

# RESTORATION PLAN FOR THE SPENCER ROAD PART OF THE LAKE TARAWERA CATCHMENT

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R4152c



# **RESTORATION PLAN FOR THE SPENCER ROAD PART OF THE LAKE TARAWERA CATCHMENT**

## **Contract Report No. 4152c**

February 2017

Updated February 2019

### **Project Team:**

Richard Gillies - Fieldwork, report author

Jennifer Murray - Fieldwork, report author

Sarah Beadel - Field assessment, project management, report author, peer review

### **Prepared for:**

Lake Tarawera Ratepayers Association

and

Tarawera Landcare 2115

## EXECUTIVE SUMMARY

Tarawera Landcare 2115, via the Lake Tarawera Ratepayers Association, has signed a MoU with Rotorua Lakes Council regarding the management of Council land along the margins of Lake Tarawera between Otumutu Lagoon and Te Toroa Point. The site is c.6.5 km long and covers 24 ha. The Lake Tarawera Ratepayers Association has commissioned this plan to guide ecological management there. A separate plan has been developed for Māori land on Kariri Point. A review of background information and ecological surveys and assessments of the study area were undertaken during October-December 2016.

Indigenous forest dominated by māhoe, mamaku, kāmahī, fivefinger and, in places, pōhutukawa and kānuka, occupies around 40% of the study area, and is representative of the vegetation regenerating after the 1886 Tarawera eruption. A distinctive feature is the presence of healthy numbers of the mistletoe *Tupeia antarctica*, an At Risk species, from Cliff Road Reserve northwards, attributable to ongoing possum control by the Tarawera community. Lakeshore vegetation provides roosting and nesting habitat for waterbirds, particularly dabchick, a Threatened endemic waterbird present along the entire shoreline. Spotless crane, an At Risk wetland bird, is present in the wetland at the end of Spencer Road, one of two wetlands within the study area.

The major threats to the ecological values of the study area, in order of magnitude, are pest plant invasion (especially crack willow along the lake margin, and jasmine and agapanthus in forest areas), ongoing clearance and modification of natural vegetation for residential/amenity purposes, and pest animal impacts.

The highest priority is to control pest plants in indigenous forest areas and wetlands within the study area, which are small, fragmented and vulnerable. The existing possum and rat control programmes should continue, in order to protect mistletoes and improve survival of forest and waterbirds. The existing walking track network should be maintained and a key track extension considered, from the community garden to Solitaire Lodge at Otumutu Lagoon. These restoration management actions are outlined (but not costed) in a ten-year plan framework.

After starting to implement this plan, the next step is to develop a restoration strategy for the entire Lake Tarawera catchment (14,520 ha), an initiative that Tarawera Landcare 2115, the Lake Tarawera Ratepayers Association, Tūhourangi, and Ngāti Rangitihi are interested in pursuing. The scope and scale of this initiative is very large and long-term, and will require close coordination between the various project partners.



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**Reviewed and approved for release by:**



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Sarah Beadel  
Director/Principal Ecologist  
Wildland Consultants Ltd

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## 1. INTRODUCTION

A group that includes the Lake Tarawera Ratepayers Association, Tarawera Landcare 2115, Tūhourangi, and Ngāti Rangitihi is keen to restore the Lake Tarawera catchment (14,520 ha<sup>1</sup>). This group, and others, have initiated various projects regarding the early stages of restoring Lake Tarawera and the surrounding catchment, and are keen to develop a restoration plan which can then be implemented by a range of people in a variety of places. A catchment-wide plan would outline a series of staged interventions that will secure existing biodiversity values, restore key aspects of ecosystems, and protect these enhanced ecosystems for future generations. The scope and scale of both developing and implementing such a plan is very large, will require close coordination between the group participants, and is a longer-term initiative.

In the meantime, Tarawera Landcare 2115, a group that operates under the umbrella of the Lake Tarawera Ratepayers Association, has signed an MoU with the Rotorua Lakes Council regarding Landcare activities on Council land at Lake Tarawera, and would like to develop a site-specific management plan focusing on Council-owned land along the lake margin, roughly from Otumutu Lagoon<sup>2</sup> to Te Toroa Point, which comprises a strip of land about 6.5 km in length and around 24 ha in size. A separate plan has been developed for Kariri Point (Wildland Consultants 2016a), which has Māori land tenure.

## 2. METHODS

Project vision and objectives were discussed with the client, who obtained permission from Rotorua Lakes Council to work on the site.

A brief review of existing information was undertaken, including ecological context, the ecological significance of the site, and existing information on biodiversity management in the vicinity of the project site.

Site visits were undertaken on 5 October, 3 and 10 November, and 7 December 2016. Vegetation and habitats of the sites were mapped in the field onto aerial imagery at a scale of 1:3,000. Checklists of plants and fauna were compiled. Locations, extent and density of pest plant infestations were recorded. Evidence of pest animal presence and/or effects was noted.

A plan framework was prepared incorporating the above information, and outlining the options, and methods involved in undertaking ecological restoration work throughout the study area, including pest plant and animal control, and indigenous revegetation. Costings do not form part of this document, as it is envisaged these will be developed on a task by task basis as implementation proceeds.

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<sup>1</sup> Rotorua Te Arawa Lakes Programme <http://www.rotorualakes.co.nz/tarawera>

<sup>2</sup> Note a restoration plan was prepared for Otumutu Lagoon (part of the area which is to be covered by the current proposed plan) in 2005 (Wildland Consultants 2005) which was implemented, at least in part, but it is now 11 years since that plan was produced and it is timely that it is renewed.

### 3. ECOLOGICAL CONTEXT AND HISTORY

Lake Tarawera and surrounds lie within the Rotorua Lakes Ecological District. Rotorua Lakes Ecological District covers approximately 139,000 ha from the base of the Rotoma hills in the east, along the northern catchment boundaries of Lakes Rotorua, Rotoehu, and Rotoma, to the Mamaku Plateau in the west, and south to Maungakakamea (Rainbow Mountain). Altitude ranges from c.20 m asl near Kawerau to 1,111 m asl at the summit of Mount Tarawera. Most of the Ecological District landforms are over 280 m asl.

Major lakes within Rotorua Lakes Ecological District - Rotorua, Rotoiti, Rotoehu, Rotoma, Tarawera, Okataina, Okareka, Tikitapu (Blue Lake), and Rotokakahi (Green Lake) - occupy depressions within the calderas of the Rotorua Volcanic Centre and Okataina Volcanic Centre. These calderas, along with the associated lakes, geothermal systems, and distinctively-shaped rhyolite domes, are the distinctive landform features of this Ecological District.

Land cover within Rotorua Lakes Ecological District comprises lakes (16% of total area), pasture-based farmland (27%), exotic plantation forest (21%), and indigenous forest (mainly tawa-dominant) and scrub (30%). Wetland vegetation comprises less than 0.1% of the land cover (Landcover Database Version 3).

Lake Tarawera, formed around 5,000 years ago<sup>1</sup> is one of the three biggest lakes and occupies a large part of the southwestern floor of Haroharo Caldera. Lake Tarawera has a surface area of 4,130 ha, and a total catchment area of 14,520 ha. Average depth is 50 metres and the deepest point is 87 metres. The water level is held to 298 metres asl by coalescing lava flows from the Haroharo and Tarawera volcanic complexes, through which the outlet flows at the eastern end of the lake.

Vegetation history is summarised below from Beadel *et al.* (1998), Nicholls (1990), and Beadel *et al.* (2011). Hardy shrubs, herbs and grasses would have been the main vegetation cover over much of Rotorua Lakes Ecological District and Kaingaroa Ecological District during the harsh, cold and windy climate that prevailed toward the close of the Pleistocene era, c.15-20 thousand years before present (BP). Forest may have occupied some relatively mild, well-sheltered sites, below 300 m above sea level (asl), such as in the lower parts of the Tarawera River valley. As the climate warmed, forest cover would have returned to higher sites. Analysis of plant pollens in peat/tephra beds near the eastern shore of Lake Rotorua implies that rimu-dominant podocarp-broadleaved forest was the main vegetation class about Rotorua 3,500 years ago (McGlone, in Kennedy *et al.* 1978). From the time of the Rotorua Tephra eruption (c.14 ka BP) until c.800 years ago, five major dome building lava flows and accompanying violent pyroclastic eruptions occurred within the Okataina Volcanic Centre, at average intervals of 2,000 years, undoubtedly obliterating or severely damaging vegetation cover. However recovery and colonisation is likely to have been well-advanced within a few decades after each event.

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<sup>1</sup> <http://www.rotorualakes.co.nz/tarawera>

With the arrival of Māori in the Bay of Plenty and Rotorua Lakes districts, thought to have been after the Mt Tarawera eruption c.1314 AD ([www.teara.org.nz](http://www.teara.org.nz)), south of Lake Tarawera and down the Tarawera River valley, mānuka and other hardy shrubs predominated on drier ground, and there were freshwater wetlands on the broad valley floors. Pōhutukawa (*Metrosideros excelsa*) forest (including pōhutukawa-northern rata (*Metrosideros robusta*) hybrids) extended from the outlet of Lake Tarawera, some distance down the Tarawera River. Podocarp-rich forest covered the southern and eastern flanks of Mt Tarawera. Submontane Hall's tōtara (*Podocarpus laetus*)-kāmahi (*Weinmannia racemosa*) forest covered the summits of Mt Tarawera, Makatiti Dome, and Haroharo. Rimu-tawa (*Beilschmedia tawa*) forest with scattered northern rata covered the lower slopes of Makatiti Dome and Haroharo, and Maungawhakangama, as well as the surrounding hills.

The Tarawera-Rotomahana volcanic eruption in June 1886 had a drastic effect on vegetation for some distance around, and would have largely obliterated vegetation along the western shoreline of Lake Tarawera including, it can be assumed, Kariri Point, some 8-10 kilometres distant from the eruption vents. Vegetation on the mountain flanks, more scrub than forest, was obliterated, mainly by the more weighty Rotomahana Mud which completely buried large tracts of scrub up to 15 kilometres distant from the source. Further than a few kilometres beyond the craters the rain of ash and lapilli caused only transitory damage. However, within ten years of the eruption the forest was almost wholly recovered and scrub was re-clothing the rest of the mud-plastered landscape (Nicholls 1959, 1963). Over the course of the 20<sup>th</sup> century the western shoreline was modified by rural development and the growth of the residential/bach community along Spencer Road.

#### 4. VEGETATION AND HABITAT TYPES

Fourteen vegetation and habitat types (listed in Table 1) were identified on Council land along the lake margin. These are mapped in Figure 1 and described below. Representative photographs of the main vegetation and habitat types are in Appendix 5. Secondary indigenous forest on flat-gentle slopes covers much of the long, linear-shaped project area. Cliffs and steep slopes are present in places along the shoreline, either falling directly into the lake, or forming a low escarpment behind a narrow terrace of flatter land bordering the lake. Numerous paths lead from residential properties to jetties and beaches along the lake margin. In areas of easy contour, residential lawns reach all the way to the lake margin, with many ornamental shrubs and trees present. There are Council-maintained parks at Rangiuru Bay, Boatshed Bay, Cliff Road, and Otumutu Lagoon consisting of grassy areas punctuated by specimen trees of various species, both exotic and indigenous.

Lake margins are, by definition, outside Council land boundaries and therefore outside the project study area, and not included in vegetation descriptions below. However, along the study area, lake margin vegetation includes areas of raupō (*Typha orientalis*) reedland and *Schoenoplectus tabernaemontani* reedland and, on the immediate land-water interface there is water purslane (*Ludwigia palustris*), water forget-me-not (*Myosotis laxa* subsp. *caespitosa*), *Azolla filiculoides*, *Myriophyllum propinquum*, and starwort (*Callitriche stagnalis*).

Table 1: Vegetation and habitat types of Rotorua Lakes Council land at Spencer Road, Lake Tarawera.

Vegetation and Habitat Type	Area (ha)
1. Māhoe-mamaku-whauwhaupaku-kōhūhū-kāmahi-crack willow forest	10.35
2. Pōhutukawa × northern rata forest	0.54
3. Kānuka forest	0.14
4. Black wattle-(rimu)/mamaku/māpou-whauwhaupaku/whekī forest	2.17
5. Mānuka-(kahikatea)-(whekī)-(mānuka)/kiokio-pūrei-raupō shrubland with local patches of bracken over a dense cover of wetland species including kiokio, swamp kiokio, pūrei, and <i>Carex geminata</i> .	0.37
6. <i>Machaerina articulata</i> reedland	0.23
7. Raupō reedland	0.01
8. Mānuka-grey willow/ <i>Machaerina arthropphylla</i> -swamp kiokio shrubland and sedgeland	0.12
9. Residential lawns and ornamental trees and shrubs, parks.	8.75
10. Grey willow forest	0.28
11. <i>Carex geminata</i> -tall fescue-Japanese honeysuckle sedgeland-grassland with occasional kiokio and raupō	0.05
12. Tasmanian blackwood forest	0.16
13. Flowering cherry-mamaku-grey willow-gorse forest and scrub	0.18
14. Kāmahi-mamaku-māhoe-pōhutukawa forest	0.41
<b>Total</b>	<b>23.75</b>

## 1. Māhoe-mamaku-whauwhaupaku-kōhūhū-kāmahi-crack willow forest

Māhoe, mamaku (*Cyathea medullaris*) and kōhūhū (*Pittosporum tenuifolium*) form a 7-10 m high canopy with kāmahi common locally, as well as whauwhaupaku (*Pseudopanax arboreus*). A range of other canopy species, mainly exotic, including crack willow, occurs throughout. Many of these have been planted. The understorey includes hangehange (*Geniostoma ligustrifolium* var. *ligustrifolium*), rangiora (*Brachyglottis repanda*), cotoneaster (*Cotoneaster glaucophyllus*), karamū (*Coprosma robusta*), and gorse (*Ulex europaeus*). Gorse is present locally in drier, open areas. Tradescantia (*Tradescantia fluminensis*), selaginella (*Selaginella kraussiana*), ginger (*Hedychium gardnerianum*), and tuber ladder fern (*Nephrolepis cordifolia*) are common in places, but not continuously so. Seedlings and saplings of flowering cherry (*Prunus* sp.) are found throughout, in low density. The ground cover is dominated by kiokio (*Blechnum novae-zelandiae*), kōwaowao (*Microsorium pustulatum*), and *Asplenium flaccidum*. Along much of the water's edge crack willow (*Salix fragilis*) dominates, and individual pōhutukawa × northern rata hybrid trees occur locally.

## 2. Pōhutukawa × northern rata forest

Several small areas of pōhutukawa × northern rata forest occur on rocky headlands and bluffs along the shoreline. On drier rocky sites mingimingi (*Leucopogon fasciculatus*) and koromiko (*Hebe stricta* var. *stricta*) are prevalent in the understorey, while elsewhere there is māhoe, whauwhaupaku, rangiora, kawakawa (*Piper excelsum* subsp. *excelsum*), kōwaowao, and *Asplenium oblongifolium*.

**3. Kānuka forest (0.13 ha)**

A dense canopy of kānuka (*Kunzea robusta*) forms a forest cover with an understorey of rangiora, mingimingi, karamū, and hangehange, with occasional flowering cherry and *Coprosma lucida*, over a groundcover of kōwaowao and annual poa (*Poa annua*).

**4. Black wattle-(rimu)/mamaku-māpou-whauwhaupaku/whēkī forest**

East of the end of Spencer Road wattles are emergent and common, as well as occasional rimu, over mamaku-māpou (*Myrsine australis*)-dominated forest similar to that present in Vegetation Type 1. Hinau (*Elaeocarpus dentatus*) is occasionally present. The understorey and groundcover includes māpou, flowering cherry, karamū, mangeao, silver fern, whēkī, hangehange, and dense areas of kiokio.

**5. Mānuka-(kahikatea)-(whēkī)-(mānuka)/kiokio-pūrei-raupō shrubland with local patches of bracken over a dense cover of wetland species including kiokio, swamp kiokio, pūrei, and *Carex geminata*.**

At Otumutu Lagoon, between the row of boatsheds and the angler accessway, is a small wetland that has received recent conservation management (see Wildland Consultants 2005). There are patches of kahikatea, kōhūhū, tarata, local kāmahi, whauwhaupaku, tī kōuka (*Cordyline australis*), and koromiko over a dense cover of wetland species generally dominated by kiokio, swamp kiokio (*Blechnum minus*), and pūrei, with other species present, including *Eleocharis acuta*, harakeke (flax), monkey musk (*Mimulus guttatus*), lotus (*Lotus pedunculatus*), *Carex geminata*, and gypsywort. There are local patches of bracken, and scattered willows to control along the lakeshore. There is occasional toetoe, and local areas of Japanese honeysuckle and calystegia, occasionally dense.

**6. *Machaerina articulata* reedland**

An area of *Machaerina articulata* reedland occurs in the wetland beyond the end of Spencer Road.

**7. Raupō reedland**

A small area of raupō reedland occurs in the wetland beyond the end of Spencer Road. Very small areas are found within vegetation type 5, as well as larger areas along sheltered parts of the lakeshore, adjacent to but outside the Council land boundaries.

**8. Mānuka-grey willow/*Machaerina arthropylla*-swamp kiokio-raupō shrubland**

This vegetation type occurs in the wetland at the end of Spencer Road. Mānuka and grey willow (*Salix cinerea*) is more prevalent in the middle of the

wetland, *Machaerina arthropphylla* and raupō in the southern part of the wetland.

**9. Residential lawns and ornamental trees and shrubs, parks.**

Residential backyards regularly utilise Council land, mainly on easy flat terrain where direct access to the lake edge is facilitated. These areas, as well as designated Reserves, typically comprise mown lawns and parkland with ornamental plantings of tall exotic trees, occasional native trees, and small specimen plantings of lower growing shrubs etc. which are typically exotic, e.g. agapanthus (*Agapanthus praecox*), although in places there are small areas of native specimen plantings. Grassy clearings and walkways between residential properties and the shoreline are frequently weedy - common species include flowering cherry, selaginella, jasmine (*Jasminum* spp.), agapanthus, and cotoneaster. Around Otumutu Lagoon in particular, a distinctive feature of lawns and parkland is the presence of several native species including *Lobelia angulata*, *Hydrocotyle heteromeria*, and *Hydrocotyle sulcata*.

**10. Grey willow forest**

Grey willow forest, 7-10 m in height and growing over standing water, with *Carex virgata*, *Carex secta*, *Carex geminata*, and toetoe (*Austroderia fulvida*), occurs around much of the perimeter of the wetland at the end of Spencer Road, and is advancing into the *Machaerina articulata* reedland.

**11. *Carex geminata*-tall fescue-Japanese honeysuckle sedge-grassland with occasional kiokio and raupō**

This vegetation type exists in a small area of the Otumutu Reserve foreshore, surrounded by (as well as bisected by) mown lawns.

**12. Tasmanian blackwood forest**

A small stand of mature Tasmanian blackwood (*Acacia melanoxylon*) is present around 400 m north of the Waitangi Stream mouth.

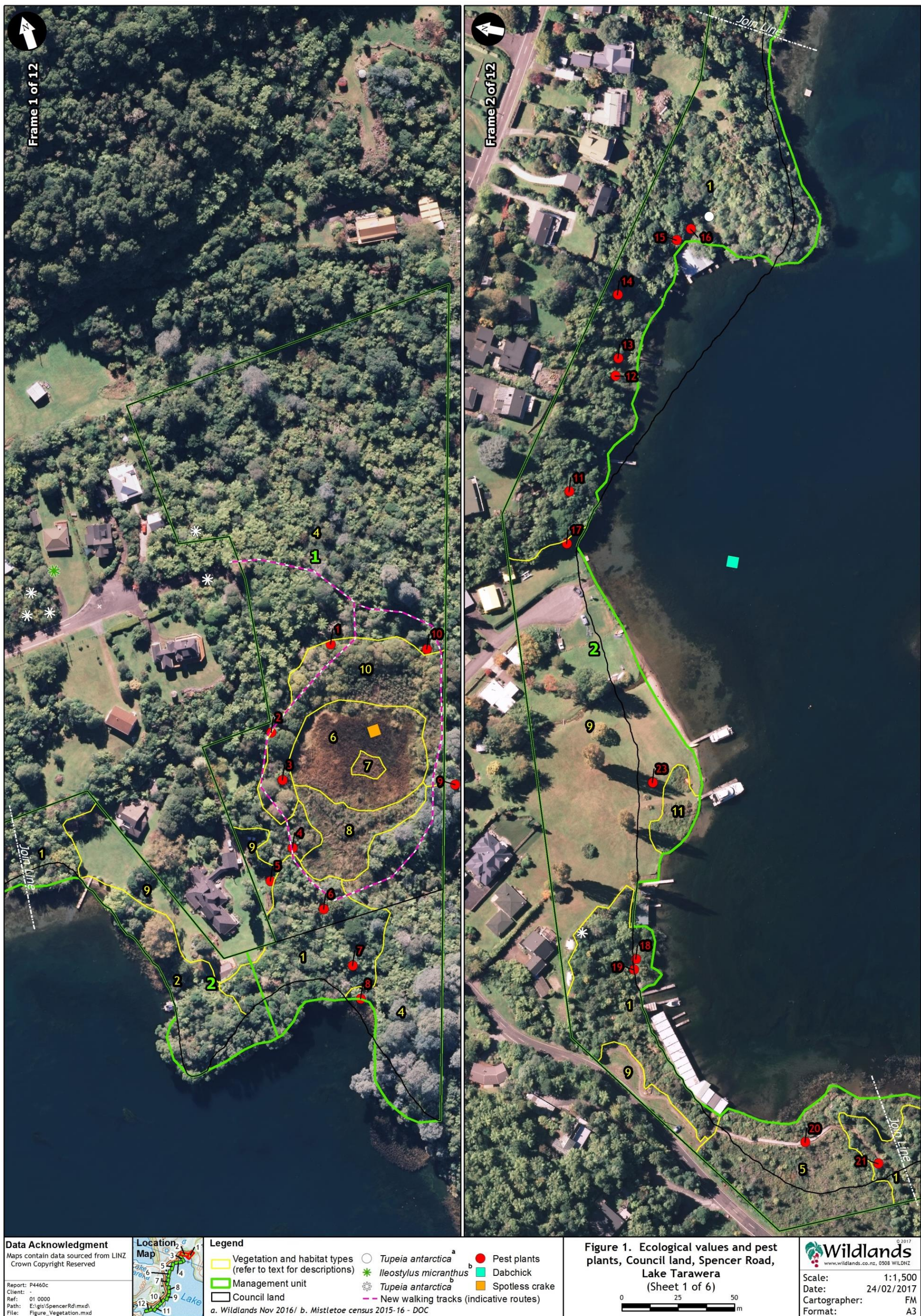
**13. Flowering cherry-mamaku-grey willow-gorse forest and scrub**

This vegetation type occurs along a 75 m long stretch of very steep, unstable cliff shoreline, just south of Vegetation Type 12.

**14. Kāmahi-mamaku-māhoe-pōhutukawa × northern rata forest**

Around Te Toroa Point (the southern-most point of the project area) kāmahi and, to a lesser extent, pōhutukawa × northern rata hybrids form the canopy along with māhoe and mamaku.









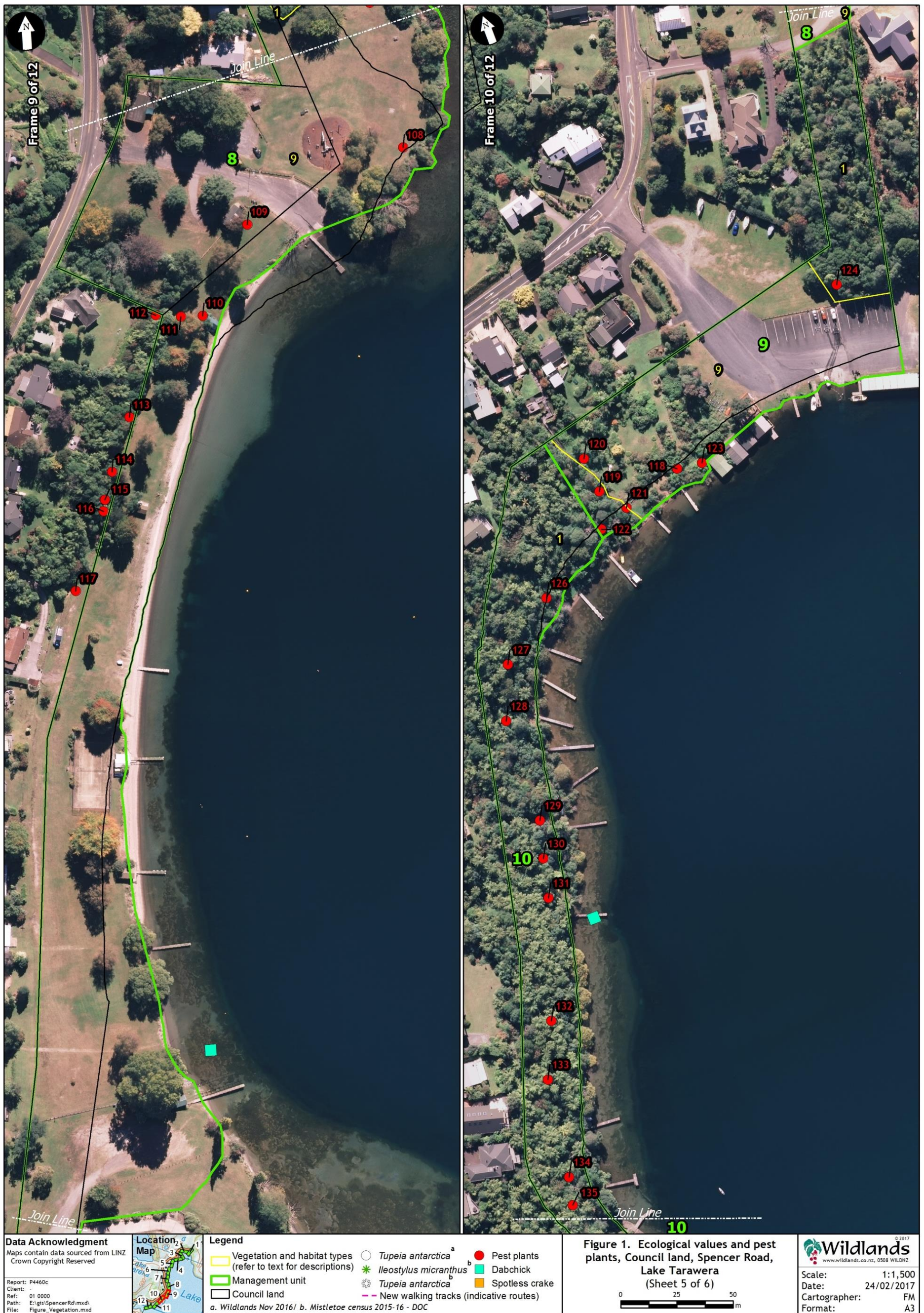




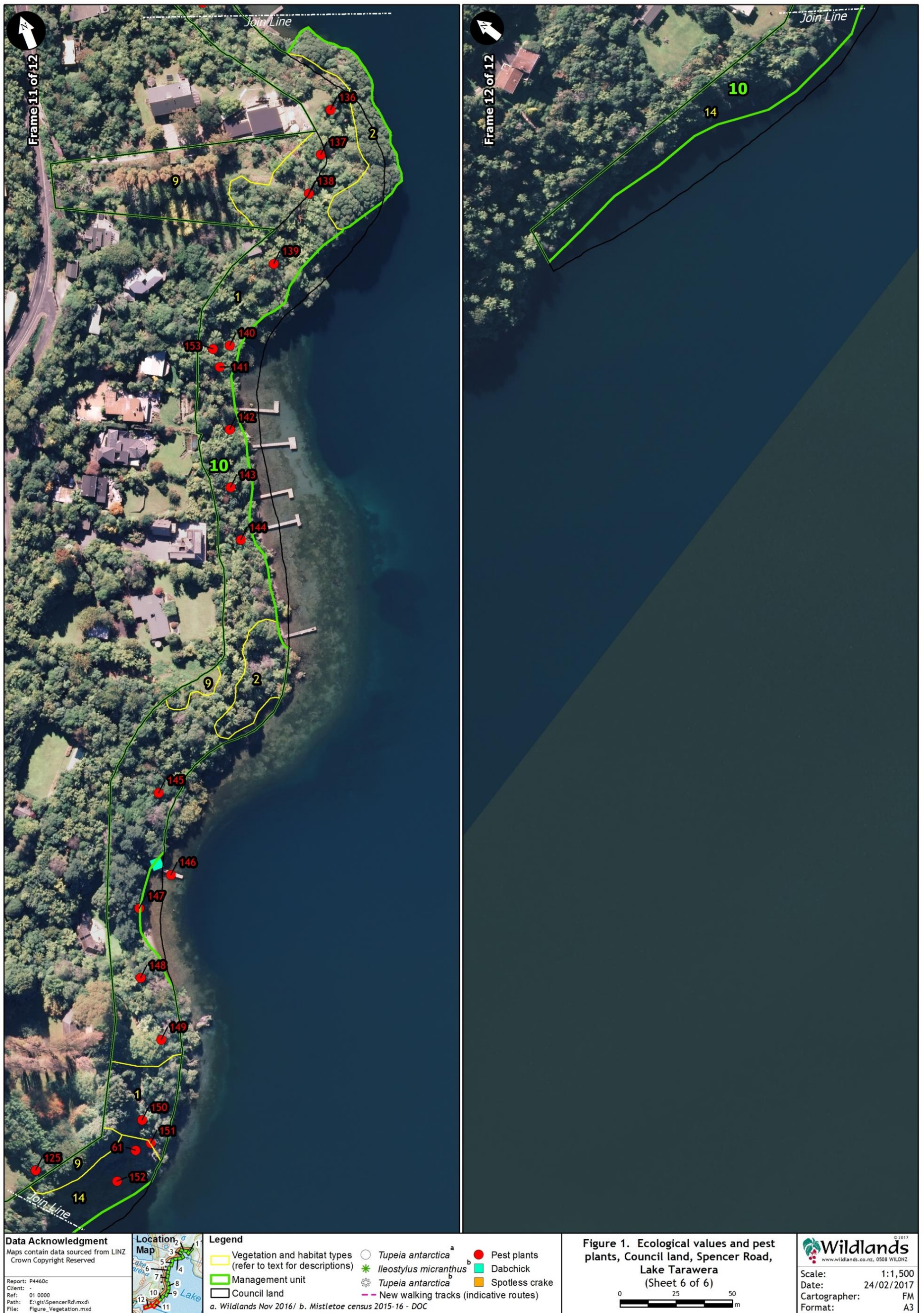














## 5. FLORA

Vascular plant species present on Te Toroa Point are listed in Appendix 1. One hundred and sixty-five indigenous species and 185 adventive and exotic species were recorded. One At Risk species (as per de Lange *et al.* 2013) is present. At least 19 plants of white mistletoe (pirita; *Tupeia antarctica*; classified as At Risk-Declining), were found at six locations from Cliff Road to the end of Spencer Road. A mistletoe census carried out by the Department of Conservation during summer 2015-2016 throughout the wider Tarawera residential community found white mistletoe at 104 locations and green mistletoe (pirita; *Ileostylus micranthus*) at 10 locations (see Figure 1). Both species are classified as 'Regionally Vulnerable' (Beadel 2016).

## 6. PEST PLANTS

### 6.1 Abundance and distribution of pest plants

Of the 185 adventive species present, around 60 are recognised as pest plant species, although not all of these are adversely affecting vegetation and habitats in the project area. The species having the greatest adverse effects, such as smothering and crowding out indigenous vegetation, and reducing natural character, are listed below in Table 2, and selected examples of pest plant-impacted vegetation are depicted in photographs in Appendix 5. Control of these species will be required to protect, maintain, and enhance the ecological values of the indigenous vegetation on Te Toroa Point, and to help establish any future indigenous plantings.

Table 2: Pest plant species on Rotorua Lakes Council land at Spencer Road, Lake Tarawera.

Scientific Name	Common Name
<i>Acacia mearnsii</i>	black wattle
<i>Acacia melanoxylon</i>	Tasmanian blackwood
<i>Acanthus mollis</i>	bear's breeches
<i>Agapanthus praecox</i>	agapanthus
<i>Allium triquetrum</i>	onion weed
<i>Aquilegia vulgaris</i>	columbine, granny's bonnet
<i>Asparagus scandens</i>	climbing asparagus
	bamboo
<i>Banksia intermedia</i>	banksia
<i>Banksia sp.</i>	banksia sp
<i>Betula pendula</i>	silver birch
<i>Calystegia silvatica</i>	greater bindweed
<i>Canna indica</i>	canna lily, Indian shoot
<i>Celastrus orbiculatus</i>	climbing spindle berry
<i>Cestrum elegans</i>	red cestrum
<i>Chamaecytisus palmensis</i>	tree lucerne
<i>Clematis vitalba</i>	old man's beard
<i>Colocasia esculenta</i>	taro
<i>Cortaderia selloana</i>	pampas
<i>Cotoneaster glaucophyllus</i>	cotoneaster
<i>Crocsmia xrocsmiiflora</i>	montbretia
<i>Cyperus papyrus</i>	Umbrella cyperus

Scientific Name	Common Name
<i>Cytisus scoparius</i>	broom
<i>Delairea odorata</i>	German ivy
<i>Dendrobenthamia capitata</i>	strawberry dogwood
<i>Elaeagnus xreflexa</i>	elaeagnus
<i>Erica lusitanica</i>	Spanish heath
<i>Erigeron karvinskianus</i>	Mexican daisy
<i>Eriobotrya japonica</i>	loquat
<i>Galeobdolon luteum</i>	aluminium plant
<i>Gladiolus undulatus</i>	gladiolus
<i>Gunnera tinctoria</i>	Chilean rhubarb
<i>Hedera helix</i>	ivy
<i>Hedychium gardnerianum</i>	kahili ginger, wild ginger
<i>Hydrangea macrophylla</i>	hydrangea
<i>Iris pseudacorus</i>	yellow flag iris
<i>Jasminum humile</i>	Italian jasmine, yellow jasmine
<i>Jasminum mesnyi</i>	primrose jasmine
<i>Jasminum polyanthum</i>	jasmine
<i>Leycesteria formosa</i>	Himalayan honeysuckle
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Nephrolepis cordifolia</i>	tuber ladder fern
<i>Nymphaea alba</i>	water lily
<i>Phytolacca octandra</i>	inkweed
<i>Plectranthus ciliatus</i>	plectranthus
<i>Pteris cretica</i>	Cretan brake
<i>Pyracantha angustifolia</i>	orange firethorn
<i>Rhaphiolepis umbellata</i> (P)	Sexton's bridge
<i>Robinia pseudoacacia</i>	false acacia, black locust, robinia
<i>Rosa rubiginosa</i>	sweet briar
<i>Rubus</i> sp. ( <i>R. fruticosus</i> agg.)	blackberry
<i>Salix cinerea</i>	grey willow
<i>Salix fragilis</i>	crack willow
<i>Selaginella kraussiana</i>	creeping clubmoss, selaginella
<i>Tecomaria capensis</i>	Cape honeysuckle
<i>Teline monspessulana</i>	Montpellier broom
<i>Tetrapanax papyriferus</i>	rice paper plant
<i>Trachycarpus fortunei</i>	Chinese windmill palm
<i>Tradescantia fluminensis</i>	Tradescantia
<i>Ulex europaeus</i>	gorse
<i>Zantedeschia aethiopica</i>	arum lily

There is a high number of pest plant species present on Council land along Spencer Road is relatively high. Several species are widely distributed, chiefly flowering cherry, agapanthus, cotoneaster, and crack willow. A second group is less widely distributed but nonetheless common, and forming large infestations in places. This second group includes tradescantia, selaginella, ginger, grey willow, English ivy (*Hedera helix*), tuber ladder fern, montbretia (*Crocasmia x crocosmiflora*), and climbing spindleberry (*Celastrus orbiculatus*). There are several other very weedy species that are a high priority for control before they become more established, including climbing asparagus (*Asparagus scandens*), old man's beard (*Clematis vitalba*; which may be more widely distributed than observed), and yellow flag iris (*Iris pseudacorus*). Many of these species will require persistent effort to reduce to low density.



Pest plant distribution is mapped in Figure 1, and the locations of major infestations are listed in Appendix 3. A variety of control techniques will be required, including cutting and poisoning, drill and inject, herbicide, physical removal of plant material and knapsack-spraying. See Appendix 4 for control methods. The approach and timing of weed control activities will be critical to ensure that potential impacts on existing indigenous species are minimised, while at the same time ensuring that effective weed control is achieved. Key weed species present (i.e. those having the highest impact currently) are discussed in more detail in the following section.

## 6.2 Key pest plant species for monitoring and management

- **Crack willow**

Crack willow is widespread along the lake margins of the project area in all age classes. This species is a high priority for control. These trees should be drilled and injected with herbicide and left *in situ* to die. Physical removal is not appropriate as broken branch and twig fragments can resprout if left on the ground.

- **Grey willow**

Grey willow forest and shrubland is present around the margins of the Spencer Road-end wetland. Grey willow shrubs are present locally in wetlands and on the lake margin through the rest of the study area. Grey willow replaces native species in wetlands and forms vast dense (often pure) stands and thickets. It causes blockages, flooding and structural changes in waterways. Seeds are spread by the wind, and stem fragments and occasionally seed are spread by water. These trees should be poisoned standing.

- **Agapanthus**

Agapanthus is widespread throughout the study area, both in residential backyards as well as in indigenous forest areas, and is a high priority for control. Agapanthus is a robust, clump-forming perennial with long, thick, white rhizomes. It is a prolific seeder, dispersing effectively and germinating densely. It is long-lived and excludes all other species, becoming the terminal species almost everywhere it grows. It causes massive biodiversity loss, and should be controlled and followed up frequently until eradicated.

- **Jasmine (*Jasminum polyanthum*)**

Jasmine is widespread, especially north of Kariri Point, and in particular between the northern end of Rangiuru Bay Reserve, and the Waitangi Road angler access path. Jasmine should be controlled, with regular follow up, and monitored, in order to achieve eradication or 'zero density'.

- **Flowering cherry**

Flowering cherry seedlings were recorded over the entire study area. Flowering cherry is a deciduous tree that can form dense stands in open or disturbed habitats preventing regeneration of native species. Seeds are long-lived and widely

dispersed by birds, and will germinate under shade. Control should occur for sapling life stages and up, along with ongoing monitoring for recolonisation.

- **Tuber ladder fern**

Tuber ladder fern is patchily distributed along the study area. It grows to 1 m high with small, erect, scaly rhizomes producing many long runners and round, 1-3 cm wide hairy potato-like tubers. Fronds (40-100 × 5-8 cm) are erect or arching when long, with serrated, divided leaflets. It spreads by spores, runners and tubers, and forms dense, long-lived patches. It crowds out native vegetation and runners and tubers will resprout if not disposed of carefully. This species should be removed.

- **Tradescantia**

Tradescantia infestations occur locally throughout the study area, and in particular between the Waitangi Stream mouth and the northern end of Rangiuru Bay Reserve. Many of these infestations are sizeable, and appear to originate from adjacent residential properties. Tradescantia is a trailing, perennial groundcover with succulent, creeping stems that root at all nodes touching the ground. It has dark green, shiny, smooth and slightly fleshy leaves and small white flowers. It smothers the ground in light to deep shade, preventing the seedlings of native species from establishing, and causes habitats to open and be invaded by exotic shrubs and vines. All remaining stem fragments will re-sprout, so maintaining a strict weed hygiene regime is essential. This area may require replanting once it is clear of tradescantia.

- **Selaginella**

Selaginella is widespread throughout the project area wherever there is plenty of shade and a moist soil coverage, and particularly throughout regenerating indigenous forest (vegetation type one). It is a small, carpet-forming, fern ally groundcover, which disperses widely and quickly. Spores and stem fragments are spread on boots, by livestock, water movement and dumped vegetation and in contaminated soil. It invades the forest floor, inhibiting the establishment of native plant seedlings, leading to higher light levels and succession by more aggressive weeds. Control is necessary for this species. Clear and maintain from tracks, especially at their ends, to prevent movement further into the bush area. Peg sites out to facilitate identification when following up, and check three-monthly for regrowth.

- **Climbing asparagus**

Climbing asparagus was sighted at two spots at Rangiuru Bay Reserve, and is possibly elsewhere. It is a slender scrambling or climbing perennial with tuberous roots, and long green, thin, wiry stems. It forms dense patches on ground or sub-canopy and has tough, long-lived tubers that resprout easily. It has a moderate growth rate and bird dispersed seeds. Climbing asparagus smothers the forest floor and understorey to 4 m, preventing the establishment of native plant seedlings and growth of established species. It can raise light levels, causing the invasion of further weeds, and can ringbark and kill soft-barked shrubs and trees. This weed

will need to be controlled, with a six-monthly follow up as tubers usually resprout after spraying. The stems break at ground level so plants cannot be pulled.

- **Japanese honeysuckle**

Japanese honeysuckle is present locally throughout the project area. Its climbing, smothering habit forms dense, long-lived masses. It is spread by birds and climbs over and smothers most plants from ground to medium canopy. It can cause canopy collapse and subsequent invasion other weed species. Japanese honeysuckle is hard to kill as the stumps resprout and the stems layer. Control is necessary with six-monthly follow ups until clear.

- **Wild ginger**

Wild Ginger infestations are present in several locations, the largest of which is below Solitaire Lodge, Otumutu Lagoon. Other locations include Cliff Road Reserve, and from south of Boat Shed Bay to Te Toroa Point. Wild ginger is shade-tolerant, long-lived, fast growing and forms deep rhizome beds. A moderate amount of seed is produced which is spread by birds and possibly possums. Rhizomes resprout from any fragment and can survive crushing, and years away from soil. Dense rhizome beds replace all other species, and the dense leaves block light and smother natives. This species needs to be controlled, with six-monthly follow ups. Check for seedlings annually.

- **Montpellier broom**

Montpellier broom is present locally and in low density (typically scattered individual plants). It is a prolific seeder, and spreads rapidly. It forms pure stands and dominates low canopy habitats, preventing the seedlings of native species from establishing. This plant should be controlled where present.

- **Climbing spindleberry**

Climbing spindleberry is present in the planted area immediately west of Boatshed Bay Reserve, and is likely to be present elsewhere along the shoreline. Surveying in autumn, when its foliage turns brown, is an effective search technique. It is a deciduous climber (<12 m high) with suckering roots, woody stems, and young green twigs that often have sharp spines. The finely serrated leaves turn yellow in autumn before falling. It grows rapidly, has a scrambling habit and layering stems become dense, forming impenetrable thickets. The seeds are spread by birds, possums and other mammals and are viable for 2-5 years. The stems strangle the host plant and climb to the top of the canopy, causing it to collapse. Climbing spindleberry is known as a hard to kill weed, as stumps and suckers resprout and dropped stems take root. Climbing spindleberry should be controlled by drilling and injecting, or cutting and stump treating the stems, leaving the remaining vegetation *in situ* to die off. The control of this plant is of very high priority and regular follow ups (at least twice per annum, in spring and late summer) will be required to successfully control this species.

- **Cotoneaster**

Cotoneaster seedlings and shrubs are scattered over much of the study area. This species is spread by birds and therefore should be controlled. Ongoing monitoring for this species should be maintained to prevent it from becoming more established.

- **Old man's beard**

Old man's beard was located at three locations (near Te Toroa Point, and at two points between the Waitangi Stream angler access and Rangiuru Bay Reserve, and is probably present in other locations. It is a deciduous, climbing, vine with very long, woody stems with six prominent leaf ribs (appear as furrows in older vines) and pale, easily rubbed-off bark. Leaves are arranged in opposite pairs on the stems, and are made up of five widely spaced leaflets that fall in autumn. Flowers are produced from December to May, followed by grey, hairy seeds in dense, fluffy clusters persisting over winter.

It grows rapidly, forming dense, heavy, masses that dominate the canopy causing it to collapse. The stems layer profusely, and it produces many long-lived seeds, which are spread by water or wind. It grows from both seed and stem fragments, and prevents the establishment of native plant seedlings. The stumps resprout very quickly and cut stems will root at the nodes.

Control of old man's beard along Spencer Road council land is a high priority. Ongoing checks for seedlings (at least six-monthly) will need to be undertaken to ensure eradication is complete. GPS records of control sites should be maintained so that known sites can be followed up on and control progress monitored. Some of the areas where old man's beard has been controlled will require replanting promptly to minimise seedling regrowth, while other sites may regenerate naturally.

- **Red cestrum**

Red cestrum was observed at several locations between the Waitangi Stream angler access and Rangiuru Bay Reserve. It is a shrub with hairy leaves which are foul-smelling when bruised. It has dense clusters of tubular magenta to deep crimson scentless flowers from January to December and produces poisonous berries which are spread by birds, flooding, soil movement and vegetation dumping. It can form dense stands in forest understorey and prevents the establishment of native seedlings. Control of all red cestrum should be undertaken, in particular the patch present in the north of the project area, along with six-monthly checks for seedlings and resprouting stems.

- **Gorse**

Gorse is found locally throughout the project area, but is nowhere present in large infestations. In this area some of it will eventually be out-competed and shaded-out by indigenous species. Gorse is likely to retain a long-term presence on Te Toroa Point, particularly on open cliff faces. Generally, gorse is not a high priority for control as it is eventually out-competed by indigenous species and is

useful as a nurse canopy for indigenous regeneration. Gorse should only be controlled in open areas, around any tracks and viewing areas.

- **Blackberry**

Blackberry is locally common, particularly in open areas where the canopy has collapsed and is growing on the banks. Blackberry will eventually be out-competed by indigenous regeneration in forest areas, so control in these areas is not a high priority. Blackberry is, however, likely to persist in open areas, and therefore should be high priority for control in such open sites.

- **Strawberry dogwood**

Strawberry dogwood trees are common locally throughout the project area. It is a small, rounded evergreen tree (up to 6-12 m tall) with paired leaves (up to 10 cm long) on short stalks that are paler green underneath with prominent veins. Numerous pale yellow flowers develop in January to February and are followed by almost round fruit (2-4 cm diameter) that ripen to red in March to April. It grows rapidly, matures quickly, and can produce a large number of seeds that are widely dispersed by birds. Control is required, along with follow up treatment of any regrowth from the root system or seedlings.

- **Pampas**

Pampas is present in five locations as individual plants or in low numbers. Pampas is a large-clump-forming grass which grows to four meters and flowers from January to June. Its seeds are spread very long distances by wind and occasionally water and it colonises disturbed sites and quickly becomes dense, replacing native vegetation. Control and follow up as needed.

- **German ivy**

German ivy was located in one location on the edge of Rangiuru Bay reserve. German ivy is a scrambling or climbing perennial vine to 3-5 metres with thin, weak green stems and yellow flowers. It has a fast growing and dense smothering habit and distributes many wind-blown seeds long distances. It smothers small trees and lower vegetation, preventing the seedlings of native species from establishing. It is easiest controlled at flowering (May to October), when highly visible and before seed is produced.

- **English ivy**

English ivy was located in several locations, mainly between the Waitangi Road angler access and Kariri Point. English ivy is a perennial climber with woody stout stems that cling to and climb almost any surface, it can grow over forest floor, sub-canopy and canopy to great heights, forming dense, long-lived masses. Birds readily spread the seed when it is produced, but most spread is through pieces dumped with green waste. It smothers and kills all plants from ground level to canopy, destroys vulnerable epiphyte niches, and prevents the establishment of native plant seedlings. Ivy is hard to kill as stumps resprout and cut stems root at nodes. The control of this species is a priority.

- **Elaeagnus**

Elaeagnus is a vigorous, dense, evergreen shrub, scrambling over support to 20 metres tall, with a very tough, suckering rootstock. It is extremely long-lived and is spread by birds in dumped vegetation. It slowly smothers all other plants to canopy height, invades well-lit or partially shaded sites, and can increase soil nutrient status, affecting which native plant species can grow there. It is high priority for control and is extremely hard to kill. Repeat treatments will be needed at stumps resprout and roots sucker.

- **Plectranthus**

Plectranthus was recorded at two locations. Plectranthus is a trailing, straggling herb which forms dense mats, similar to tradescantia, that prevent seedlings of native species from establishing, leading to eventual thinning of the canopy and the area being opened up to invasion by other weeds. Runners are the only method of spread, and are moved around in soil and with green waste dumping. Control is necessary, follow up within 3-6 months.

- **Yellow flag iris**

Yellow flag iris is present in several locations, and is a robust aquatic perennial to 1-2 metres that grows in leafy clumps. Rhizomes form dense floating mats, and it displaces native plants, especially vulnerable species that live on the margins of waterbodies. Seeds and rhizome fragments are spread by water and its poisonous seeds may have an impact on birdlife. This species is a high priority for control. Prevent seeding, and ensure regular follow-up of sites that have been controlled, as rhizomes resprout and seed bank can re-infest bare sites.

### 6.3 Other pest plant species

It is likely that other pest plant species will invade or be discovered in the future. It is therefore important that regular monitoring for pest plant species is undertaken, preferably at least on an annual basis, or more often if resources are available.

## 7. FAUNA

### 7.1 Avifauna

A range of common terrestrial bird species is present along the lake margin between Te Toroa Point and Otumutu Lagoon. Kererū (*Hemiphaga novaeseelandiae*) are common, as are tui (*Prosthemadera novaeseelandiae novaeseelandiae*), and korimako (bellbird; *Anthornis melanura melanura*), and this is attributable to the long-running (since 2000) rat control operation undertaken by the Lake Tarawera community. Various waterbird species utilise the lake shore vegetation for roosting and nesting, including New Zealand dabchick (weweia; *Poliocephalus rufopectus* - Threatened-Nationally Vulnerable), New Zealand scaup (papango; *Aythya novaeseelandiae*), Australian coot (*Fulica atra australis*), and black swan (*Cygnus atratus*). A full list of birds recorded in the study area is provided in Appendix 2. Dabchick were sighted

along the entire length of the study area shoreline, including at least nine at Otumutu Lagoon, and seven at Rangiuru Bay (see Figure 1).

## 7.2 Bats

Long-tailed bats (pekapeka-tou-roa; *Chalinolobus tuberculatus*) are likely to forage along the Spencer Road area, given that they are known to be present around nearby Lake Okareka. Trees containing cavities may provide roosting sites for bats, although this is less likely given the forest type is comparatively young and small in stature. Long-tailed bats are classified as Threatened-Nationally Vulnerable (O'Donnell *et al.* 2013).

## 7.3 Lizards

There is little information on the current status and distribution of lizard species around Lake Tarawera. However, three sightings of lizard (mokomoko) species have been made in the Lake Tarawera catchment in recent years, comprising forest gecko (*Mokopirirakau granulatus*, At Risk-Declining), green gecko (*Naultinus elegans*, At Risk-Declining), and speckled skink (*Oligosoma infrapunctatum*; At Risk-Declining - see Hitchmough *et al.* 2013). One or more of these species may be present within the study area, albeit in low numbers.

## 7.4 Introduced mammals

A wide range of pest animal species will be present. Possums (*Trichosurus vulpecula*) will be present and browsing on palatable tree species such as māhoe and, in conjunction with ship rats (*Rattus rattus*) and Norway rats (*Rattus norvegicus*), consuming fruits and preying on a range of indigenous fauna, including birds, lizards (if present), and invertebrates. Stoats (*Mustela erminea*), weasels (*Mustela nivalis vulgaris*), hedgehogs (*Erinaceus europaeus*), and feral cats (*Felis catus*) are likely to be present at least intermittently, and preying on indigenous fauna. Dama wallabies (*Macropus eugenii*) and rabbits (*Oryctolagus cuniculus cuniculus*) will also be present throughout, and will be browsing on low-stature groundcover vegetation, and reducing the recruitment of palatable species into the understorey and sub-canopy tiers.

## 8. ECOLOGICAL VALUES

Regenerating forest along the Lake Tarawera shoreline, growing on Rotomahana mud erupted in 1886, is one of the vegetation types inadequately represented in the protected areas of Rotorua Lakes Ecological District. The white mistletoe *Tupeia antarctica* (At Risk-Declining; as per de Lange *et al.* 2013) is present at several locations from Cliff Road Reserve northwards, and is a distinctive feature of the flora in this area. It is either absent, or present in low numbers only (and has therefore escaped detection), south of Cliff Road Reserve, despite the presence of its main host plant, whauwhaupaku.

Long-tailed bats probably forage from time to time and possibly roost in trees along the project area, and at least one lizard species may also be present, albeit in low numbers.

Lakeshore vegetation provides roosting and nesting habitat for waterbirds, including dabchick (Threatened-Nationally Vulnerable), which are present along the entire shoreline in what appear to be healthy numbers. Dabchick are not thought to be in the group of wetland bird species most vulnerable to predation by introduced mammals (O'Donnell *et al.* 2015); however there is little real-world data to support or refute this, and it is reasonable to assume that the current rat control will be having neutral or positive effects for this species. Spotless crane (At Risk-Relict) are present in the wetland at the end of Spencer Road. This species is a distinctive wetland dweller whose distribution is probably underestimated due to its cryptic nature, but which is potentially vulnerable to predation by introduced mammals (O'Donnell *et al.* 2015), therefore extending rat control and implementing predator control around the Spencer Road-end wetland may be beneficial. Spotless crane are known to be present at a number of wetland sites within the Tarawera plantation forest, within 12-15 km of the Spencer Road wetland.

## 9. KEY THREATS TO ECOLOGICAL VALUES

The major threats to the ecological values of the study area, in order of magnitude, are pest plant invasion, ongoing clearance and modification of natural vegetation for residential/amenity purposes, and pest animal impacts. There is scope for better management of all three threats.

## 10. CARE GROUP AND AGENCY INITIATIVES

Department of Conservation undertook control of old man's beard in the early 1990s, but this work ceased a long time ago.

The Lake Tarawera community commenced a rat control project in 2000, with the assistance of Bay of Plenty Regional Council. The project has run since then, with funding assistance from BOPRC, Department of Conservation, and private donations, and currently has around 500 baitstations covering around 85% of the individual private properties in the community. The project is currently guided by a biodiversity management plan put together by BOPRC. Department of Conservation has carried out censuses of mistletoes (white mistletoe *Tupeia antarctica*, and green mistletoe *Ileostylus micranthus*) and dabchicks along the Lake Tarawera shoreline in recent years.

BOPRC has continued to undertake control of particular weed species, such as yellow flag iris.



## 11. GAPS IN CURRENT MANAGEMENT, OPPORTUNITIES FOR RESTORATION AND FUTURE MANAGEMENT

The major gap in current management is pest plant control. In the absence of management, it can be expected that distribution, abundance and density of pest plants will increase, particularly for flowering cherry, jasmine, climbing spindleberry, crack willow, old man's beard, climbing asparagus, and ginger. The suite of climbing pest plants in particular has the potential to invade and smother the mamaku-māhoe-kōhūhū forest canopy, which is vulnerable to weed invasion given its narrow linear shape, degree of fragmentation, and the presence along its length of a large and diverse weed propagule source from the 200 or so individual residential properties bordering the council marginal strip.

The highest priority is to control and remove weed infestations in indigenous forest areas. This will be greatly assisted if adjoining landowners control the same suite of weeds on their own properties. Careful, targeted pest plant control that minimises non-target impacts on indigenous vegetation will allow natural vegetation regenerate in previously weed-infested areas.

Possum control coordinated by Tarawera Landcare 2115 appears to have been sufficiently effective to protect the large *Tupeia* mistletoe population, a species which is a highly preferred food source for possums. Rat control will also be benefiting the mistletoe population by boosting survival of key pollinating bird species such as tui and bellbird.

There are opportunities to protect and improve the natural character of the two wetlands within the study area, namely the Otumutu Lagoon wetland, which requires site-led control of all weed species, and the Spencer Road-end wetland, which requires removal of the large grey willow infestation as well as site-wide control of other weeds.

### 11.1 Future management

Opportunities for active management to retain and enhance the ecological values of the project area are outlined below, including weed control, pest animal control, and limiting and in some cases remediating the incursion of residential amenity areas. Existing walking tracks provide a natural, low key experience that is suited to the environmental setting, but could be sign-posted better in some areas.

#### 11.1.1 Weed control

All pest plant species should be controlled to 'zero density' (i.e. removal of all individual plants) in areas of natural vegetation, i.e. the Otumutu Lagoon and Spencer Road-end wetlands, and areas of indigenous forest. It would also be desirable for similar weed control to occur in adjacent private property. Weeds that may be being spread by foot traffic (e.g. selaginella, tradescantia), should be controlled along all sections of walking track.

Ongoing vigilance and monitoring will be required to maintain a low incidence of pest plant species in the reserve in the future. Follow-up control will be required for 3-5 years. Following this, weeds will continue to establish on the site and low-level control will be required on an ongoing basis.

### Logistical and Practical Considerations

Access to some of the pest plant infestations on Te Toroa Point will be difficult because of the steep banks on which some of the pest plants are growing. This will affect the cost and time required to undertake weed control works. Some of the control work will need to be undertaken by abseiling.

### Weed Hygiene

Where pest plant species are controlled and have seeds or tubers present, or can spread from plant fragments, care should be taken to avoid new infestations establishing. This is particularly important for climbing spindleberry, tuber ladder fern, tradescantia, old man's beard, and ginger.

Continued vigilance will also be required around any routes along which plant material has been carried out of the reserve or been transported on shoes or clothing, particularly on tracks.

#### 11.1.2 Pest animal control

Rat control bait stations are already in place, part of a network of around 500 bait stations along Spencer Road, and are serviced throughout the year. Tarawera Landcare also has an 'as-needed' possum control service available, and this appears to have been sufficient to protect *Tupeia antarctica* plants, which are in good health with little evidence of possum browse. Rat control should be maintained, as this will be improving breeding/survival outcomes for iconic species such as kereru, tui, and bellbird. The latter two species are important pollinators of native mistletoes, and therefore represent another key component in maintaining the health and vitality of *Tupeia* populations. Consideration could be given to implementing mustelid control along the shoreline vegetation, as well as around the Spencer Road-end wetland.

#### 11.1.3 Planting

Planting should be kept to a minimum and native species should be left to regenerate naturally. Areas where intensive weed control has been undertaken should be assessed after three years of weed control to determine if planting is required. If there are gaps where indigenous cover has not regenerated naturally and some planting is needed, species such as māhoe, tree fuchsia, pate, *Coprosma robusta*, hangehange, five finger, pigeonwood, and kawakawa should be used. If rat control is successful then there should be numerous seedlings that could be transplanted into areas that require planting.

If more plants are required than seedlings available then plants purchased should preferably be grown from seed or material sourced from the site, however if such stock is not available then plant stock sourced from the Rotorua Lakes Ecological

District is acceptable. PB plant stock should be used to give plants a good chance of surviving any pest animal browsing. Plants should be placed at 1.5 metre spacings. All weeds will need to be controlled prior to planting. Follow-up weed control and maintenance of plantings will be required for 2-3 years after planting to ensure that the plants survive.

There is an opportunity to establish new *Tupeia* plants throughout the project area using established propagation and translocation techniques. There is also an opportunity to plant and establish other Threatened or At Risk plant species that occur naturally in Rotorua Lakes Ecological District (or were present in the District previously) in suitable sites, for example *Pimelea tomentosa* (in open/rocky/bluffy sites), king fern (*Marattia salicina* - in well-shaded, moist gullies), and *Rorippa divaricata* (lake margins).

#### 11.1.4 Walking tracks

There is a good walking track network along most of the Council land where access is enabled by roads or by Fish and Game angler access points. Navigation is mostly obvious and straightforward, but in places could do with extra signage. A walk-through audit to identify the number and location of these places should be undertaken, but is not a high priority.

There is an excellent opportunity to connect the two existing walking tracks at Otumutu Lagoon, between the community gardens and Solitaire Lodge, where there is currently a gap in the track network of c.200 m. This is of high priority.

Of high priority is to ensure that there is a continuous walking track from one end of the study area to the other end.

## 12. LONG-TERM VISION, TEN YEAR RESTORATION OBJECTIVES, MANAGEMENT AND MONITORING FRAMEWORK

### 12.1 Vision statement

A suggested vision statement for the project area is:

**Indigenous vegetation and habitats on Council land along Spencer Road are free of pest plants and pest animals, populations of threatened plants and fauna are flourishing, and the area's biodiversity and ecological processes are overwhelmingly indigenous in character.**

This statement could serve as an initial basis for discussion between stakeholders (Tarawera Landcare, the wider community, tangata whenua, RLC, DOC, BOPRC) to build a shared, agreed concept of how the lakeside Council land might be managed.

## 12.2 Ten year restoration framework

A ten year restoration framework for the study area is set out in Table 3. The main restoration objectives, in order of priority from highest to lowest, are:

- Protect and restore the wetlands at Otumutu Lagoon and the end of Spencer Road.
- Protect the existing populations of white mistletoe and green mistletoe.
- Protect indigenous forest within the study area.
- Progressively increase the natural character of the Council Reserves at Boat Shed Bay, Rangiuru Bay, Cliff Road, and Otumutu Lagoon.
- Enhance public access opportunities.
- Progressively increase the natural character of the backyards of private residences that are utilising Council land.

The table contains measurable objectives for each priority area, broad details on methods, timing and locations which can then be used to develop more detailed workplans and costings, and monitoring methods that can be implemented to measure progress towards objectives in a cost-effective way.

## 12.3 Management units

In order to systematically plan and target management effort it is useful to break larger restoration sites into a series of smaller management units. We have demarcated ten management units for Council land along the Spencer Road lakeshore based on a combination of ecological values, vegetation and habitats, pest plant distribution (given that pest plant control is the major management action to be undertaken), and logistical/access considerations. These are mapped in Figure 2, described briefly below, and referred to in the overall management plan framework:

### Management Units

1. Spencer Road-end wetland and surrounding black wattle/indigenous forest.
2. Northern part of Otumutu Lagoon including wetland adjacent to Spencer Road.
3. Southwestern part of Otumutu Lagoon and the point separating the lagoon from Te Karamea Bay.
4. Cliff Road Reserve - Te Karamea Bay.
5. Te Miro Point.
6. Waitangi Bay to northern end of Rahuiroa Bay.
7. Rahuiroa Bay and Tarapatiki Point.
8. Rangiuru Bay.
9. Boat Shed Bay.
10. Boat Shed Bay - Te Toroa Point.

Table 3: Ten-year restoration framework for Rotorua Lakes Council land, Spencer Road lake margin, Lake Tarawera.

**Legend** ■ higher level of effort/cost involved in management towards objective.  
 ■ lower level of effort/ cost involved in management towards objective.

Ten Year Objective (in Descending Order of Priority)	Site	Action	Monitoring	Year									
				1	2	3	4	5	6	7	8	9	10
<b>Protect wetlands</b>  <i>By year 10 weed abundance should be visibly and measurably lowered to 'zero density' and wetland fauna should be at natural levels of abundance.</i>	Spencer Road-end wetland	Grey willow control, site-led control of other weed species	- Photopoints, two yearly - Re-map vegetation, Years 5 and 10.	■		■		■		■		■	
		- Extend existing rodent control - Predator trapping (Henry or DOC 200)	- Collate and report rodent control data - Collate and report rodent control data - Annual wetland bird survey.	■	■	■	■	■	■	■	■	■	■
	Otumutu Lagoon wetland	Weed control (site-led, i.e. all species)	- Photopoints, two yearly - Re-map vegetation, Years 5 and 10.		■		■		■		■		■
<b>Protect mistletoe</b>  <i>No visible possum browse on mistletoes or their host trees.</i>	Management Units 2-4	Maintain current level of possum control	- Foliar Browse Index sample of mistletoes annually/two-yearly. - Collate and report possum control data	■	■	■	■	■	■	■	■	■	■
<b>Protect indigenous forest</b>  <i>By year 10 weed abundance should be visibly and measurably lowered to 'zero density'.</i>	Management Units 1-10	Weed control (site-led, i.e. all species)	- Photopoints, two yearly - Re-map weed infestations			■	■			■			■
<b>Increase 'natural character' of Council Reserves</b>  <i>By year 10 Council Reserves should have a visibly indigenous natural character.</i>	Management Units: 2-Otumutu Lagoon 4-Cliff Road 8-Rangiorua Bay, 9-Boat Shed Bay	Investigate joint agreed approach with Council/community, progressively remove exotics, plant natives.  Remove pest plants immediately	- Photopoints					■	■	■	■	■	■
<b>Enhance public access opportunities</b>  <i>By year 10 all walking tracks on Council land should be clearly sign-posted, track improvements have been made where needed, and tracks are free of transportable weeds such as selaginella. There is a high quality walking track/boardwalk from Solitaire Lodge to Spencer Road, Otumutu Lagoon.</i>	Management Units 2-10  Management Unit 1	Track/boardwalk construction - Spencer Road-Solitaire Lodge  Track and asset maintenance  Weed control	- Photopoints, - Periodic walk-through inspections (three yearly?)	■			■			■			■
<b>Increase 'natural character' of residential 'backyards' on Council land</b>  <i>By year 10 backyards should have a visibly indigenous natural character.</i>	Management Units 2-10	Remove exotics, plant natives							■	■	■	■	■
<b>Protect mistletoes and plant other Threatened or At Risk species.</b>  <i>No visible possum browse on mistletoes or their host trees; by year 10, ecologically suitable Threatened or At Risk plants are established at a range of sites.</i>	Management Units 2-4 - mistletoes  Management Units 1-10 - other Threatened or At Risk plant species	Maintain current level of possum control  Undertake planting	- Foliar Browse Index sample of mistletoes annually/two-yearly. - Collate and report possum control data - Photopoints for new plantings.						■	■	■	■	■







## ACKNOWLEDGMENTS

We would like to thank the Lake Tarawera Ratepayers Association and Tarawera Landcare 2115, principally Libby Fletcher, Peter Fahey, and John McMullen, and Tūhourangi for instigating this project and for providing logistical support.

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## VASCULAR PLANT SPECIES LIST, SPENCER ROAD COUNCIL LAND

### Key

P = Planted  
N = Natural  
\* = Pest plant

### INDIGENOUS SPECIES

#### Gymnosperms

<i>Agathis australis</i> (P)	kauri
<i>Dacrycarpus dacrydioides</i> (N,P)	kahikatea
<i>Dacrydium cupressinum</i> (N)	rimu
<i>Podocarpus totara</i> (P)	tōtara

#### Monocot. trees and shrubs

<i>Cordyline australis</i> (N)	tī kōuka, cabbage tree
<i>Rhopalostylis sapida</i> (P)	nīkau

#### Dicot. trees and shrubs

<i>Alectryon excelsus</i> subsp. <i>excelsus</i> (P)	tītoki
<i>Aristotelia serrata</i> (N)	makomako, wineberry
<i>Beilschmiedia tawa</i> (sapling)	tawa
<i>Brachyglottis repanda</i> (N)	rangiora
<i>Coprosma grandifolia</i> (N)	kanono, raurēkau, raurākau, manono
<i>Coprosma ×cunninghamii</i> (P)	
<i>Coprosma ×kirkii</i> (P)	
<i>Coprosma lucida</i>	karamū, kāramuramu, glossy karamū
<i>Coprosma propinqua</i> var. <i>propinqua</i> (N)	
<i>Coprosma robusta</i> (N)	karamū, kāramuramu
<i>Coriaria arborea</i> var. <i>arborea</i> (N)	tutu
<i>Corokia cotoneaster</i> (P)	korokio, korokio tāra
<i>Corynocarpus laevigatus</i> (P)	karaka
<i>Dodonaea viscosa</i> (P) (purple and green)	akeake
<i>Elaeocarpus dentatus</i> (N)	hīnau, whīnau
<i>Entelea arborescens</i> (P)	whau
<i>Fuchsia excorticata</i> (N)	kōtukutuku, kōnini
<i>Gaultheria antipoda</i> (N)	tāwiniwini, koropuka, takapo, taupuku
<i>Geniostoma ligustrifolium</i> var. <i>ligustrifolium</i> (N)	hangehange
<i>Griselinia littoralis</i> (P)	kāpuka
<i>Griselinia lucida</i> (P)	puka



<i>Hebe stricta</i> var. <i>stricta</i> (N)	koromiko, kōkōmuka
<i>Hebe</i> “Wiri” (P)	
<i>Hebe</i> sp. (purple flower) (P)	
<i>Hedycarya arborea</i> (N)	porokaiwhiri; pigeonwood
<i>Hoheria sexstylosa</i> (P)	houhere, lacebark
<i>Knightia excelsa</i> (P)	rewarewa
<i>Kunzea robusta</i> (N)	kānuka
<i>Leptecophylla juniperina</i> var. <i>juniperina</i> (N)	prickly mingimingi
<i>Leptospermum scoparium</i> agg. (N)	mānuka
<i>Leptospermum scoparium</i> (red flowered cultivar) (P)	mānuka
<i>Leucopogon fasciculatus</i> (N)	mingimingi
<i>Leucopogon fraseri</i> (N)	pātōtara
<i>Litsea calicaris</i> (N)	mangeao
<i>Lophomyrtus bullata</i> × <i>L. obcordata</i> (P)	
<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i> (N)	māhoe
<i>Metrosideros excelsa</i> (N)	pōhutukawa
<i>Metrosideros robusta</i> (N)	northern rātā
<i>Metrosideros excelsa</i> × <i>M. robusta</i> (N)	
<i>Myrsine australis</i> (N)	māpou, matipou, māpau
<i>Olearia paniculata</i> (P)	akiraho
<i>Olearia rani</i> (P)	heketara
<i>Olearia traversii</i> (P)	
<i>Pimelea prostrata</i> (P)	pinātoro
<i>Piper excelsum</i> subsp. <i>excelsum</i> (N)	kawakawa
<i>Pittosporum crassifolium</i> (P)*	karo
<i>Pittosporum eugenioides</i> (P)	tarata; lemonwood
<i>Pittosporum tenuifolium</i> (N)	kōhūhū, rautāhiri, rautāwhiri
<i>Pomaderris amoena</i> (N)	tauhinu
<i>Pomaderris kumeraho</i> (P)	kūmarahou
<i>Pseudopanax arboreus</i> (N)	whauwhaupaku, puahou, five finger
<i>Pseudopanax crassifolius</i> × <i>P. lessonii</i> (P*; naturalised)	
<i>Pseudopanax laetus</i> (P)	
<i>Pseudowintera colorata</i> (P)	mountain horopito
<i>Schefflera digitata</i> (N)	patē
<i>Sophora tetraptera</i> (P)	kōwhai
<i>Sophora</i> sp. (N?)	
<i>Tupeia antarctica</i> (N)	pirita
<i>Weinmannia racemosa</i> (N)	kāmahi
<b>Monocot. lianes</b>	
<i>Ripogonum scandens</i> (N)	supplejack, kareao
<b>Dicot. lianes</b>	
<i>Calystegia sepium</i> subsp. <i>roseata</i> (N)	pōhue
<i>Clematis paniculata</i> (N)	puawānanga
<i>Metrosideros diffusa</i> (N)	rātā

<i>Metrosideros fulgens</i> (N)	rātā
<i>Metrosideros perforata</i> (N)	aka
<i>Muehlenbeckia australis</i> (N)	puka

## Lycopods and psilopsids

*Tmesipteris tannensis* (N)

## Ferns

<i>Adiantum cunninghamii</i> (N)	huruhuru tapairu, maidenhair fern
<i>Asplenium bulbiferum</i> (N)	mouku, hen and chicken fern
<i>Asplenium flaccidum</i> (N)	makawe, ngā makawe o Raukatauri
<i>Asplenium oblongifolium</i> (N)	huruhuru whenua
<i>Asplenium polyodon</i> (N)	petako
<i>Azolla filiculoides</i> (N)	retoretore
<i>Blechnum chambersii</i> (N)	rereti, nini
<i>Blechnum discolor</i> (N)	piupiu, crown fern
<i>Blechnum filiforme</i> (N)	pānako
<i>Blechnum novae-zelandiae</i> (N)	kiokio
<i>Blechnum penna-marina</i> subsp. <i>alpina</i> (N)	
<i>Blechnum vulcanicum</i> (N)	korokio
<i>Cardiomanes reniforme</i> (N)	kidney fern, konehu, raurenga, kopakopa
<i>Cyathea dealbata</i> (N)	ponga, silver fern
<i>Cyathea medullaris</i> (N)	mamaku
<i>Dicksonia fibrosa</i> (N)	whēkī-ponga, kurīpākā
<i>Dicksonia squarrosa</i> (N)	whēkī
<i>Diplazium australe</i> (N)	
<i>Hymenophyllum demissum</i> (N)	irirangi, piripiri, filmy fern
<i>Hymenophyllum multifidum</i> (N)	mauku, filmy fern
<i>Hymenophyllum sanguinolentum</i> (N)	piripiri, filmy fern
<i>Hypolepis ambigua</i> (N)	
<i>Lastreopsis glabella</i> (N)	
<i>Microsorium pustulatum</i> (N)	kōwaowao, pāraharaha, hound's tongue fern
<i>Paesia scaberula</i> (N)	mātātā
<i>Pellaea rotundifolia</i> (N)	tarawera, button fern
<i>Pneumatopteris pennigera</i> (N)	pākau
<i>Polystichum neozelandicum</i> subsp. <i>neozelandicum</i> (N)	pikopiko, shield fern
<i>Pteridium esculentum</i> (N)	rārahu, bracken
<i>Pteris macilenta</i> (N)	titipo, sweet fern
<i>Pteris tremula</i> (N)	turawera, shaking brake
<i>Pyrrosia eleagnifolia</i> (N)	leather-leaf fern
<i>Rumohra adiantiformis</i> (N)	karuwhai

## Orchids

<i>Earina autumnalis</i> (N)	raupeka
<i>Earina mucronata</i> (N)	peka-a-waka

<i>Microtis unifolia</i> agg. (N)	
<i>Pterostylis banksii</i> (N)	tutukiwi
<i>Thelymitra longifolia</i> (N)	

## Grasses

<i>Austroderia fulvida</i> (N)	toetoe
<i>Chionochloa flavicans</i> f. <i>flavicans</i> (P)	
<i>Deyeuxia avenoides</i> (N)	
<i>Lachnagrostis filiformis</i> (N)	
<i>Microlaena stipoides</i> (N)	pātītī, meadow rice grass
<i>Poa anceps</i> agg. (N)	
<i>Poa</i> sp. (N)	
<i>Rytidosperma gracile</i> (N)	

## Sedges

<i>Carex dissita</i> (N)	
<i>Carex geminata</i> agg. (N)	rautahi
<i>Carex maorica</i> (N)	
<i>Carex secta</i> (N)	pūrei, makura, pūreirei, pūrekireki, pūkio
<i>Carex solandri</i> (N)	
<i>Carex virgata</i> (N)	pūrei
<i>Cyperus ustulatus</i> f. <i>ustulatus</i> (N)	toetoe upoko-tangata
<i>Eleocharis acuta</i> (N)	spike sedge
<i>Eleocharis gracilis</i> (N)	
<i>Ficinia nodosa</i> (N)	wīwī
<i>Machaerina arthropophylla</i> (N)	
<i>Machaerina sinclairii</i> (N)	toetoe tūhara, pēpepe
<i>Morelotia affinis</i> (N)	
<i>Schoenoplectus tabernaemontani</i> (N)	kāpūngāwhā
<i>Schoenus maschalinus</i> (N)	
<i>Uncinia scabra</i> (N)	matau
<i>Uncinia uncinata</i> (N)	kamu matau a Maui, kamu

## Rushes

<i>Luzula picta</i> var. <i>picta</i> (N)	
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## Monocot. herbs (other than orchids, grasses, sedges, and rushes)

<i>Arthropodium cirratum</i> (P)	rengarenga
<i>Astelia chathamica</i> (P)	
<i>Astelia fragrans</i> (P)	kakaha
<i>Astelia solandri</i> (P)	kōwharawhara
<i>Dianella nigra</i> (N)	tūrutu
<i>Lemna disperma</i> (N)	karearea
<i>Libertia grandiflora</i> (P)	mīkoikoi; native iris
<i>Phormium cookianum</i> subsp. <i>hookeri</i> (N,P)	wharariki, mountain flax

<i>Phormium tenax</i> (N,P)	harakeke, flax
<i>Typha orientalis</i> (N)	raupō

### Composite herbs

<i>Euchiton japonicus</i> (N)	
<i>Senecio minimus</i> (N)	

### Dicot. herbs (other than composites)

<i>Centella uniflora</i> (N)	
<i>Epilobium pallidiflorum</i>	tawarewa
<i>Glossostigma elatinoides</i> (N)	
<i>Gonocarpus micranthus</i> (N)	piripiri
<i>Haloragis erecta</i> subsp. <i>erecta</i> (N)	toatoa
<i>Hydrocotyle heteromeria</i> (N)	
<i>Hydrocotyle moschata</i> (N)	
<i>Hydrocotyle sulcata</i> (N)	
<i>Lobelia angulata</i> (N)	pānakenake
<i>Myriophyllum propinquum</i> (N)	
<i>Oxalis exilis</i> (N)	
<i>Pelargonium inodorum</i> (N)	kopata
<i>Persicaria decipiens</i> (N)	tutunawai
<i>Ranunculus reflexus</i> (N)	maruru

## **NATURALISED AND EXOTIC SPECIES**

### Gymnosperms

<i>Chamaecyparis lawsoniana</i>	Lawson's cypress
<i>Cryptomeria japonica</i>	Japanese cedar
<i>Cupressus macrocarpa</i>	macrocarpa
<i>Larix decidua</i>	European larch
<i>Pinus</i> sp.	
<i>Sequoia sempervirens</i>	coast redwood

### Monocot. trees and shrubs

<i>Trachycarpus fortunei</i>	Chinese windmill palm
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### Dicot. trees and shrubs

<i>Acacia mearnsii</i>	black wattle
<i>Acacia melanoxylon</i>	Tasmanian blackwood
<i>Azalea</i> sp. (P)	azalea
<i>Banksia intermedia</i>	banksia
<i>Banksia</i> sp.	
<i>Betula pendula</i>	silver birch
<i>Buxus sempervirens</i>	box

<i>Callistemon</i> sp.	bottlebrush
<i>Cestrum elegans</i>	red cestrum
<i>Chamaecytisus palmensis</i>	tree lucerne
<i>Cotoneaster glaucophyllus</i>	cotoneaster
<i>Cytisus scoparius</i>	broom
<i>Dendrobenthamia capitata</i>	strawberry dogwood
<i>Elaeagnus</i> × <i>reflexa</i>	elaeagnus
<i>Erica lusitanica</i>	Spanish heath
<i>Eriobotrya japonica</i>	loquat
<i>Fuchsia magellanica</i>	Magellan fuchsia
<i>Grevillea robusta</i>	silky oak
<i>Grevillea</i> sp. (ornamental shrubs) (P)	
<i>Hydrangea macrophylla</i>	hydrangea
<i>Hypericum androsaemum</i>	tutsan
<i>Jasminum mesnyi</i>	primrose jasmine
<i>Juglans</i> sp.	walnut
<i>Laurus nobilis</i>	bay tree
<i>Leycesteria formosa</i>	Himalayan honeysuckle
<i>Lupinus arboreus</i>	lupin
<i>Macadamia</i> sp.	macadamia
<i>Magnolia grandiflora</i>	laurel magnolia
<i>Malus</i> × <i>domestica</i>	apple tree
<i>Malus</i> sp.	crab apple
<i>Metrosideros</i> sp. (orange-red flowers) (P)	
<i>Paulownia tomentosa</i>	paulownia
<i>Photinia</i> × <i>fraseri</i> 'Red Robin'	red robin
<i>Populus nigra</i> 'Italica'	Lombardy poplar
<i>Prunus campanulata</i>	Taiwan cherry
<i>Prunus</i> × <i>domestica</i>	plum
<i>Pyracantha angustifolia</i>	orange firethorn
<i>Quercus robur</i>	English oak
<i>Rhaphiolepis umbellata</i> (P)	Sexton's bridge
<i>Rhododendron</i> sp. (unidentified) (P)	rhododendron
<i>Robinia pseudoacacia</i>	false acacia, black locust, robinia
<i>Rosa rubiginosa</i>	sweet briar
<i>Rosa</i> sp.	climbing rose
<i>Rubus</i> sp. ( <i>R. fruticosus</i> agg.)	blackberry
<i>Salix cinerea</i>	grey willow
<i>Salix fragilis</i>	crack willow
<i>Salix matsudana</i> 'Tortuosa'	tortured willow
<i>Tecomaria capensis</i>	Cape honeysuckle
<i>Teline monspessulana</i>	Montpellier broom
<i>Tetrapanax papyriferus</i>	rice paper plant
<i>Teucrium fruticans</i>	
<i>Tibouchina urvilleana</i>	glory bush
<i>Ulex europaeus</i>	gorse
 Monocot. lianes	
 <i>Asparagus scandens</i>	 climbing asparagus

## Dicot. lianes

<i>Calystegia silvatica</i>	greater bindweed
<i>Celastrus orbiculatus</i>	climbing spindle berry
<i>Clematis vitalba</i>	old man's beard
<i>Delairea odorata</i>	German ivy
<i>Hedera helix</i>	ivy
<i>Jasminum humile</i>	Italian jasmine, yellow jasmine
<i>Jasminum polyanthum</i>	jasmine
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Lophospermum erubescens</i>	climbing gloxinia
<i>Vitis vinifera</i>	grape

## Lycopods and psilopsids

<i>Selaginella kraussiana</i>	creeping clubmoss, selaginella
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## Ferns

<i>Nephrolepis cordifolia</i>	tuber ladder fern
<i>Pteris cretica</i>	Cretan brake

## Grasses

<i>Agrostis capillaris</i>	bamboo
<i>Agrostis stolonifera</i>	browntop
<i>Aira caryophyllaea</i> subsp. <i>caryophyllaea</i>	creeping bent
<i>Aira praecox</i>	silver hairy grass
<i>Anthoxanthum odoratum</i>	early hair grass
<i>Axonopus fissifolius</i>	sweet vernal
<i>Bromus diandrus</i>	narrow-leaved carpet grass
<i>Bromus willdenowii</i>	ripgut brome
<i>Cortaderia selloana</i>	prairie grass
<i>Dactylis glomerata</i>	pampas
<i>Ehrharta erecta</i>	cocksfoot
<i>Festuca rubra</i> subsp. <i>rubra</i>	veldt grass
<i>Holcus lanatus</i>	red fescue
<i>Paspalum distichum</i>	Yorkshire fog
<i>Poa annua</i>	Mercer grass
<i>Poa pratensis</i>	annual poa
<i>Schedonorus arundinaceus</i>	Kentucky bluegrass
<i>Sporobolus africanus</i>	tall fescue
<i>Vulpia</i> sp.	ratstail

## Sedges

<i>Carex divulsa</i>	grey sedge
<i>Carex ovalis</i>	oval sedge

*Cyperus papyrus*

## Rushes

*Elegia capensis*

*Juncus bufonius* var. *bufonius*

*Juncus effusus* var. *effusus*

*Juncus microcephalus*

*Juncus tenuis* var. *tenuis*

toad rush

soft rush, leafless rush

South American rush

track rush

## Monocot. herbs (other than orchids, grasses, sedges, and rushes)

*Agapanthus praecox*

*Allium triquetrum*

*Beschornaria* sp.

*Canna indica*

*Colocasia esculenta*

*Crocasmia* × *crocasmiiiflora*

*Gladiolus undulatus*

*Hedychium gardnerianum*

*Iris pseudacorus*

*Kniphofia praecox*

*Lilium formosanum*

*Narcissus pseudonarcissus*

*Sisyrinchium* "blue"

*Tradescantia fluminensis*

*Zantedeschia aethiopica*

agapanthus

onion weed

canna lily, Indian shoot

taro

montbretia

gladiolus

kahili ginger, wild ginger

yellow flag iris

red hot poker

Formosan lily

daffodil

tradescantia

arum lily

## Composite herbs

*Bellis perennis*

*Cirsium arvense*

*Cirsium vulgare*

*Conyza sumatrensis*

*Crepis capillaris*

*Erigeron karvinskianus*

*Gamochaeta coarctata*

*Hypochaeris radicata*

*Leontodon taraxacoides*

*Leucanthemum vulgare*

*Mycelis muralis*

*Senecio bipinnatisectus*

*Sigesbeckia orientalis*

*Sonchus asper*

*Sonchus oleraceus*

*Taraxacum officinale*

lawn daisy

California thistle

Scotch thistle

broad-leaved fleabane

hawksbeard

Mexican daisy

purple cudweed

catsear

hawkbit

oxeye daisy

wall lettuce

Australian fireweed

Indian weed, punawaru

prickly puha

puha, sow thistle

dandelion

## Dicot. herbs (other than composites)

<i>Acaena agnipila</i>	Australian sheep's burr
<i>Acanthus mollis</i>	bear's breeches
<i>Anagallis arvensis</i>	scarlet pimpernel
<i>Aquilegia vulgaris</i>	columbine, granny's bonnet
<i>Callitriche stagnalis</i>	starwort
<i>Cardamine</i> sp.	
<i>Cerastium fontanum</i> subsp. <i>vulgare</i>	mouse-ear chickweed
<i>Cymbalaria muralis</i>	ivy-leaved toad flax
<i>Dichondra micrantha</i>	Mercury Bay weed
<i>Digitalis purpurea</i>	foxglove
<i>Epilobium</i> sp.	
<i>Euphorbia peplus</i>	milkweed
<i>Fragaria vesca</i>	wild strawberry
<i>Fumaria muralis</i>	scrambling fumitory
<i>Galeobdolon luteum</i>	aluminium plant
<i>Galium aparine</i>	cleavers
<i>Galium palustre</i>	marsh bedstraw
<i>Geranium molle</i>	dovesfoot cranesbill
<i>Geranium robertianum</i>	herb Robert
<i>Gunnera tinctoria</i>	Chilean rhubarb
<i>Linum catharticum</i>	purging flax
<i>Lotus pedunculatus</i>	lotus
<i>Mentha × piperita</i>	peppermint
<i>Mentha spicata</i>	spearmint
<i>Mimulus guttatus</i>	monkey musk
<i>Myosotis laxa</i> subsp. <i>caespitosa</i>	water forget-me-not
<i>Myosotis sylvatica</i>	garden forget-me-not
<i>Nasturtium officinale</i>	watercress
<i>Nymphaea alba</i>	water lily
<i>Oenothera stricta</i>	evening primrose
<i>Orobancha minor</i>	broomrape
<i>Oxalis incarnata</i>	lilac oxalis
<i>Persicaria capitata</i>	pink-head knotweed
<i>Persicaria hydropiper</i>	water pepper
<i>Physalis peruviana</i>	cape gooseberry
<i>Phytolacca octandra</i>	inkweed
<i>Plantago australis</i>	swamp plantain
<i>Plantago lanceolata</i>	narrow-leaved plantain
<i>Plectranthus ciliatus</i>	plectranthus
<i>Prunella vulgaris</i>	selfheal
<i>Ranunculus flammula</i>	spearwort
<i>Ranunculus repens</i>	creeping buttercup
<i>Rumex acetosella</i>	sheep's sorrel
<i>Rumex obtusifolius</i>	broad-leaved dock
<i>Sagina procumbens</i>	pearlwort
<i>Silene coronaria</i>	rose campion
<i>Silene gallica</i>	catchfly
<i>Solanum nigrum</i>	black nightshade



*Trifolium dubium*  
*Trifolium pratense*  
*Trifolium repens*  
*Verbascum virgatum*  
*Veronica arvensis*  
*Veronica persica*  
*Veronica serpyllifolia*

suckling clover  
red clover  
white clover  
moth mullein  
field speedwell  
scrambling speedwell  
turf speedwell

## FAUNA SPECIES LIST FOR SPENCER ROAD COUNCIL LAND

New Zealand Threat Classifications are given for all species classified as ‘Threatened’ or ‘At Risk’ (Bats - O’Donnell *et al.* 2013; birds - Robertson *et al.* 2013; lizards - Hitchmough *et al.* 2013).

### Key

P Observed during field work in 2016.

\* Likely to be present, given known local distribution, either permanently or occasionally.

# Potentially present, either permanently or occasionally, given known local distribution.

## **MAMMALS**

### **Indigenous**

*Chalinolobus tuberculatus* “North Island” \*

(Threatened-Nationally Vulnerable)

pekapeka; long-tailed bat (North Island)

### **Introduced (feral)**

*Erinaceus europaeus*\*

European hedgehog

*Felis catus*\*

cat

*Macropus eugenii*\*

dama wallaby

*Mus musculus*\*

kiore-iti; house mouse

*Mustela erminea*\*

stoat

*Mustela furo* #

ferret

*Mustela nivalis vulgaris*\*

weasel

*Oryctolagus cuniculus cuniculus*\*

European rabbit

*Rattus norvegicus*\*

pouhawaiki; Norway rat

*Rattus rattus*\*

ship rat

*Trichosurus vulpecula*\*

brush-tail possum

## **BIRDS**

### **Indigenous**

*Anthornis melanura melanura* (P)

korimako; makomako; bellbird

*Aythya novaeseelandiae* (P)

pāpango; New Zealand scaup

*Chrysococcyx lucidus lucidus* (P)

pīpīwharau; shining cuckoo

*Circus approximans* (P)

kāhu; swamp harrier

*Cygnus atratus* (P)

black swan

*Eudynamis taitensis*<sup>#</sup> (At Risk-Naturally Uncommon)

koekoeā; long-tailed cuckoo;

*Falco novaeseelandiae* "bush"\* (Threatened-Nationally Vulnerable)

*Fulica atra australis* (P)

*Gerygone igata* (P)

*Hemiphaga novaeseelandiae* (P)

*Hirundo neoxena neoxena* (P)

*Larus dominicanus dominicanus* (P)

*Mohoua albigilla*<sup>#</sup>

*Ninox novaeseelandiae novaeseelandiae*\*

*Petroica longipes* (P)

*Petroica macrocephala toitoi*\*

*Phalacrocorax carbo novaehollandiae* (P)

(At Risk-Naturally Uncommon)

*Phalacrocorax melanoleucos brevirostris* (P)

*Phalacrocorax sulcirostris* (P) (At Risk-Naturally Uncommon)

*Poliocephalus rufopectus* (P) (Threatened-Nationally Vulnerable)

*Porphyrio melanotus melanotus* (P)

*Porzana tabuensis tabuensis* (P) (At Risk-Relict)

*Prothemadera novaeseelandiae novaeseelandiae* (P)

*Rhipidura fuliginosa placabilis* (P)

*Tadorna variegata*\*

*Todiramphus sanctus vagans* (P)

*Zosterops lateralis lateralis* (P)

bush falcon

Australian coot

riroriro; grey warbler

kererū; kūkupa; New Zealand pigeon

welcome swallow

karoro; southern black-backed gull

pōpokatea; whitehead

ruru; morepork

toutouwai; North Island robin

miromiro; pied tomtit

kawau; black shag

kawau paka; little shag

little black shag

weweia; New Zealand dabchick

pūkeko

pūweto; spotless crane;

tūi

pīwakawaka; North Island fantail

pūtangitangi; pari; paradise shelduck

kōtare sacred kingfisher; New Zealand kingfisher

silveryeye; tauhou

## **Introduced**

*Anas platyrhynchos* (P)

*Branta canadensis* (P)

*Fringilla coelebs* (P)

*Passer domesticus* (P)

*Platycercus eximius* (P)

*Turdus merula* (P)

mallard

Canada goose

chaffinch

house sparrow

eastern rosella

Eurasian blackbird

## **REPTILES/MOKOMOKO**

Mokomoko is the general Māori name for skink and gecko

### **Gecko**

*Mokopirirakau granulatus*<sup>#</sup> (At Risk-Declining)

*Naultinus elegans*<sup>#</sup> (At Risk-Declining)

*Oligosoma infrapunctatum*<sup>#</sup> (At Risk-Declining)

forest gecko

Auckland green gecko

speckled skink

## LOCATIONS OF MAIN PEST PLANT INFESTATIONS

Mgmt Unit	Site No.	Description	Extent approx. (m <sup>2</sup> )	NZTM East	NZTM North
1	1	Sycamore, ornamental rose, blackberry,	5	1897856	5770459
	2	Exotic iris	1	1897819	5770431
	3	Arum lily	1	1897816	5770409
	4	Apple	1	1897811	5770379
	5	Redwood (small), cherry, small patches of selaginella	5	1897797	5770368
	6	Exotic shrub	5	1897815	5770349
	7	Fig, macadamia, walnut	5	1897819	5770321
	8	Yellow flag iris, Spanish heath,	5	1897817	5770306
	9	Cherry (mature)	10	1897888	5770382
	10	Gorse	1	1897896	5770443
2	11	Flowering cherry	5	1897479	5770456
	12	Bamboo, ivy, agapanthus, Japanese honeysuckle, elderflower.	5	1897533	5770445
	13	Selaginella, grey willow, crack willow, tutsan	5	1897541	5770445
	14	Sycamore seedlings	5	1897568	5770450
	15	Cotoneaster	5	1897597	5770429
	16	Selaginella, montbretia, sycamore, gorse, blackberry, monocot liane	25	1897603	5770423
	17	Japanese honeysuckle, aluminium plant	5	1897456	5770453
	18	Yellow flag iris, Japanese honeysuckle, <i>Calystegia sylvatica</i>	5	1897280	5770389
	19	Blackberry, willows	50	1897275	5770389
	20	Gunnera	5	1897213	5770301
	21	Gorse	5	1897210	5770267
	22	Hydrangea	5	1897217	5770201
	23	Japanese honeysuckle, yellow flag iris, Spanish heath, Yorkshire fog, gypsywort	5	1897358	5770396
3	24	Hydrangea	5	1897299	5770136
	25	Glory bush, selaginella, Paulownia, strawberry dogwood, camelias (non-invasive). <i>Pseudopanax crassifolius</i> × <i>lessonianum</i> hybrids (control), sycamore, cotoneaster	25	1897296	5770137
	26	Climbing climbing spindleberry (possibly present - search for in autumn), cotoneaster, hydrangea, agapanthus	25	1897287	5770129
	27	Gunnera, tuber ladder fern, rose campion	25	1897300	5770123
	28	Agapanthus, flowering cherry	5	1897314	5769805
	29	Pampas	5	1897438	5769828
	30	Flowering cherry, selaginella	5	1897461	5769832
	31	Jasmine, gorse	5	1897516	5769878
	32	Jasmine, <i>Sisyrinchium</i> "blue", <i>Pseudopanax crassifolius</i> × <i>lessonianum</i> hybrid	5	1897580	5769977
	33	Ginger	5	1897574	5769974
	34	Flowering cherry, jasmine, Montpellier broom	5	1897552	5769957
	35	Cherry, jasmine, ginger, pampas	5	1897505	5769959
	36	Ginger	5	1897483	5769956

Mgmt Unit	Site No.	Description	Extent approx. (m <sup>2</sup> )	NZTM East	NZTM North
	37	Ginger, hydrangea, flowering cherry, Japanese honeysuckle, grey willow, agapanthus.	25	1897418	5769948
4	38	Tree lucerne, plectranthus	5	1897067	5769621
	39	Agapanthus, jasmine, Easter lily	5	1897082	5769642
	40	Spanish heath	5	1897126	5769673
	41	Flowering cherry, silver birch, Lombardy poplar	5	1897168	5769726
	42	Flowering cherry	25	1896971	5769551
	43	Ginger (dense), cotoneaster, hydrangea, flowering cherry, bamboo, silver birch.	25	1896968	5769550
5	44	Crack willow-(grey willow)-cherry on lake edge	250	1897029	5769276
	45	Clearing with following pest plants around margin: mature cherry, montpellier broom, gorse, inkweed, poplars (resprouting following felling).	200	1897029	5769232
	46	Jasmine, occasional cherry, present throughout this section.	150	1896985	5769286
	47	Large flowering cherry tree, gorse, occasional grey willow	500	1897053	5769125
	48	Cotoneaster, crack willow,	5	1897019	5769103
	49	Montbretia,	3	1896983	5769102
	50	Tasmanian blackwood	500	1896970	5769090
	51	Montpellier broom, flowering cherry (large)	5	1896954	5769075
	52	Pampas, grey willow	10	1896850	5768992
6	53	Flowering cherry, fig	10	1896964	5768705
	54	Tradescantia	25	1896956	5768731
	55	Crack willow, cotoneaster, flowering cherry, tradescantia, grey willow	25	1896958	5768753
	56	Crack willow, cotoneaster, flowering cherry, tradescantia, grey willow	25	1896950	5768768
	57	Big crack willow, tradescantia to lake edge	5	1896937	5768782
	58	Flowering cherry, gorse, Spanish heath, Japanese honeysuckle, cotoneaster	50	1896889	5768850
	59	Flowering cherry, gorse, Spanish heath, Japanese honeysuckle, cotoneaster	50	1896859	5768864
	60	Flowering cherry	5	1896829	5768876
	61	Flowering cherry, <i>Sisyrinchium</i> "blue"	5	1896736	5766108
	62	Red cestrum, montbretia, rose campion	5	1896967	5768680
	63	Montbretia, flowering cherry seedlings (many), poplars, agapanthus, <i>Carex divulsa</i> .	5	1896972	5768698
	64	Silver birch, watsonia, montpellier broom, gorse, crack willow, lupins	10	1896980	5768673
	65	Montbretia	15	1896986	5768666
	66	Tradescantia-jasmine-cotoneaster	20	1896988	5768657
	67	Spanish heath	1	1896993	5768617
	68	Mexican daisy	10	1896989	5768598
	69	Pink-head knotweed, aluminium plant, selaginella, old man's beard	15	1896984	5768580
	70	Jasmine, tradescantia, strawberry dogwood, agapanthus	20	1896979	5768540
7	71	Pampas, hydrangea (on boundary)	5	1896986	5768528
	72	Spanish heath, flowering cherry, cotoneaster, silver birch, agapanthus, watsonia, grevillea, lupin, ornamental rose, with planted mountain flax, kōwhai, and akeake.	104-105	1896975	5768488

Mgmt Unit	Site No.	Description	Extent approx. (m <sup>2</sup> )	NZTM East	NZTM North
	73	Spanish heath, flowering cherry, cotoneaster, silver birch, agapanthus, watsonia, grevillea, lupins, ornamental rose, with planted mountain flax, kōwhai, and akeake.	104-105	1896967	5768443
	74	<i>Astelia</i> sp., oak (x 2), agapanthus, Montpellier broom	15	1896953	5768432
	75	<i>Pteris cretica</i>	5	1896950	5768409
	76	Silver birch/agapanthus, acer (15-17 m tall), banksia	10	1896951	5768376
	77	Agapanthus, jasmine, flowering cherry, gorse. Clearing-manage back into native vegetation	20	1896955	5768356
	78	Spanish heath, purple akeake, crack willow, banksia/agapanthus, azalea, selaginella	20	1896959	5768328
	79	Lawson cypress (15 m), rhododendron, hydrangea, tuber ladder fern, selaginella	15	1896963	5768263
	80	<i>Pteris cretica</i> , Mexican daisy, <i>Hypericum</i> sp.	3	1896971	5768235
	81	Maple, magnolia, lemon, silver birch, ivy, ornamental rose	10	1896979	5768212
	82	Agapanthus, all around boat shed	10	1897011	5768181
	83	Beschornaria, planted tanekaha	5	1897001	5768145
	84	Red robin, bamboo, bottlebrush, flowering cherry, cotoneaster, jasmine	15	1897009	5768129
	85	agapanthus, strawberry dogwood, Hebe "Wiri", variegated flax	20	1897013	5768119
	86	Exotic clematis, Mexican daisy, grevillea, hebe cultivar, <i>Coprosma robusta</i> x <i>acerosa</i> hybrid	5	1897028	5768058
	87	Hydrangea	1	1897053	5768033
	88	Cotoneaster, agave, flowering cherry, plum	5	1897062	5768019
	89	Beschornaria, Douglas fir, corokia hybrid, strawberry dogwood, crabapple hedge, conifer, hydrangea, cotoneaster, agapanthus	25	1897074	5768011
	90	Beschornaria, Douglas fir, corokia hybrid, strawberry dogwood, crabapple hedge, conifer, hydrangea, cotoneaster, agapanthus	25	1897107	5768009
	91	Tuber ladder fern, ivy, agapanthus, cotoneaster	50	1897107	5768008
	92	Silver birch, Lombardy poplar (x 3), occasional agapanthus and Montpellier broom	25	1897175	5768002
	93	Mexican daisy, hydrangea, agapanthus, aluminium plant	50	1897182	5767989
	94	Grey willow, crack willow, mercer grass, gypsywort, polygonum, yellow flag iris, fan palm, granny's bonnet, wild strawberry	30	1897198	5767993
	95	Magellan fuchsia	5	1897235	5767937
	96	Agapanthus	30	1897244	5767913
	97	False acacia (x 2), agapanthus	10	1897255	5767863
	98	Well-maintained lawn with false acacia (5-6), patches of agapanthus, and flax, karamū and kōhūhū	50	1897307	5767769
	99	Redwood, conifers (x 2, 20-25 m tall). Native plantings underneath including nīkau and rengarenga	25	1897308	5767751
	100	Watsonia	5	1897335	5767710
	101	Blackberry	5	1897355	5767719
	102	Flowering cherry, old man's beard, jasmine, tuber ladder fern, hydrangea, cotoneaster, silver birch, pampas.	100	1897351	5767657

Mgmt Unit	Site No.	Description	Extent approx. (m <sup>2</sup> )	NZTM East	NZTM North
	103	Ginger	100	1897381	5767609
	104	Selaginella, montbretia, onion weed, ivy, Kermadec cabbage tree, agapanthus, hydrangea, yucca	100	1897381	5767603
	105	Umbrella cyperus, climbing asparagus, camelia, cestrum, tradescantia	100	1897382	5767594
8	106	Umbrella cyperus, climbing asparagus, camelia, cestrum, tradescantia	100	1897401	5767573
	107	Crack willow, occasional silver birch and ash. Karamū-kōhūhū-māhoe/rank grass along lake margin. In the park itself there are silver birch (x 6), as well as maple, poplars	100	1897428	5767559
	108	Crack willow, occasional silver birch and ash. Karamū-kōhūhū-māhoe/rank grass along lake margin. In the park itself there are silver birch (x 6), as well as maple, poplars	100	1897438	5767494
	109	Purple akeake	1	1897367	5767465
	110	Agapanthus	2	1897344	5767426
	111	Umbrella cyperus	1	1897334	5767426
	112	Hydrangea, agapanthus, as well as native plantings	5	1897323	5767427
	113	Agapanthus, rice paper plant, ivy, climbing asparagus	30	1897308	5767383
	114	German ivy, aluminium plant	5	1897299	5767359
	115	Hydrangea, English ivy	10	1897295	5767347
	116	Cryptomeria, tradescantia	15	1897294	5767342
	117	Exotic <i>Metrosideros</i>	5	1897279	5767308
9	118	Agapanthus, climbing spindleberry, cotoneaster, jasmine, montbretia, gorse, rhododendron, Japanese honeysuckle, tuber ladder fern, Spanish heath, umbrella cyperus, strawberry dogwood, flowering cherry, exotic fuchsia, gingko, arum lily, bear's breeches, Montpellier broom. There is also planted kauri, nīkau, kōhūhū, tarata, purple flax, golden tōtara, dwarf mountain flax, <i>Pseudopanax</i> (cultivar), kōwhai, <i>Astelia chathamica</i> , <i>Chionochloa flavescens</i> .	25	1897114	5766859
	119	As per 118	25	1897078	5766862
	120	As per 118	25	1897077	5766878
	121	As per 118	25	1897087	5766851
	122	Cotoneaster	5	1897073	5766846
	123	Japanese honeysuckle, blackberry, crack willow by boatshed	10	1897126	5766858
	124	Tradescantia, red cestrum	50	1897210	5766910
	125	Bamboo (dumped)	5	1896692	5766116
10	126	Selaginella, montbretia, crack willow, grey willow, strawberry dogwood, onion weed, prostrate kōwhai	15	1897040	5766826
	127	Selaginella, montbretia, crack willow, grey willow, strawberry dogwood, onion weed, prostrate kōwhai	15	1897013	5766805
	128	Selaginella	5	1897003	5766782
	129	Japanese honeysuckle	10	1897001	5766735
	130	Selaginella	5	1896997	5766719
	131	Strawberry dogwood, flowering cherry, selaginella	5	1896992	5766702

Mgmt Unit	Site No.	Description	Extent approx. (m <sup>2</sup> )	NZTM East	NZTM North
	132	Hydrangea on both sides of shoreline track	20	1896974	5766650
	133	Hydrangea on both sides of shoreline track	20	1896963	5766627
	134	Aluminium plant	20	1896956	5766583
	135	Ginger	5	1896953	5766571
	136	Ginger	5	1896988	5766505
	137	Japanese honeysuckle	5	1896977	5766488
	138	Selaginella	5	1896966	5766474
	139	Plectranthus, selaginella	45	1896940	5766451
	140	Crack willow	1	1896908	5766425
	141	Agapanthus	5	1896900	5766417
	142	Tradescantia, selaginella	25	1896894	5766390
	143	Ginger. Some mamaku cut down here, could be re-planted?	2	1896885	5766366
	144	Strawberry dogwood. Tōtara planted here.	1	1896881	5766343
	145	Ginger, walnut	20	1896805	5766252
	146	Crack willow along lake shore, false acacia	25	1896796	5766216
	147	Agapanthus, walnut, Japanese honeysuckle	10	1896778	5766207
	148	Old man's beard, ginger, flowering cherry	20	1896767	5766178
	149	Ginger, hydrangea, walnut at base of bouldery bluff slope	30	1896765	5766149
	150	Slip, dump site for lawn clippings, occasional flowering cherry, conifer x 1 (15 m)	15	1896744	5766119
	151	Ornamental rose	1	1896744	5766108
	152	Tuber ladder fern	5	1896723	5766098
	153	Camellia	1	1896900	5766426



## WEED CONTROL METHODS

Pest Plant	Control Method(s)	Chemical(s)	Application Rate	Timing	Remarks
Agapanthus ( <i>Agapanthus praecox</i> )	Dig out and dispose off-site	-	-	Year round	Only if this can be done without posing a weed hygiene risk
	Knapsack - foliar spray	Triclopyr	60ml/10 litres water	Year round	
	Knapsack - foliar spray	Metsulfuron	2.5g/10 litres water	Year round	
Climbing asparagus ( <i>Asparagus scandens</i> )	Knapsack - foliar spray	Glyphosate 360	100ml/10 litres water	October-March	
Climbing spindleberry ( <i>Celastrus orbiculatus</i> )	Knapsack - foliar spray	Triclopyr	60ml/10 litres water	December-April	Do not pull vegetation from host plant.
	Cut and treat stems	Metsulfuron	5g/10 litres water	December-April	
Red cestrum ( <i>Cestrum elegans</i> )	Cut and treat stumps	Triclopyr	60ml/10 litres water	November-March	
Old man's beard ( <i>Clematis vitalba</i> )	Introduce biological control agents if possible			Year round	
	Cut and treat stumps (cut at 1m above, and at ground level to prevent aerial roots attaching from hanging stems)	Metsulfuron	5g/litre water, plus 2ml surfactant	November-March	Leave stems in air to die.
	Vial treatment - pull up as many stems as possible and treat remainder.	Metsulfuron	1g/20ml water	November-March	Leave stems in air to die.
	Foliar spray	Clopyralid or Triclopyr	70ml Clopyralid/10 litre water, plus 2ml surfactant, or 60ml Triclopyr/10L water plus 2ml surfactant.	November-March	
Strawberry dogwood ( <i>Dendrobenthamia capitata</i> )	Hand pull seedlings/small plants			Year round	
	Cut and treat stumps	Triclopyr	60ml/1 litre water	November-March	
	Drill and inject	Metsulfuron	20g/litre water, plus 2ml surfactant	November-March	

Pest Plant	Control Method(s)	Chemical(s)	Application Rate	Timing	Remarks
Kahili ginger ( <i>Hedychium gardnerianum</i> )	Hand pull seedlings/small plants.			October to February	Ensure no tuber left behind.
	Knapsack - foliar spray	Metsulfuron	5g/10 litres water + 10ml Surfactant	Spring to late autumn	Not for use around native vegetation or waterways.
	Cut and treat stems/tubers	Metsulfuron	20g/10 litres water	Spring to late autumn	For application near waterways and indigenous vegetation.
Japanese honeysuckle ( <i>Lonicera japonica</i> )	Knapsack - foliar spray	Clopyralid	40-50ml/10 litres water	October-March	
	Cut and treat stems	Triclopyr	60ml/1 litre water	October-March	Do not pull vegetation from host plant.
Tuber ladder fern ( <i>Nephrolepis cordifolia</i> )	Knapsack - foliar spray	Metsulfuron	5g/10 litres water	March to May	
Flowering cherry ( <i>Prunus</i> sp.)	Cut and treat stumps	Triclopyr	60ml/10 litres water	November-March	
Blackberry ( <i>Rubus fruticosus</i> agg.)	Knapsack - foliar spray	Triclopyr	60ml/10 litres water	December-April	
Selaginella ( <i>Selaginella kraussiana</i> )	Knapsack - foliar spray	Glyphosate 360	100ml/10L water	Year round	Pull away from non-target species before spraying
Montpellier broom ( <i>Teline montspessulana</i> )	Hand pull seedlings/small plants			Year round	
	Knapsack - foliar spray	Metsulfuron	5g/10 litres water	November-February	Do not spray if seed pods have turned brown.
Tradescantia ( <i>Tradescantia fluminensis</i> )	Knapsack - foliar spray	Triclopyr	60ml/10 litre water	November-March	Pull away from non-target species before spraying.

SITE PHOTOGRAPHS



Plate 1: Ginger infestations occur locally throughout the study area. (November 2016)



Plate 2: Large tradescantia infestation spreading from the neighbouring residential property, one of a number of such sites throughout the project area. (November 2016)





Plate 3: Regenerating indigenous forest dominated by māhoe, mamaku, and kōhūhū is the main vegetation type along the Spencer Road lake margin. Exotic trees and shrubs are common. (November 2016)



Plate 4: In places, *Schoenoplectus tabernaemontani* reedland (pictured) and raupō reedland extend out from the shoreline. (November 2016)





Plate 5: Agapanthus is a frequent feature of residential lawns and gardens utilising Council land. (November 2016)



Plate 7: Crack willow frequently dominates shoreline vegetation, with regenerating māhoe-mamaku-kōhūhū forest behind. (November 2016)





Plate 8: In Council parks, shoreline weedy “non-planted” trees such as crack willow can be removed immediately, planted specimen trees can be removed progressively and replaced with native trees and shrubs. (November 2016)



Plate 9: An old building site at Boat Shed Bay has received ecologically inappropriate plantings, and has a large suite of exotic pest plants. (November 2016)



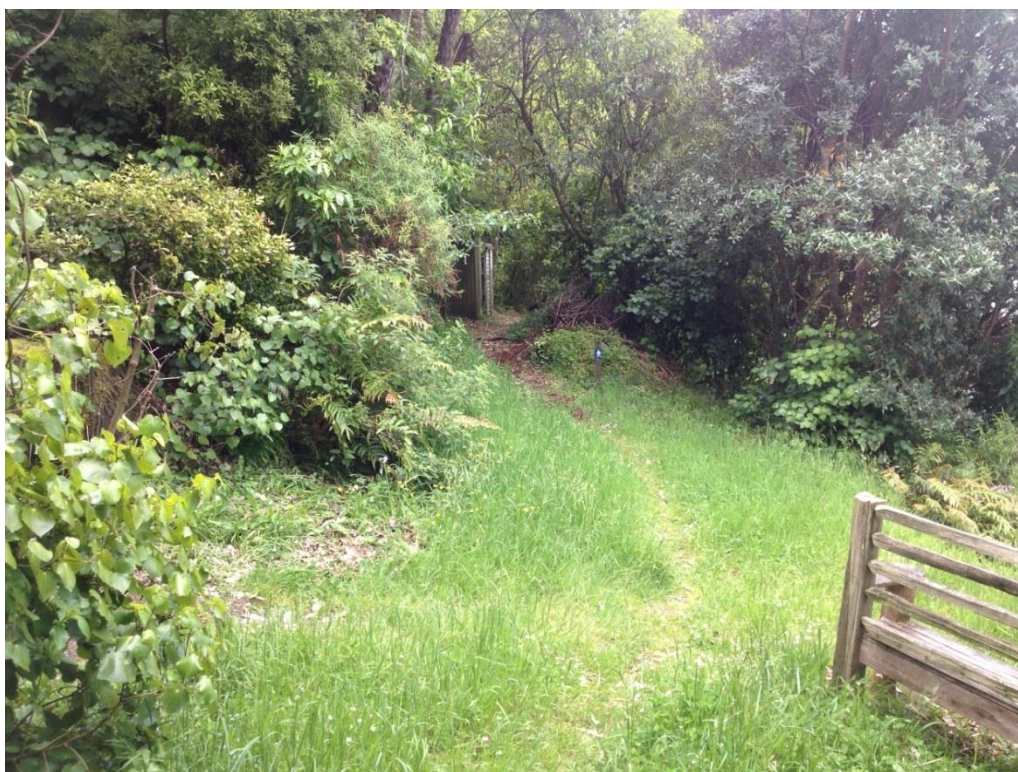


Plate 10: Grassy clearings and walkways between residential properties and the shoreline are frequently weedy - common species include flowering cherry, selaginella, jasmine, agapanthus, and cotoneaster. (November 2016)



Plate 11: Grey willow shrubland is advancing into the Spencer Road-end wetland, and is a high priority for control. Spotless crane are present here. (November 2016)





Plate 12: A small wetland at Otumutu Lagoon, adjacent to Spencer Road and the row of boat sheds, has been the focus of some previous restoration management (Wildland Consultants 2005 provides a restoration plan for this area). (November 2016)



# Wildlands

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Call Free 0508 WILDNZ  
Ph: +64 7 343 9017  
Fax: +64 7 3439018  
[ecology@wildlands.co.nz](mailto:ecology@wildlands.co.nz)

99 Sala Street  
PO Box 7137, Te Ngae  
Rotorua 3042,  
New Zealand

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