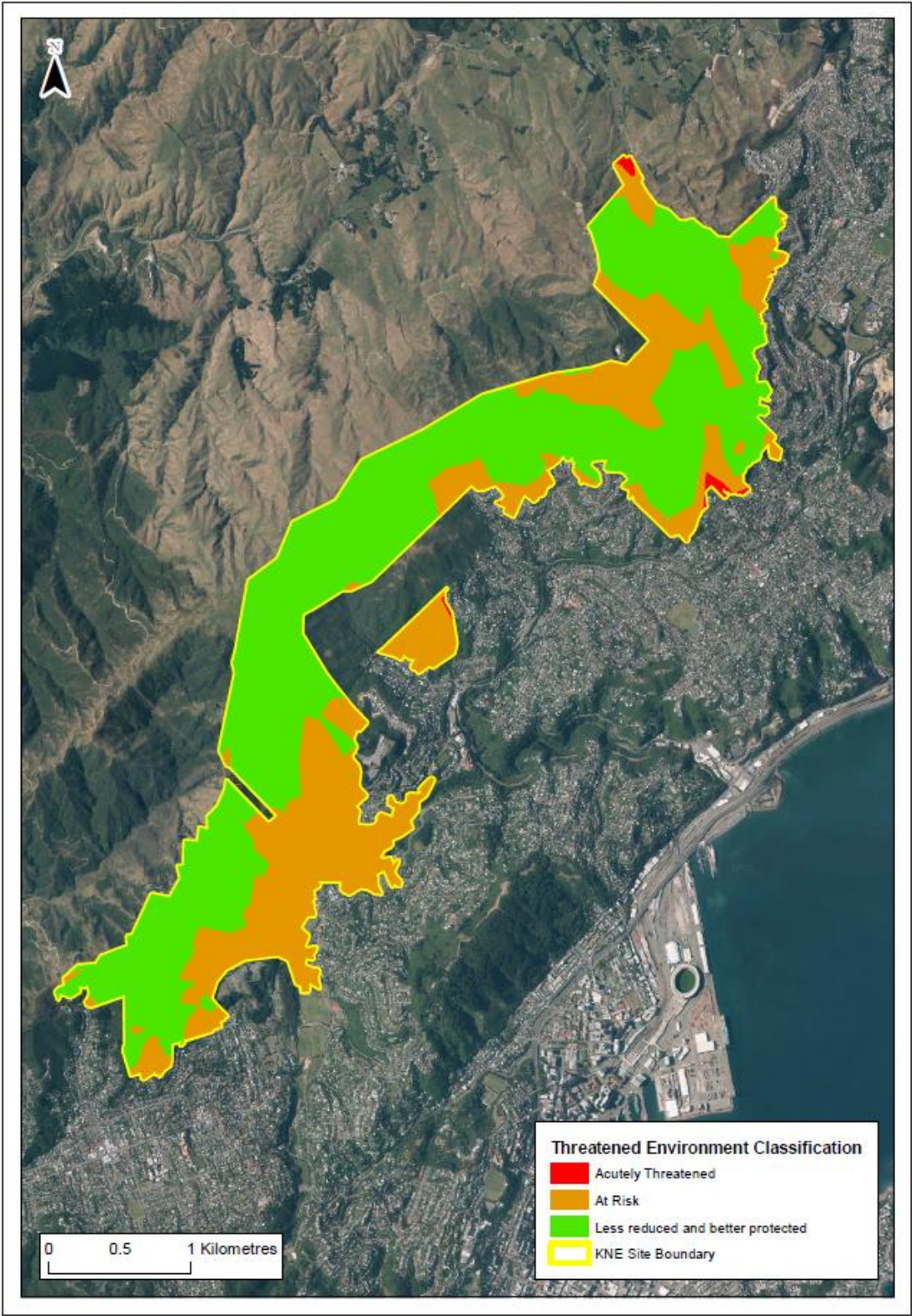
Appendix 1: Site maps



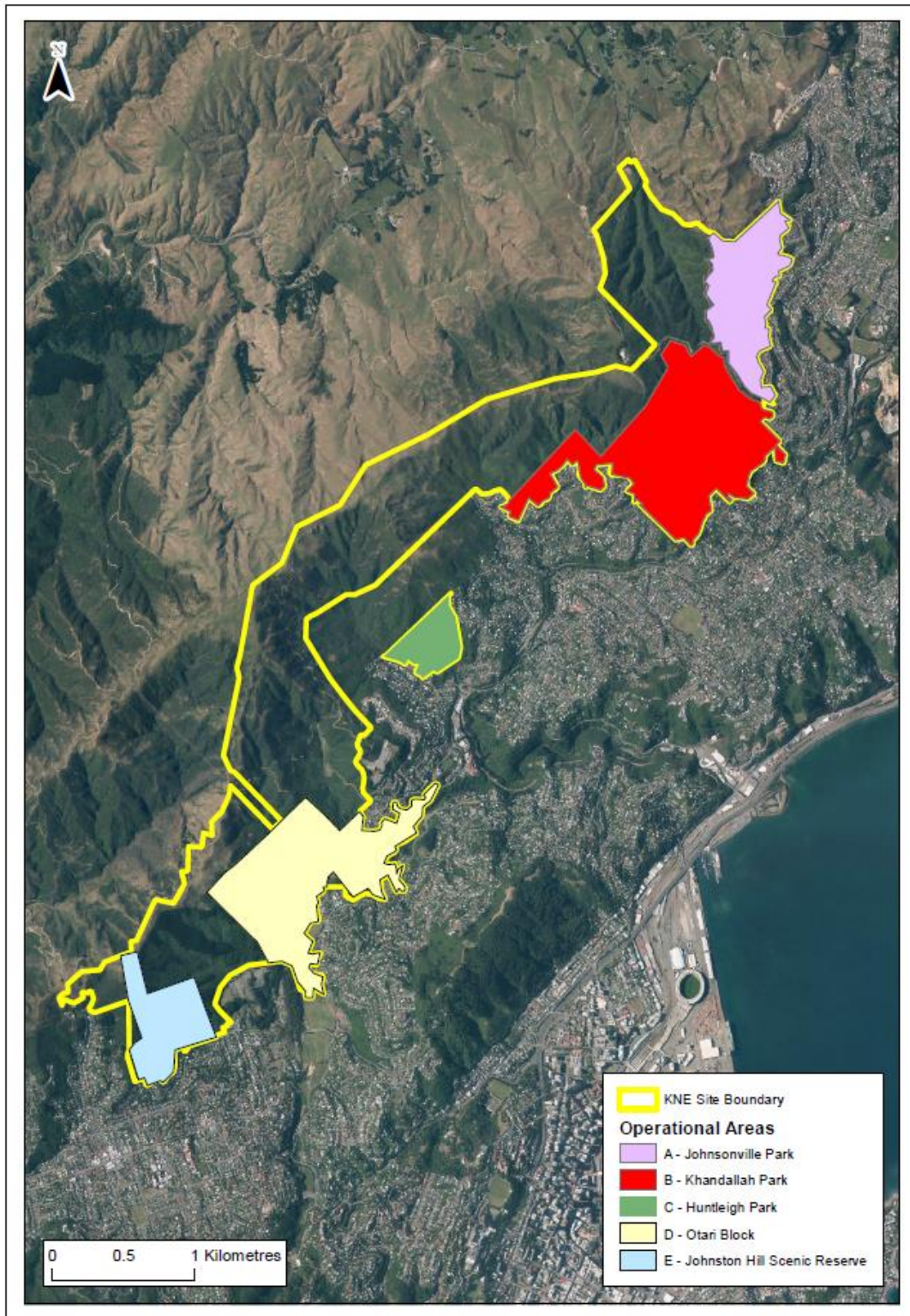
Map 1: Western Wellington Forests KNE site boundary.



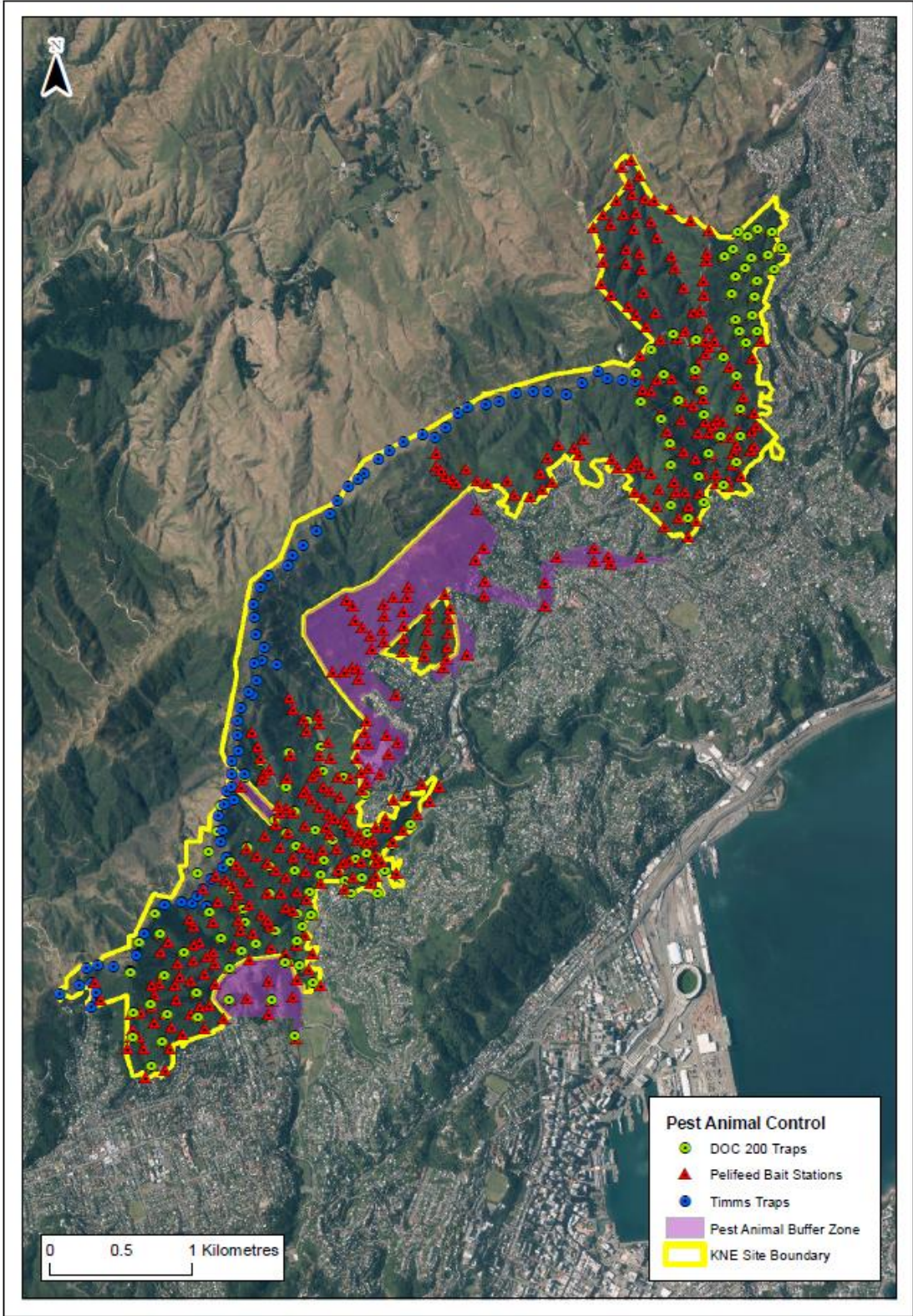
Map 2: Property boundaries and WCC owned/administered land within the Western Wellington Forests KNE site.



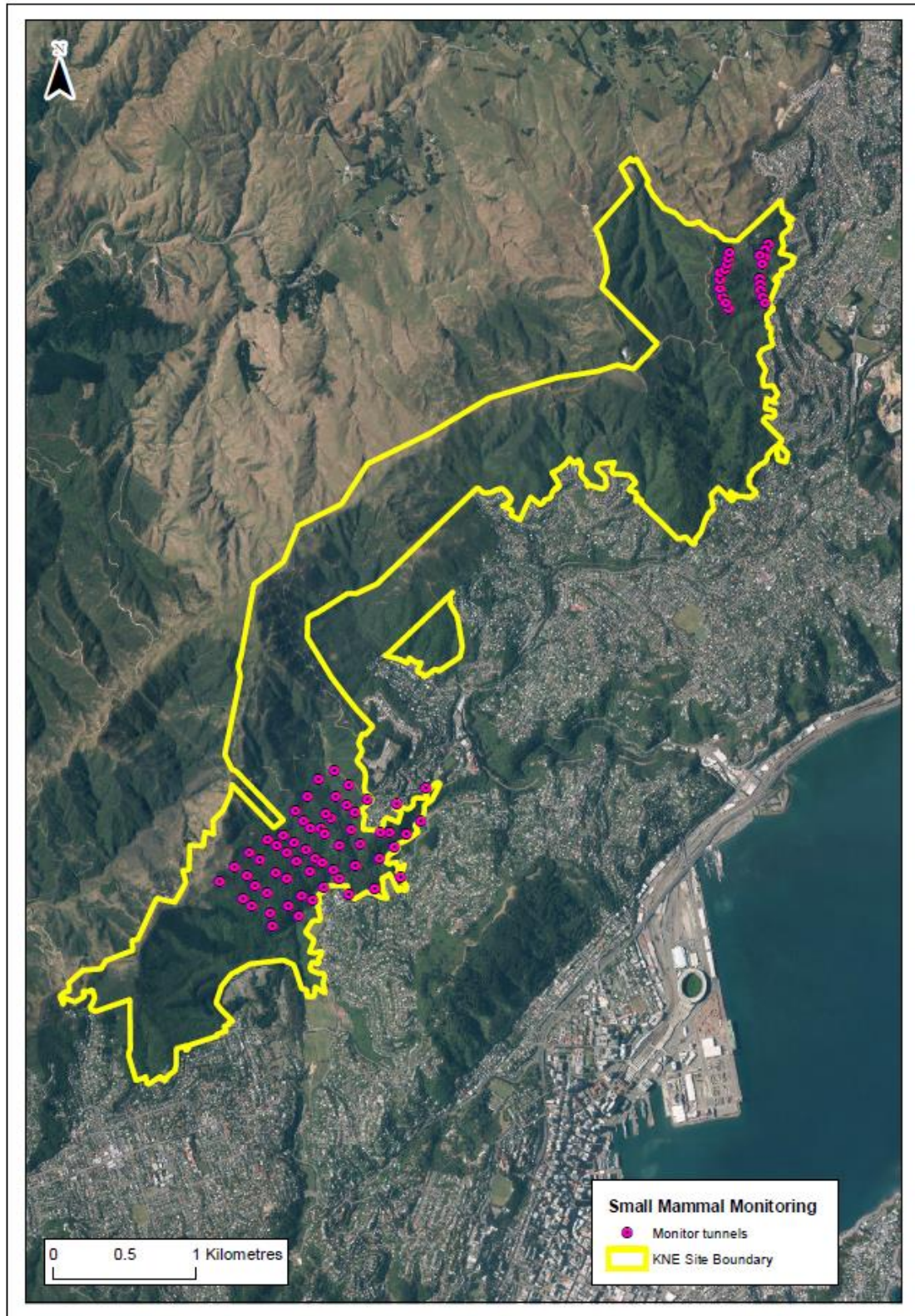
Map 3: Land Environment New Zealand (LENZ) threat classification for the Western Wellington Forests KNE site (copyright Ministry for the Environment/Landcare Research).



Map 4: Operational areas in the Western Wellington Forests KNE site.



Map 5: Pest animal control in the Western Wellington Forests KNE site.



Map 6: Small mammal monitoring tracking tunnel locations in the Western Wellington Forests KNE site.

Appendix 2: Wellington City Council Reserves

Table 6: Wellington City Council reserves included in the Western Wellington Forests KNE site.

Wellington City Council Reserves
Johnston Hill Scenic Reserve
Otari Wiltons Bush
Otari Farm Reserve
Wilton Park
Kilmister Block
Awarua Street Recreation Reserve
Huntleigh Park
Khandallah Park
Johnsonville Park
Karori Cemetery
Kanpur Road / Nalanda Crescent Reserve
Kim Street Reserve
Orleans Recreational Reserve*
Cummings Park*
Heke Street Park*

* Outside of the KNE site boundary but within pest animal buffer zone

Appendix 3: 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 cycle³⁶ with the exception of birds that are assessed on a five-year cycle³⁷. 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 Western Wellington Forests KNE site.

Table 7: Threatened and At Risk species recorded in the Western Wellington Forests KNE site.

Scientific name	Common name	Threat status	Observation
Plants(vascular)³⁸			
<i>Anemanthele lessoniana</i>	Hunangāmoho	Threatened-Nationally Vulnerable	Wellington Botanical Society 2007 ³⁹
<i>Streblus banksii</i>	Large-leaved milk tree	At Risk-Relict	GWRC site inventory Wilton House
<i>Peraxilla tetrapetala</i>	Crimson mistletoe	At Risk–Declining	Wellington Botanical Society 2007
<i>Teucrium parvifolium</i>	Teucrium	At Risk–Declining	Wellington Botanical Society 2007
<i>Caladenia bartlettii</i>	None known	At Risk-Naturally Uncommon	Wellington Botanical Society 2007
Birds⁴⁰			
<i>Falco novaeseelandiae</i>	New Zealand falcon, kārearea	Threatened-Nationally Vulnerable	New Zealand eBird database
<i>Nestor meridionalis septentrionalis</i>	North Island kākā	Threatened-Nationally Vulnerable	New Zealand eBird database
<i>Notiomystis cincta</i>	Hihi, stichbird	Threatened-Nationally Vulnerable	New Zealand NatureWatch
<i>Cyanoramphus novaezelandiae novaezelandiae</i>	Red-crowned parakeet, kākārīki	At Risk-Relict	New Zealand eBird database
Reptiles⁴¹			
<i>Naultinus punctatus</i>	Barking gecko	At Risk-Declining	Department of Conservation 2014 ⁴²

Scientific name	Common name	Threat status	Observation
<i>Oligosoma zelandicum</i>	Glossy brown skink	At Risk-Declining	Department of Conservation 2014
<i>Oligosoma ornatum</i>	Ornate skink	At Risk-Declining	Department of Conservation 2014
<i>Mokopirirakau</i> 'southern North Island'	Ngahere gecko	At Risk-Declining	Department of Conservation 2014
Freshwater fish⁴³			
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk-Declining	NIWA 2015 ⁴⁴
<i>Galaxias brevipinnis</i>	Kōaro	At Risk-Declining	NIWA 2015
<i>Galaxias argenteus</i>	Giant kōkopu	At Risk-Declining	NIWA 2015
Invertebrates⁴⁵			
<i>Powelliphanta traversi latizona</i>	None known	Threatened-Nationally Endangered	Walker 2003 ⁴⁶

Appendix 4: Regionally threatened species list

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

Table 8: Regionally threatened species recorded in Western Wellington Forests KNE site.

Scientific name	Common name	Threat status	Observation
Plants⁴⁸			
<i>Cyathea cunninghamii</i>	Slender tree fern	Regionally Sparse	Wellington Botanical Society 2007

Appendix 5: Ecological weed species

Key ecological weeds recorded within the Western Wellington Forests KNE site. Plant species are listed in priority order based on the priorities identified in Greater Wellington – Regional Pest Management Strategy. 2002 – 2022 (GW RPMS)⁴⁹, WCC pest management plan (WCC PMS)⁵⁰, the 2013 weed survey of the Western Wellington Forest KNE site⁵¹, Draft Suburban Reserves Management Plan⁵², the Otari Management Plan⁵³, and the restoration and weed plan for Khandallah and Johnsonville Parks⁵⁴.

Table 9: Ecological weed species recorded in Western Wellington Forests KNE site.

Scientific Name	Common Name	Priority
<i>Chrysanthemoides monilifera</i>	Boneseed	1
<i>Asparagus scandens</i>	Climbing asparagus	1
<i>Lonicera japonica</i>	Japanese honeysuckle	1
<i>Plectranthus ciliatus</i>	Plectranthus, Blue spur flower	1
<i>Clematis vitalba</i>	Old man's beard	1
<i>Cobaea scandens</i>	Cathedral bells	1
<i>Hedychium gardnerianum</i>	Kahili ginger	1
<i>Passiflora tripartita</i> var. <i>mollissima</i>	Banana passionfruit	1
<i>Crassula multicava</i>	Fairy crassula	1
<i>Galeobdolon luteum</i>	Aluminium plant (artillery plant)	1
<i>Elaeagnus xreflexa</i>	Elaeagnus	1
<i>Bambusa</i> sp.	Bamboo	1
<i>Hedera helix</i> subsp. <i>helix</i>	Ivy	1
<i>Jasminum polyanthum</i>	Jasmine	1
<i>Sambucus nigra</i>	Elderberry	1
<i>Cortaderia selloana</i>	Pampas	2
<i>Erigeron karvinskianus</i>	Mexican daisy	2
<i>Selaginella kraussiana</i>	African clubmoss, selaginella	2
<i>Zantedeschia aethiopica</i>	Arum lily	2
<i>Hypericum androsaemum</i>	Tutsan	2
<i>Acer pseudoplatanus</i>	Sycamore	2
<i>Buddleja davidii</i>	Buddleia	2
<i>Erica lusitanica</i>	Spanish heath	2
<i>Senecio mikanioides</i>	German ivy	2
<i>Vinca major</i>	Periwinkle	2
<i>Rubus</i> sp. (<i>R. fruticosus</i> agg.)	Blackberry	2

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Scientific Name	Common Name	Priority
<i>Acanthus mollis</i>	Bear's breeches	2
<i>Agapanthus praecox</i>	Agapanthus	2
<i>Crataegus monogyna</i>	Hawthorn	2
<i>Fatsia japonica</i>	Fatsia or Japanese aralia	2
<i>Ilex aquifolium</i>	Holly	2
<i>Prunus</i> sp.	Ornamental cherry	2
<i>Watsonia bulbifera</i>	Watsonia	2
<i>Berberis darwinii</i>	Darwin's barberry	3
<i>Tradescantia fluminensis</i>	Tradescantia	3
<i>Calystegia silvatica</i>	Greater bindweed	3
<i>Crocasmia xrocosmiiflora</i>	Montbretia	3
<i>Clethra arborea</i>	Lily of the valley tree	3
<i>Cotoneaster glaucophylla</i>	Cotoneaster	3
<i>Laurus nobilis</i>	Bay tree, sweet bay, bay laurel	3
<i>Metrosideros excelsa</i>	Pohutukawa	3
<i>Pittosporum crassifolium</i>	Karo	3
<i>Pittosporum raphii</i>	Karo	3
<i>Pseudopanax</i> sp.	Pseudopanax hybrids	3
<i>Hoheria populnea</i>	Lacebark	4
<i>Lupinus arboreus</i>	Lupin	4
<i>Tropaeolum majus</i>	Nasturtium	4
<i>Pinus radiata</i>	Radiata pine	5
<i>Chamaecytisus palmensis</i>	Tree lucerne	5
<i>Foeniculum vulgare</i>	Fennel	5
<i>Pseudotsuga menziesii</i>	Douglas fir	5
<i>Cytisus scoparius</i>	Broom	6
<i>Ulex europaeus</i>	Gorse	6

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