

Te Waoku Kahikatea Reserve

Ecological restoration plan

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Approvals panel			
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Introduction

Te Waoku Kahikatea Reserve is both Schedule-A Site of Ecological Significance and a Significant Landscape in the Christchurch District Plan on account of its size, plant species diversity, waterbird populations and high natural character and rural amenity.

Vision

Te Waoku Kahikatea Reserve will be valued as an important community asset that people of all ages and backgrounds will be actively involved in managing and nurturing. People will visit the reserve regularly for the enjoyment of nature, passive recreation, education, nature play, and for social interaction. The forest, lakes and waterways will be representative of formerly widespread indigenous ecosystems that once occurred in Canterbury and will be used by native birds, lizards, invertebrates and fish as an important feeding and breeding resource in a city-wide network of natural areas.



Figure 1: Looking northeast across the lower pond at Te Waoku Kahikatea Reserve in the early morning (Photograph, A. Shadbolt 2025).

Objectives

Continuing to restore and enhance forest and freshwater ecosystems at Te Waoku Kahikatea will have the following ten key objectives:

- ✓ Optimise the ecological roles and functions of Te Waoku Kahikatea Reserve
- ✓ Manage a range of threats that are impacting on natural values of the reserve
- ✓ Provide important resources for native wildlife as part of a city-wide forest patch network
- ✓ Act as a 'lifeboat' for biodiversity by establishing new populations of indigenous flora and fauna
- ✓ Provide manawhenua with opportunities to exercise Mātauranga Māori and support mahinga kai
- ✓ Provide opportunities for people to experience and interact with urban wilderness
- ✓ Reduce ongoing operational costs and carbon emissions associated with managing mown turf
- ✓ Continue to manage the reserve as an iconic landscape feature that contributes to community identity
- ✓ Meet a critical need to provide quality habitat for translocated lizard populations
- ✓ Promote and support restoration of ecological values on neighbouring properties

Context

Ōtautahi-Christchurch, a biodiversity hotspot within the plains ecological region¹, contains many important biodiversity sites, some of national or international importance. However, over the past 700 years Canterbury has suffered enormous loss in both the extent and quality of its indigenous biodiversity with Māori and European settlement. Pre-European fires meant that only a very small amount of native forest remained on the Canterbury Plains by the 1840s, and subsequent colonisation by European settlers in the 1850s brought further rapid habitat destruction to the Canterbury Plains and Port Hills.

The historic ‘Black Maps’ of Ōtautahi-Christchurch dating from the 19th Century show extensive areas of wetland with only limited areas of forest at Pūtagringamotu-Riccarton Bush (c.22 hectares) (Figure 2) and Papanui Bush (c.30 hectares). Unfortunately, Papanui Bush was completely felled by settlers within approximately five years, and Pūtagringamotu-Riccarton bush was reduced to around seven hectares in a similar period.

Native forests have begun to have a renaissance in recent years in Ōtautahi-Christchurch, as have our native bush birds. Planted native forests now well-exceed the c.1840 extent but further restoration is essential for sustaining wildlife and providing high quality nature experiences for all. Te Waoku Kahikatea Reserve is one of a number of significant native forest reserves spread across Ōtautahi-Christchurch that helps fulfil these roles.

Styx Vision 2000 – 2040

In the late 1990s, consultation and research identified key concerns and opportunities for the Pūharakekenui-Styx River catchment’s ecosystem, leading to the development of five guiding visions that were formalised in the Council-community’s **Styx Vision 2000–2040**, adopted in 2001 (Figure 3).

The five visions aim to: protect and enhance a viable spring-fed river ecosystem; create a source-to-sea urban national reserve; establish a “living laboratory” for research and learning; maintain and celebrate the area’s unique character as a special place; and foster strong partnerships through collaboration and shared stewardship.

For nearly 25 years, steady progress has been made towards these long-term goals, supported by ongoing ecological restoration activities such as those at Te Waoku Kahikatea Reserve.

Thanks to these efforts, indigenous vegetation now covers 7.3% of the Pūharakekenui River catchment – a stark contrast to the remainder of the Low Canterbury Plains where just 0.5% of its original indigenous vegetation cover remains.

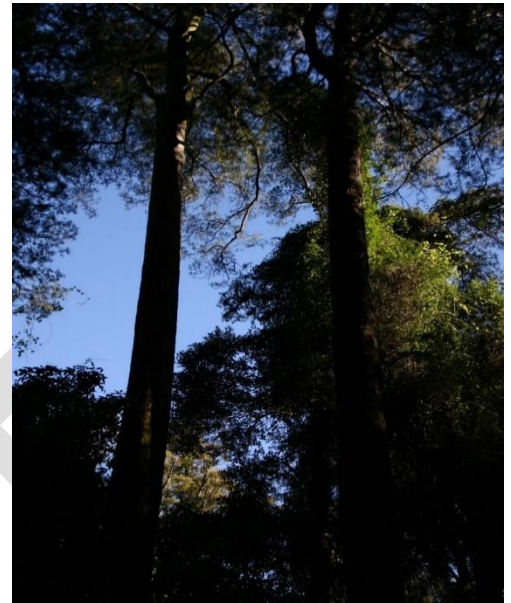


Figure 2: Emergent kahikatea (*Dacrydium dacrydioides*) at Pūtagringamotu – Riccarton Bush (Photograph: A. Shadbolt, 2019)

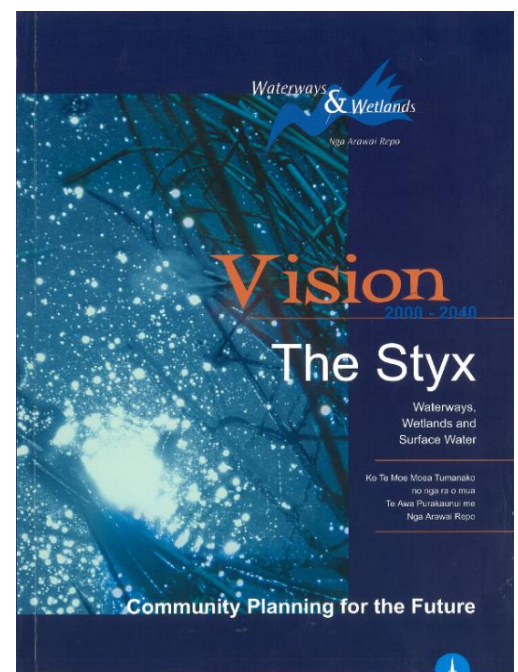


Figure 3: Council’s Styx Vision 2000 – 2040 planning document.

¹ www.doc.govt.nz/documents/science-and-technical/ecoregions4.pdf

Te Waoku Kahikatea Reserve

Location

Te Waoku Kahikatea Reserve is an approximately six-hectare local Regional Park located at 303 Radcliffe Road in the rural Christchurch area of Marshland (Figure 4). The reserve is bordered by the Pūharakekenui-Styx River on its southeastern boundary and has just one road frontage, however links to Marshland Road via the adjoining Kā Pūtahi Confluence Reserve.



Figure 4: Location of Te Waoku Kahikatea Reserve (yellow outline) bordered by Radcliffe Road, the Pūharakekenui-Styx River, Kā Pūtahi Creek and the Kā Pūtahi Confluence Conservation Reserve.

History

A large block of land at 303 Radcliffe Roads and was acquired by the Council in the mid-2000s for the dual roles of 1) creating a key node in the Pūharakekenui-Styx Source to Sea Reserve Network, and 2) treating contaminated stormwater runoff from Radcliffe Road Drain and Mundys Drain. Sediment-laden stormwater from these drains had historically discharged directly to the Pūharakekenui-Styx River via timber lined boxed culverts that had no mechanisms to remove sediment or other contaminants. Prior to the Council acquiring the property, use of the land had included the areas last operational dairy farm, an apple orchard, and later horse & cattle grazing.



Figure 5: Park entrance signage at the frontage of Te Waoku Kahikatea Reserve at 303 Radcliffe Road

Soon after the property was acquired, a series of sedimentation ponds began to be excavated throughout the length of the reserve, and both Radcliffe Road Drain and Mundys Branch Drain were to be diverted via naturalised channels into the ponds. Due to consenting issues, the drain diversion and stormwater treatment system were not fully completed until 2010. Now the system discharges into Kā Pūtahi Creek to the east via the constructed ponds that serve to slow water velocity down so that sediment being transported in the water column drops out into the bed of the ponds instead of the natural waterways. These ponds not only serve an important water quality improvement function but also provide an important resource for native wildlife and are a key element of the reserve's landscape character and aesthetics.

During the construction of the naturalised stream channels and ponds, contractors uncovered hundreds of totara stumps and woody material from an ancient buried native forest and helped inform ecological restoration planning at the site. These totara stumps can be seen along the sides of the main path towards the eastern end of the reserve.

Native forest and riparian planting at the reserve commenced in 2010, and the main planting areas were completed by 2014 (**See Appendix 2**) with ongoing planting activities limited to infill planting and enrichment planting with understorey species once suitable shelter had developed. To date, more than 3000 kahikatea (*Dacrycarpus dacrydioides*) have been planted, around 2500 totara (*Podocarpus totara*), 1000 matai (*Prumnopitys taxifolia*) and more than 70 other species of eco-sourced native trees, shrubs, ferns, groundcovers and climbers.

From 2012 until present, planting has expanded into the Kā Pūtahi Confluence Conservation Reserve and also onto neighbouring properties as opportunities presented themselves. At more than 7.5 hectares, Te Waoku Kahikatea Reserve alone is larger than Pūtaringamotu-Riccarton Bush, and when considering contiguous plantings on neighbouring properties and at Kā Pūtahi Confluence Conservation Reserve, it is almost twice the size – c.13.5 ha! In 2014, the site was included as both a Schedule-A Site of Ecological Significance and a Significant Landscape in the Christchurch District Plan on account of its size, plant species diversity, waterbird population, high natural character and rural amenity.

Although the reserve is dominated by native vegetation, the Radcliffe Road frontage is dominated by large European elm trees, a large macrocarpa, an old pear tree and a small collection of Lombardy poplars which all add to the rural amenity of the site. Towards the end of the reserve beside the large pond an English Oak had been planted by the former property owner in memory of his wife who had passed away. Along the banks of the Pūharakekenui-Styx River, large willows and poplars still dominate the riverbanks in some areas which are suppressing the growth of native forest species.

Now that older plantings have been established for up to 15 years, they have developed sheltered micro-climates that have allowed for the under planting of (E.g.) native ferns and frost tender species. The size of some of the vegetation can now easily support a range of native climbers such as bush lawyers – which are now abundant in places – and clematis. Where conditions are right, many native trees, shrubs, and grasses are beginning to naturally regenerate in the forest understorey and alongside tracks (Figure 6), and for the last few years kahikatea have begun to set heavy crops of fruit.



Figure 6: Prolific native seedling regeneration in the Te Waoku Kahikatea Reserve forest understorey. Species include kapuka, karamu, fivefinger, lemonwood, and lowland ribbonwood (Photograph A. Shadbolt 2025)

A milestone of restoration success, on the 19th of September 2025, we recorded the first kahikatea seedling at the reserve (Figure 7) growing on a rotting willow log in the forest understorey.



Figure 7: The first kahikatea seedling (centre) recorded at Te Waoku Kahikatea Reserve in 2025 (Photograph A. Shadbolt, 2025)

Biodiversity management issues

The main management issue that is evident at Te Waoku Kahikatea Reserve is the presence of established biodiversity **pest plants** such as ivy, karo (North Island Pittosporum species), old man's beard, crack and grey willow, and other woody weeds. Neighbouring and/or nearby sites, as well as areas within the reserve itself are often a source of these pest plants.

As habitat matures and begins to support more significant native wildlife populations, **introduced mammalian pests** will become a greater management issue, and the reserve also supports populations of **nuisance birds** including feral pigeons and introduced waterfowl. **Wildlife disturbance** from recreation activities – including dogs – is likely to be an ongoing issue to be managed.

Climate change consideration will need to be taken into account and will include increased occurrences of drought conditions and a possible higher risk of fire.

Pest plants

Although the extensive native forest and riparian planting are mostly thriving under a low-level maintenance regime, exotic pest plants such as European ivy (*Hedera helix*) dominate the young forest understory in places (Refer Figure 8) and is also prolific along the margins of the Pūharakekenui Styx River. If left unchecked, ivy will continue to carpet the understorey preventing regeneration of native forest species. Once ivy begins to climb, it produces prolific fruit (and seed) which is dispersed by both native and exotic birds, further exacerbating the problem at Te Waoku Kahikatea Reserve and other nearby natural areas too.



Figure 8: European ivy (*Hedera helix*) is prolific at Te Waoku Kahikatea Reserve and threatens to severely compromise restoration success.

Other undesirable woody weeds and vines at Te Waoku Kahikatea include are listed in Table 1. These species have the potential to dominate the established forest and spread into new planted areas where they will displace indigenous plant communities and the indigenous fauna those communities' support.

Luckily, many of these pest plant species are both relatively sparse and young and able to be controlled cost effectively compared to if they are left to establish further.



Figure 9: North Island Pittosporum /karo (*Pittosporum ralphii*) is one of the most common woody weeds at Te Waoku Kahikatea Reserve

Table 1: Biodiversity pest plants and other undesirable plant species occurring at Te Waoku Kahikatea Reserve and prioritised recommended control actions.

Species	Common name	Recommendation
<i>Hedera helix</i>	Ivy	Completely eradicate new occurrences and progressive control of established areas through ongoing hand weeding and herbicide application. HIGH PRIORITY
<i>Maytenus boaria</i>	Chilean mayten	Completely eradicate from reserve, waterway corridor and lake margins. HIGH PRIORITY
<i>Ligustrum vulgare</i>	Wild privet	Remove remnant privet hedge at Radcliffe Rd frontage and eradicate wildings. HIGH PRIORITY
<i>Prunus spp</i>	Wild cherry	Eradication of existing saplings and ongoing surveillance and control of new occurrences. HIGH PRIORITY
<i>Alnus spp.</i>	Alder	Completely eradicate from reserve – particularly waterway corridor and follow up control of new seedling growth. HIGH PRIORITY
<i>Salix fragilis</i>	Crack willow	Completely eradicate from waterway corridor and lake margins. HIGH PRIORITY
<i>Salix cinerea</i>	Grey willow	Completely eradicate from waterway corridor and lake margins. HIGH PRIORITY
<i>Malus spp.</i>	Apple	Have mostly eradicated from reserve. Ongoing surveillance and control as needed. MEDIUM PRIORITY
<i>Pittosporum crassifolium & P. ralphii</i>	Karo	Ongoing surveillance and completely eradicate HIGH PRIORITY
<i>Clematis vitalba</i>	Old man's beard	Ongoing surveillance and eradication. HIGH PRIORITY
<i>Conium maculatum</i>	Hemlock	Chemical control or physical removal and re-plant areas with dense native vegetation to reduce future extend of this species. MEDIUM PRIORITY
<i>Quercus robur</i>	English oak	Ongoing control of seedlings in vicinity of adult memorial tree, and around trees on the true right bank of Kā Pūtahi Creek upstream from the red bridge. LOWER PRIORITY
<i>Poplar spp.</i>	Poplar	Sustained control of new seedlings and saplings throughout reserve, particularly along Pūharakekenui-Styx River corridor. LOWER PRIORITY
<i>Calystegia vulgaris</i>	Convolvulus	Ongoing control in young plantings until such time that convolvulus does not pose a significant threat to restoration success. LOWER PRIORITY
<i>Rubus fruticosus</i>	Blackberry	Ongoing control of blackberry, particularly at eastern end of reserve in forest understorey. LOWER PRIORITY
<i>Hebe strictissima</i>	Banks Peninsula hebe	Remove local species from Radcliffe Road Drain corridor and replace them with appropriate local species. LOWER PRIORITY
<i>Eucalyptus nitens</i>	Shining gum	Remove mature shining gums growing on the true right bank of Kā Pūtahi Creek immediately upstream with the Creek's confluence with the Pūharakekenui-Styx River. MEDIUM PRIORITY

Pest animals

Mammalian pests

The Council has prepared an operational pest plan² (CCC 2024c) for parks in response to its statutory obligations to 1) halt the decline of indigenous biodiversity, 2) mitigate biosecurity threats, and 3) maintain the integrity of public infrastructure. The plan gives the highest priority to sites that have high biodiversity values that are being significantly impacted by pest animals resulting in ongoing biodiversity decline, and particularly where it is agreed that urgent control action is needed to halt and ideally reverse this decline. Although Te Waoku Kahikatea Reserve does not yet meet this level of urgency, it does meet the second priority of being a Site of Ecological Significance with high biodiversity values that will significantly benefit from animal pest control.

As-such, the New Zealand Conservation Trust has maintained permanent trap lines through Te Waoku Kahikatea Reserve and the adjoining Kā Pūtahi Confluence Conservation reserve since August 2020. Their catches have included rats, hedgehogs, mice, weasels, stoats, and ferrets. The Council's Regional Park Rangers have also supported pest animal control at the site by installing and managing a series of possum traps throughout the reserve.

Table 2 lists species either occurring or likely to occur at Te Waoku Kahikatea Reserve, including their RPMP designation and control approach for this specific site. For Te Waoku Kahikatea Reserve, in order of priority: **Total Control** means the eradication of all individuals of a pest animal species as soon as possible; **Progressive Control** means control of all individuals with the aim of eradication over the medium term; **Containment Control** means control all individuals to contain the species' spread immediately and reduce its population over the long term, and **No Control** means that no control is currently required.

Table 2: List of biodiversity pest animals likely to occur (marked with an asterisk) and/or have the potential to occur at Te Ngahere Reporepo Ngā Tahuna by Canterbury Regional pest Management Plan (RPMP) designation and control approach.

Common name	Scientific name	RPMP designation	Control approach
Feral rabbit*	<i>Oryctolagus cuniculus</i>	Declared Pest	Progressive control
Brown hare*	<i>Lepus europaeus</i>	Organism of interest	Progressive control
Possum*	<i>Trichosurus vulpecula</i>	Declared Pest	Containment control
Hedgehog*	<i>Erinaceus europaeus</i>	Organism of interest	Containment control
Feral cat*	<i>Felis catus</i>	Organism of interest	Total control
Ferret*	<i>Mustelo furo</i>	Organism of interest	Progressive control
Stoat*	<i>Mustelo ermine</i>	Organism of interest	Progressive control
Weasel*	<i>Mustelo nivalis</i>	Organism of interest	Progressive control
Norway rat *	<i>Rattus norvegicus</i>	Organism of interest	Containment control
Ship rat*	<i>Rattus rattus</i>	Organism of interest	Containment control
House mouse*	<i>Mus mus</i>	-	Containment control

For further information on the Council's obligations and approach to animal pest control, please refer to the **Christchurch City Council Operational Pest Management Plan 2023 – 2033²**.

² Christchurch City Council 2023

Dominance of mallard-grey duck hybrids

Citizen science waterbird monitoring of the lakes at Te Waoku Kahikatea Reserve since 2014 by the Styx Living Laboratory Trust has shown a relatively large and stable population of mallard and mallard-grey duck hybrids (Figure 10) that tends to dominate the waterbird assemblage despite the lakes being surrounded by dense native plantings. Large numbers of mallards and mallard-grey duck hybrids have a range of impacts on water quality and other native waterbirds, including:

- ✓ **Nutrient loading and eutrophication:** Mallards contribute to nutrient enrichment in water bodies through their faeces, which are rich in nitrogen and phosphorus. This nutrient input can accelerate eutrophication, leading to algal blooms, decreased oxygen levels, and overall deterioration of water quality.
- ✓ **Physical damage to aquatic vegetation:** High densities of mallards can physically damage submerged and emergent vegetation through foraging and movement, disrupting habitat structure and further impacting water quality.
- ✓ **Hybridization with native species:** Mallards readily hybridise with native dabbling ducks, such as the critically endangered New Zealand grey duck (*Anas superciliosa*), leading to genetic dilution and potential loss of unique native species. This hybridisation can threaten the genetic integrity and survival of native duck populations.
- ✓ **Competition for resources:** Mallards are aggressive and adaptable, often outcompeting native waterbirds for food, nesting sites, and habitat space. Their dominance can lead to declines in native species populations and reduced biodiversity.
- ✓ **Disease transmission:** Dense congregations of mallards can serve as reservoirs for pathogens, increasing the risk of disease transmission to other waterfowl and potentially to humans.



Figure 10: Mallard (left) and mallard-grey duck hybrids (right) can dominate the lakes at Te Waoku Kahikatea Reserve particularly during winter (Photographs, A. Crossland).

Managing mallard and mallard-grey duck hybrid populations is important for maintaining water quality and protecting native biodiversity in small lake ecosystems like those at Te Waoku Kahikatea Reserve. Strategies may include habitat modifications (E.g., refer Figure 11), discouraging feeding by humans, and public education to mitigate the negative impacts associated with high densities of mallards (Refer Table 3).

Table 3: Suggested control methods for mallard and mallard-grey duck hybrids at Te Waoku Kahikatea Reserve.

Control method	Description	Priority
Enhance riparian vegetation cover	Plant and bolster dense native vegetation around lake margins to reduce open water areas and roosting areas favoured by mallards.	High priority
Avoid artificial feeding areas	Continue to limit peoples access to the water's edge to discourage the creation of feeding spots that can attract large flocks of mallards.	High priority
Create shallow, vegetated wetlands	Over time, manage lakes to transition toward wetlands with shallow depths and abundant emergent plants to support species like (E.g.) New Zealand scaup and paradise shelduck, which prefer such environments.	Medium priority
Microhabitat diversification	Create a wider variety of microhabitats, such as shallow pools with dense vegetation, to provide suitable nesting sites for native species, potentially giving them a competitive advantage over mallards	Medium priority
Educational signage	Raise public awareness by installing interpretation about the importance of native waterbirds and the issues caused by mallard hybrids.	Medium priority
Citizen science	Continue to support Styx Living Laboratory Trust volunteers to carry out monthly counts and reporting to monitor population dynamics and inform management decisions	High priority



Figure 11: Te Waoku Kahikatea Reserve lake margins where riparian vegetation cover can be bolstered to discourage mallard-grey duck hybrids

Feral rock pigeons

A small but increasing population of feral rock pigeons (*Colomba livia*) roost and nest in the large barn next to the Radcliffe Road carpark. Attempts have been made to deter pigeons by installing bird spikes in the rafters of the barn and night shooting. Bird spikes worked successfully for the first few years however the pigeons have learned how to roost beside these and have even used the spikes to construct nests on. They not only cause excessive fouling and damage to the rafters and floor of the barns – presenting a human health risk - but they also have potential to impact on the ecological values of the reserve.

If not properly managed, feral rock pigeons breed year-round and can build up populations at Te Waoku Kahikatea Reserve in the same way they have at Pūtaringamotu-Riccarton Bush where researchers³ found that 97.4% nested on the ground in the predator free habitat. This entails a risk of direct competition with native fauna for food and nesting sites, and the risk of disease and parasite transmission that could impact on populations of native birds. Several possible control strategies are outlined in Table 4 and include approaches such as physical exclusion, habitat modification, behavioural deterrents, and trapping and shooting.

Community Engagement also plays a role in managing feral rock pigeons at Te Waoku Kahikatea Reserve. This could include educating visitors and staff about not intentionally (or even inadvertently) feeding wildlife and the importance of maintaining a pigeon-free environment to protect native species. Councils 'Rubbish-free Regional Parks' policy already helps eliminate food scraps and waste from the reserve.

Table 4: Suggested control methods for feral rock pigeons at Te Waoku Kahikatea Reserve.

Control method	Advantages	Disadvantages
Repair/reinstall bird spikes High priority	Effective, long-lasting, humane.	May be unsightly; installation requires effort.
Install bird netting/mesh Medium priority	Physically blocks access.	Can trap non-target species if not properly installed
Nest removal High priority	Disrupts breeding cycle.	Must be done consistently; may provoke re-nesting elsewhere.
Install visual deterrents Consider/medium priority	Low cost, easy to deploy.	Birds may habituate over time.
Install sonic devices Consider/low priority	Non-invasive, covers larger areas.	Effectiveness can diminish; may disturb other wildlife; requires power source.
Trapping Consider/Medium priority	Immediate population reduction.	Requires ongoing effort; ethical considerations.
Shooting Consider/medium priority	Immediate, targeted, and cost-effective population reduction.	Public safety and public perception issues; temporary solution without addressing underlying attractants; legal restrictions on discharging firearms in public areas; animal welfare concerns.

³ Briskie and Shorey (2021).

Fire risk

Limited information is available regarding fire behaviour in New Zealand's native forests, but they are generally considered less flammable than (e.g.) exotic plantations. In native forests, moisture levels are assumed to be higher due to accumulation of decomposing leaves and logs which hold moisture. Higher moisture levels often lead to fuel being unavailable to fire consumption until drought conditions occur. However, with climate change, Canterbury is expected to experience more frequent and more severe droughts, increasing the risk and impacts of wildfire on high-value ecological sites like Te Waoku Kahikatea Reserve.

Research at Te Waoku Kahikatea Reserve by a University of Canterbury NZ School of Forestry dissertation student⁴ found that ignition susceptibility along the main path was mostly low to medium (31% and 35% respectively). Thirty percent of the transects fell into the 'high' susceptibility category, however the main contributor to ignition susceptibility in these areas was found to be exotic grass (Figure 12). Only 5% of the sampled locations fell into the 'very high' susceptibility category – again because of exotic grass – and none were 'extreme'. The highest weightings in ignition susceptibility were found to be more a result of lack of management than fuel loads produced by the restoration plantings themselves.

Another contributor to ignition susceptibility was very high to extreme litter loads in the higher risk categories produced by *Hebe salicifolia*, *Pittosporum tenuifolium*, *P. eugenoides*, *Olearia paniculata*, and *Griselinea littoralis*.

Because fires – either accidentally or intentionally lit – usually begin at the human interface of natural areas such as along paths and at places where people congregate, special attention shall be paid to these areas. Here we will continue to suppress exotic grasses and maintain the high degree of variability in habitat structure. We will also favour species in our new plantings along human interfaces that are known to have low flammability whilst still achieving an authentic natural plant community composition.



Figure 12: Exotic grasses along path margins at Te Waoku Kahikatea Reserve are the main contributor to ignition susceptibility (Photograph: A. Shadbolt 2025)

⁴ McCarthy, 2024

Ecological values

Despite its human-constructed nature, Te Waoku Kahikatea Reserve has been evaluated against the criteria for determining significant indigenous vegetation and significant habitat of indigenous fauna listed in Appendix 3 of the Canterbury Regional Policy Statement⁵. The site has been listed as a Site of Ecological Significance (SES) in the Christchurch District Plan because it meets the representativeness criteria (criteria 1 & 2), rarity/distinctiveness criteria (criteria 3 & 4), and ecological context criteria (criterion 8). Detail of this assessment is provided in **Appendix 1**.

Botanical values

No original remnant indigenous vegetation occurs at this site apart from some sedges, rushes, ferns, and the nationally at-risk/declining climbing nettle (*Urtica persconfusa*) along the Pūharakekenui-Styx River and Kā Pūtahi Creek. All other indigenous plants throughout the reserve (E.g., Figure 13) have either been planted as part of a programme of native forest and riparian restoration, have subsequently self-colonised, or have naturally regenerated as seedlings in the forest understorey or along forest edges.



Figure 13: Maturing restoration plantings on a drier site at Te Waoku Kahikatea Reserve (Photograph A. Shadbolt 2025).

At the time of writing, there are at least 95 indigenous plant species established at Te Waoku Kahikatea Reserve (**Appendix 3**).

With few exceptions, all plantings have been eco-sourced from the Low Canterbury Plains Ecological District or next nearest source. Some non-local native plant species have been planted in the reserve but are limited to *Hebe strictissima* (Banks Peninsula hebe) planted in small numbers (<10) along Radcliffe Road Drain, and *Phyllocladus trichomanoides* (celery pine) planted in a small number (<5) as a future cultural resource for weavers. We propose to remove the Banks Peninsula hebes and replace them with appropriate local species, but we do not intend to remove the celery pines as they are not considered a threat to restoration values and will serve an educational role.

Actions

- ✓ Enrichment planting with key species as microclimates and/or physical environments develop.
- ✓ Encourage spread of *Urtica persconfusa* through careful vegetation management practices.

⁵ Environment Canterbury. 2013

Avifauna values

Forty-one species have been recorded at Te Waoku Kahikatea Reserve (Table 5) during 1) the Styx Living Laboratory Trust's monthly waterbird monitoring, 2) Council's programmed slow walk bush bird transect surveys and 3) other incidental eBird reports. Of these, more than half (24) are indigenous species.

Table 5: Bird species recorded at Te Waoku Kahikatea Reserve. Species shown in bold type indicate indigenous species.

Species	Common name	Comment
Graylag goose	<i>Anser anser</i>	Uncommon
Canada goose	<i>Branta canadensis</i>	Uncommon
Black swan	<i>Cygnus atratus</i>	Resident
Paradise shelduck	<i>Tadorna variegata</i>	Common
Muscovy duck	<i>Cairina moschata</i>	Dumped/released at site
Australasian shoveler	<i>Spatula rhynchotis</i>	Common
Grey duck	<i>Anas superciliosa</i>	Regular
Mallard x grey duck hybrid	<i>Anas platyrhynchos x superciliosa</i>	Resident
Grey teal	<i>Anas gracilis</i>	Common
New Zealand scaup	<i>Aythya novaeseelandiae</i>	Common
Rock pigeon	<i>Colomba livia</i>	Resident
Barbary dove	<i>Streptopelia roseogrisea</i>	Uncommon
Shining cuckoo	<i>Chalcites lucidus</i>	Regular
Eurasian coot	<i>Fulica atra</i>	New resident
Pūkeko	<i>Porphyrio melanotus</i>	Common
Pied stilt	<i>Himantopus leucocephalus</i>	Flyover only
South Island pied oystercatcher	<i>Haematopus finschi</i>	Flyover only
Spur-winged plover	<i>Vanellus miles</i>	Flyover only
Southern black-backed gull	<i>Larus dominicanus</i>	Flyover only
Little pied cormorant	<i>Microcarbo melanoleucos</i>	Regular
Black cormorant	<i>Phalacrocorax carbo</i>	Uncommon
White-faced heron	<i>Egretta novaehollandiae</i>	Uncommon
Australasian harrier	<i>Circus approximans</i>	Common
Little owl	<i>Athene noctura</i>	Uncommon
Sacred kingfisher	<i>Todiramphus sanctus</i>	Regular
New Zealand falcon	<i>Falco novaeseelandiae</i>	Uncommon
Bellbird	<i>Anthornis melanura</i>	Common
Grey warbler	<i>Gerygone igata</i>	Common
Australian magpie	<i>Gymnorhyna tibicen</i>	Common
New Zealand fantail	<i>Rhipidura fuliginosa</i>	Common
Skylark	<i>Alauda arvensis</i>	Common
Welcome swallow	<i>Hirundo neoxena</i>	Common
Silvereye	<i>Zosterops lateralis</i>	Common
European starling	<i>Sturnus vulgaris</i>	Common
Song thrush	<i>Turdus philomelos</i>	Common
Eurasian blackbird	<i>Turdus merula</i>	Common
Dunnock	<i>Prunella modularis</i>	Common
House sparrow	<i>Passer domesticus</i>	Common
Common chaffinch	<i>Fringilla coelebs</i>	Common
European greenfinch	<i>Chloris chloris</i>	Common
European goldfinch	<i>Carduelis carduelis</i>	Common
Californian quail	<i>Callipepla californica</i>	Uncommon
Chinese ring-necked pheasant	<i>Phasianus colchicus</i>	Uncommon

Bush birds

On its own, Te Waoku Kahikatea Reserve would not support viable bush bird population in the long term. However, it will be a significant contributor to a city-wide bush bird **meta-population** - a population of populations that allows for some dispersal between patches (see also Meurk & Hall 2006). Because several native bush birds have already been recorded at Te Waoku Kahikatea Reserve, this indicates that native avian species can be expected to increase in both diversity and abundance as more habitat restoration is carried out and as the habitat continues to mature.

Waterbirds

Both the Styx Living Laboratory Trust and Council's ornithologist have been regularly monitoring waterbirds at Te Waoku Kahikatea Reserve for more than ten years. To-date, 14 species of indigenous waterbirds have been recorded at the site (refer Table 4), compared to just four exotic species. Three of these exotic species - greylag geese, Canada geese, and Muscovy ducks - are only rare visitors, while mallard-grey duck hybrids can occur in large numbers and often outnumber indigenous species.

Mallard-grey duck hybrids

This species appears to be experiencing increasing seasonal peaks over time where they occur on the main ponds between May and July in numbers sometimes well-exceeding 150 birds. During spring and summer (October to December) when birds are more dispersed during breeding, numbers drop to below 20 – 30 birds, and often less than 10.

Grey duck/pārerā

There remains a small but often overlooked resident breeding population of grey duck/pārerā (Threatened – Nationally Vulnerable) (Figure 14) surviving locally in saltmarshes and densely vegetated freshwater wetlands across Ōtautahi-Christchurch. The council's ornithologist has highlighted the ponds at Te Waoku Kahikatea Reserve as one of the sites with the most regular occurrences of this species in the city. This reinforces the need to continue to develop optimum habitat for this species and other indigenous waterbirds and to protect them from human disturbance. A threatened species recovery plan for grey duck/pārerā is currently being prepared by Council's Parks Biodiversity Team and will contain a range of recommendations that can be applied to Te Waoku Kahikatea Reserve.



Figure 14: A pair of grey duck/pārerā at The Groynes Reserve, Northwest Ōtautahi-Christchurch (Photograph A. Crossland 2005)

Actions

- ✓ Bolster lake margin planting (including in-filling areas of open exotic grass and establishing emergent rushes) to remove optimum habitat for Mallard and Canada geese.
- ✓ Design and install fine-scale habitat features such as roosts and emergent logs around lake margins to favour (E.g.) grey teal and cormorants.
- ✓ Maintain an effective vegetated buffer between the ponds and the walkway to minimise wildlife disturbance.
- ✓ Construct viewing hide at strategic location to provide optimal low/no impact wildlife viewing.
- ✓ Designate and enforce Te Waoku Kahikatea Reserve as a dogs-on-lead only site.
- ✓ Implement the recommendation of the planned grey duck threatened species recovery plan.
- ✓ Continue to carry out predator and pest animal control in collaboration with community partners and reserve neighbours.
- ✓ Consider Te Waoku Kahikatea Reserve as part of wider avian species reintroduction initiatives (E.g. Figure 15) across Ōtautahi-Christchurch as habitat increases and matures, and as predator control technologies evolve.



Figure 15: Consider Te Waoku Kahikatea Reserve as a future candidate site part of wider avian species reintroductions (E.g., South Island robin) across Ōtautahi-Christchurch (Photograph A. Shadbolt, 2024).

Herpetofauna values

The greater Ōtautahi-Christchurch area provides habitat for up to five species of native lizard (Table 6), all of which are ‘absolutely protected’ under the Wildlife Act 1953, s63 (1) (c), and lizard habitats are protected by the Resource Management Act (1991). At any site where lizards and/or their habitat has been identified, we are required to adhere to legislation outlined in the Wildlife Act, and the Christchurch City Councils Biodiversity Strategy to protect rare and threatened native biodiversity; understanding that it is unlawful to disturb or destroy protected wildlife or any protected game species.

Table 6: Five indigenous lizard species occurring on the greater Ōtautahi-Christchurch area.

Common Name	Scientific Name	Conservation Status
Southern grass skink	<i>Oligosoma aff. polychroma</i> , Clade 5	At Risk - Declining
McCann’s skink	<i>Oligosoma maccanni</i>	Not Threatened
Canterbury spotted skink	<i>Oligosoma aff. lineoocellatum</i>	Threatened - Nationally critical
Waitaha gecko	<i>Woodworthia cf. brunnea</i>	At Risk - Declining
Jewelled gecko	<i>Naultinus gemmeus</i>	At Risk - Declining

Indigenous lizard species often occupy habitats of otherwise low ecological value (i.e., weedy vegetation and vegetation margins) and are very cryptic species, making them difficult to detect and identify. Areas of vegetation such as exotic grasses, vines, shrubs, trees, and dense vegetation such as toetoe and harakeke often provide suitable habitat for indigenous lizards. Animals may also be found sheltering beneath objects (natural or manmade) that provide cover, such as pieces of wood, rocks, bricks etc.

To date, no lizard surveys have been done in Te Waoku Kahikatea Reserve, although there have been anecdotal and reliable sightings both here and at the immediately adjacent Ka Putahi Confluence Conservation Reserve in recent years, and we assume they will be reasonably widespread given both the age of the plantings and that they are interspersed with areas of rough grass and other habitat features such as large woody debris.

Species that expected to be present at Te Waoku Kahikatea Reserve – and/or could be released there include Southern grass skink and McCann’s skink which have conservation treat rankings of ‘At Risk – Declining’ and ‘Not Threatened’ respectively. Once the planted native forest has matured further, introductions of Waitaha geckos and jewelled geckos could be considered. Habitat at the reserve would not be suited to Canterbury spotted skinks reintroduction.

As part of further planning for lizard translocations to Te Waoku Kahikatea Reserve, a lizard survey will be completed. This survey will determine the size of the existing population which will in-turn inform how many animals we will be able to release so that we do not exceed the sites carrying capacity.

Actions

- ✓ Carry out a survey for lizards in key parts of the reserve to determine presence and/or populations level(s) to inform habitat development, management, and potential to use as a lizard translocation site .
- ✓ Optimise lizard carrying capacity at key locations through planting of lizard supporting species, creating fine scape habitat features, and carrying out targeted pest animal control.
- ✓ Work with the Councils herpetologist, park rangers and others to develop a plan(s) for the reintroduction of lizards – including Waitaha geckos and jewelled geckos - to the reserve.

Freshwater aquatic values

Although no aquatic ecology surveys have been done within in the reserve's ponds and naturalised waterways, the reserve is bordered by both the Pūharakekenui-Styx River (> 700 m) and Ka Putahi Creek (270 m) - both of which have high ecological values. Aquatic fauna (fish and aquatic invertebrates) has unrestricted access to the reserve's ponds and further upstream to the naturalised sections Radcliffe Road Drain and Mundys Drain.

Actions

- ✓ Conduct survey of aquatic fauna.
- ✓ Commence a programme of regular water quality monitoring of ponds, including pond inflow and outflow.
- ✓ Work with freshwater ecologists to design and incorporate various habitat modification and fine scale features to support indigenous aquatic fauna.
- ✓ Consider the need to work with DoC to carry out surveillance for pest fish.

Invertebrate values

Although no formal systematic invertebrate surveys have yet been carried out at Te Waoku Kahikatea Reserve, 48 species – including 19 indigenous species have been recorded on the iNaturalist website (**Refer Appendix 5**).

In December 2025, the Styx Living Laboratory Trust began a formal invertebrate monitoring programme using pitfall traps within two permanent sample plots (PSPs) at the eastern end of Te Waoku Kahikatea Reserve to collect baseline population data. Collected specimens have been preserved and stored at the Trust's field centre for later identification by entomologists and/or students as part of their citizen science work. The results of this monitoring will also provide data in support of future invertebrate, avian, and lizard/gecko reintroductions.

As new plantings at Te Waoku Kahikatea Reserve establish and begin to provide appropriate habitat, re-introductions/ translocations of appropriate invertebrate species could be carried out.



Figure 16: SCION forest scientist Alan Leckie demonstrates a pitfall trap at Te Waoku Kahikatea Reserve during the Styx Living Laboratory Trust's annual 'Summer in The Styx' event. (Photograph A. Shadbolt 2022)

Actions

- ✓ Collaborate with the Styx Living Laboratory Trust on their terrestrial invertebrate monitoring programme using such techniques as (E.g.) sweeping & beating, pitfall traps, malaise traps and/or light traps.
- ✓ Continue to enhance habitat to support indigenous terrestrial invertebrates through the planting of specific native plants and introduction of fine scale habitat features.
- ✓ Work with entomologist(s) to develop a terrestrial invertebrate reintroduction plan.

Restoration method

Successful restoration of Te Waoku Kahikatea Reserve sees the entire site restored as an indigenous forest dominated riparian ecosystem. This will involve:

- ✓ Planting large gaps and previously un-planted within existing plantings to maintain continuous forest canopy.
- ✓ Enrichment planting of under-represented species within existing planted areas.
- ✓ Enrichment planting with new species (E.g., Figure 17) in existing planted areas as appropriate microclimates develop.
- ✓ Under-planting existing planted areas with (e.g.) understory groundcovers, ferns and climbers.
- ✓ Managing open areas on the reserve as lizard habitat through managing exotic grass, establishing suitable groundcover and shrub species, and providing lizard refuge areas of woody debris and rock/stone.
- ✓ Eradication of pest plant species and exotic woody vegetation including willows and poplars along the Pūharakekenui-Styx River.



Figure 17: A Styx Living laboratory Trust volunteer planting seven-finger (*Schefflera digitata*) in the forest understory at Te Waoku Kahikatea Reserve (Photograph A. Shadbolt 2025).

Restoration zoning

To aid planning of the forest, the proposed planted area has been separated into ten distinct zones (Figure 18), based on distinct ecosystem types. These zones include:

- 1) **Mixed podocarp-broadleaved forest on drier soils:** This is the most dominant forest type within Te Waoku Kahikatea Reserve, covering approximately four hectares. This forest is dominated by totara, matai and kahikatea trees planted at 3 - 5 m centres with a wide selection of other locally sourced trees, shrubs and climbers.
- 2) **Dense kahikatea dominated forest on moist soils:** Towards the east end of the reserve, kahikatea has been planted in dense stands on a low wet floodplain.
- 3) **Mixed woodland/shrubland on dry sandy soils:** Original planting on an old sandy ridge near the eastern end of the reserve have struggled to establish and has resulted in a unique open woodland/shrubland environment.
- 4) **Riparian and in-stream ecosystems along restored waterways:** This zone covers the constructed and naturalised sections of Radcliffe Road Drain and Mundys Drain and includes the established riparian plantings (dominated by pukio sedge) and the instream habitat.
- 5) **Riparian ecosystems along wet pond margins:** Lake margins are dominated by planted and self-established pukio sedge and harakeke that blend seamlessly with the contiguous native forest and shrubland ecosystems.
- 6) **Low wet floodplain along Ka Putahi Creek:** Riparian wetland/floodplain planting here is again dominated by pukio sedge and harakeke that blends seamlessly with dense ti kouka stands. This zone also hosts the at-risk/declining swamp nettle (*Urtica persconfusa*) along the margins of Ka Putahi Creek.
- 7) **Steep riparian edge along Pūharakekenui-Styx River:** The entire >700 m length of the Pūharakekenui-Styx River in this section is characterised by steep – sometimes vertical – banks. Towards the upstream end, large poplar and willow trees are the dominate feature of this zone, while most have already been removed from the downstream section. We will gradually phase these large poplars and willows out over time (Refer Table 8) as they are supressing native plantings, contributing significant amounts of leaf-fall to the river which adversely effects water quality, and are a continual problem for managing waterway conveyance and navigation.
- 8) **Induced wetland at Radcliffe Road frontage:** Here an historic flowing freshwater bore has induced a wetland area that occupies roughly the footprint of the former farmhouse and offers a unique restoration opportunity.
- 9) **Grass mound (proposed lizard habitat):** Near the Radcliffe Road frontage of the reserve, a large mown grass mound – formed from surplus cut material from the reserve's ponds - is proposed to be planted as grassland/shrubland habitat that can support translocated lizard populations.
- 10) **Mown grass paddock (proposed open woodland):** Approximately 2600 m² of mown grass at the Radcliffe Road frontage is proposed to be planted with native specimen trees to create an open woodland that still allows for overflow car parking.

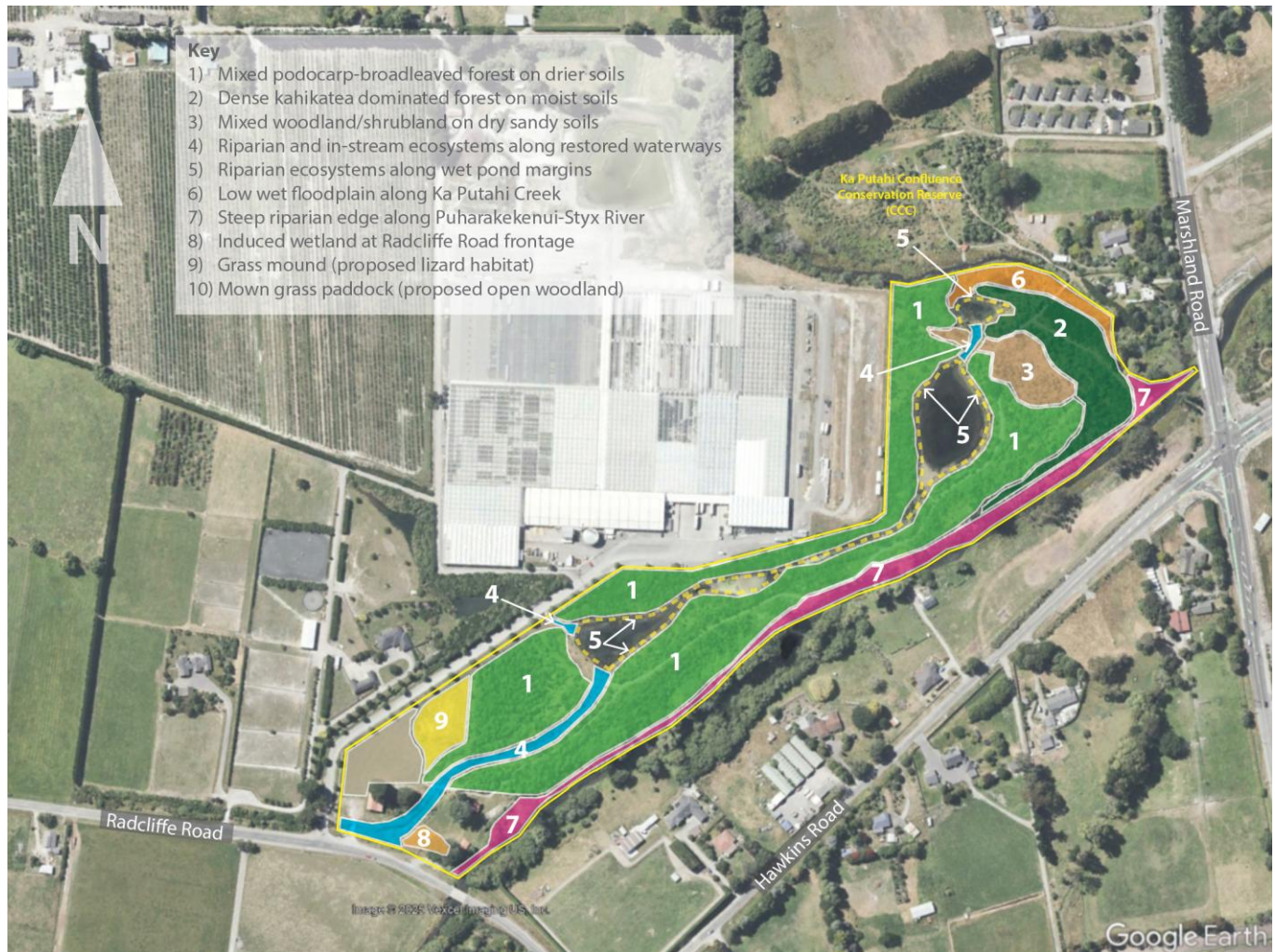


Figure 18: Restoration Zones at Te Waoku Kahikatea Reserve

Planting

Species selection

As part of the Council's 'Agenda 21' project undertaken by Lucas and Associates⁶, the land surfaces of Ōtautahi-Christchurch were mapped for their approximate age, soil development, drainage, analogy with surviving remnants and historic accounts of the former natural mature vegetation/ecosystems. Each area was reconstructed as a model to be used as a guide for restoration, and plant lists were compiled for each of the ten original indigenous ecosystems including trees, shrubs, scramblers and ground covers.

The Lucas & Associates maps show Te Waoku Kahikatea Reserve mostly located on lush, wet, older Taitapu soils, bordered by an intricate complex of lush, dry soils along the Pūharakekenui-Styx River and mid-aged Waimakariri along Kā Pūtahi Creek (Figure 19). In reality though, these soils have been significantly modified by historic farming practices and by subsequent earthworks associated with creating constructed ponds and waterways in the early 2000s. The soil types described in Lucas and associates should therefore be used as a guide only, and further restoration activities will be guided by fine-scale site assessment. As-such, species suitable for planting at Te Waoku kahikatea could be selected from several of the Lucas and Associates lists, including:

⁶<https://www.lucas-associates.co.nz>

- ✓ **‘Kahikatea/Kereru – Mānatu’** lush older plains ecosystem
- ✓ **‘Houhere/Piwakawaka – Kōhūhū’** mid age plains ecosystem
- ✓ **‘Totara/Bellbird – Matai’** older plains ecosystem
- ✓ **‘Tussock/Green Skink – Ti Kouka’** young plains ecosystem
- ✓ **Ti Kouka/kotare – kanuka** mid-age plains ecosystem

NOTE: All species used for forest restoration planting at Te Waoku Kahikatea Reserve shall be eco-sourced from naturally occurring vegetation remnants the Low Plains Ecological District or nearest appropriate location as approved by Council’s parks ecologist.



Figure 19: Location of Te Waoku Kahikatea Reserve (yellow polygon) in relation to various ecosystem types based on underlying soils (Source: Lucas and Associates Indigenous Ecosystems of Ōtautahi Christchurch).

Planting remaining un-planted areas

Although Te Waoku Reserve is almost entirely planted and thriving, there are 11 areas of either mown/managed turf, unplanted areas, and/or areas where previous plantings have failed that can be restored as part of the forest reserve ecosystem (Refer Figure 20). These are briefly described below, with indicative species lists for each area provided in **Appendix 6**.

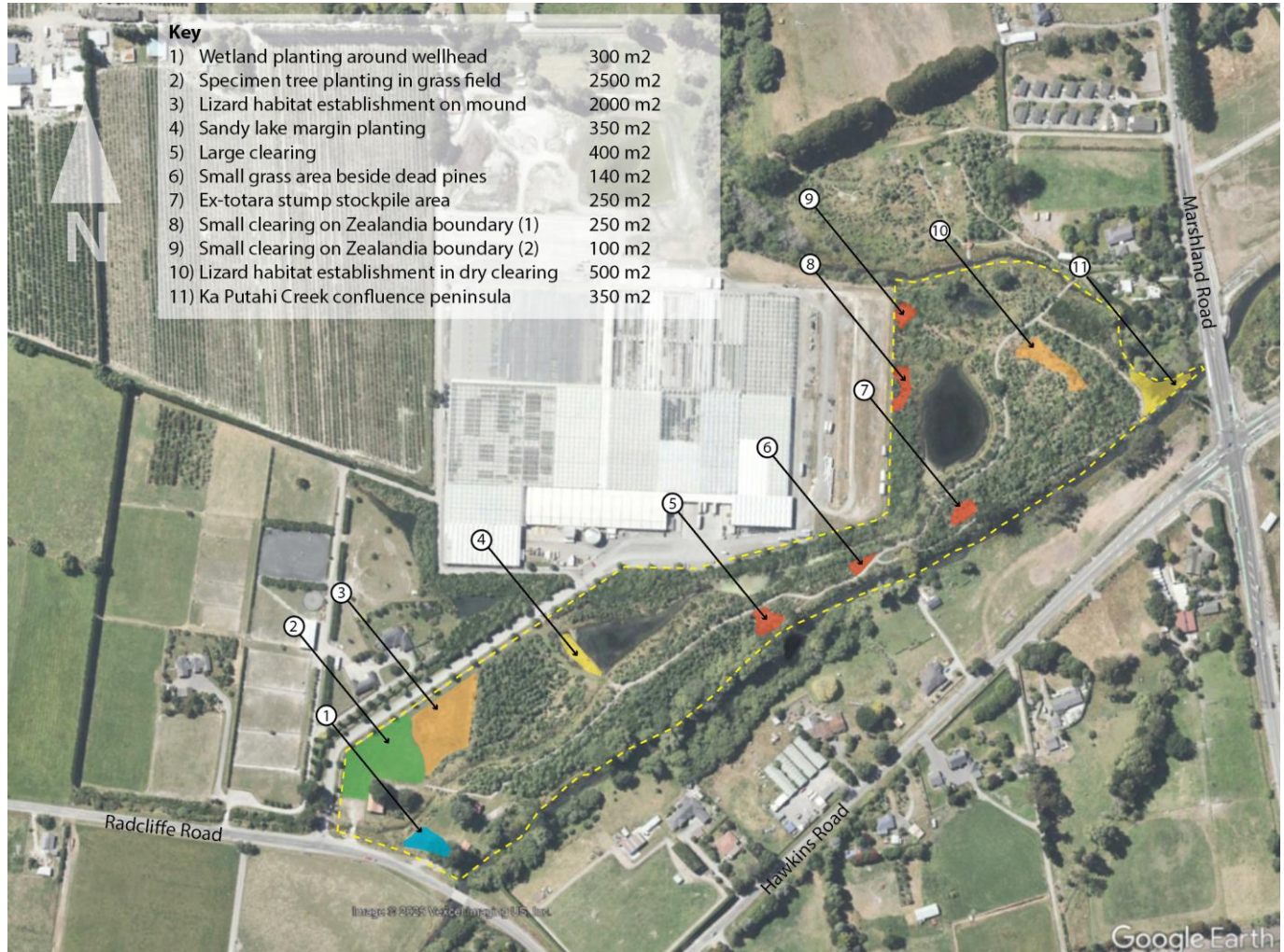


Figure 20: Proposed planting of key un-planted areas and clearings at Te Waoku Kahikatea Reserve.

Area 1: Wetland planting around wellhead (300 m²)

A slowly leaking artesian bore has created a permanent wetland near the frontage of the reserve at Radcliffe Road. This unique situation allows for the establishment of native sedges and native wet turf species.

Area 2: Specimen tree planting in grass field (2500 m²)

The large mown grass paddock at the Radcliffe Road frontage is currently used only once each year to cater for carparking for the Styx Living Laboratory Trust's annual 'Summer in The Styx' event. We propose to plant native specimen trees into the grassed area with strategically arranged low native groundcover plantings that increase canopy and habitat coverage while still allowing for overflow carparking for events. A detailed planting plan for this area is provided in **Appendix 7**.

Area 3: Lizard habitat establishment on mound (2000 m²)

The large earth mound within the mown area near the Radcliffe Road frontage will be planted with native tussocks, shrubs and vines to provide habitat for lizards that needs to be salvages and translocated from other sites around Ōtautahi-Christchurch. The area will also host a series of fine-scale habitat features and lizard refuges such as log piles and stone mounds. Prior to planting and lizard release, we propose to construct a chip-surfaced pathway to the top so that the mound can also be used as a elevated lookout area across the reserve.

Area 4: Sandy lake margin planting (350 m²)

At the southern end of the first lake, soils along its margin are unusually sandy and previous plantings have mostly failed. We propose to re-plant this area with species that are likely to be more tolerant of sandy but often wet soils to provide a better lake margin buffer.

Area 5: Large clearing (400 m²)

A large area partway along the reserve has been used as an open area to process logs and chipping from a tree removal project several years ago. This area contains a thick layer of well-rotted wood chip, and we propose to plant this area with native forest species and provide a series of features and opportunities for 'nature play'.

Area 6: Small grass area beside dead pines (140 m²)

A small grass area at the centre of the reserve has never been planted. This area has needed to be regularly mown or scrub-barred, and we propose to extend native forest into this area to increase tree canopy and reduce ongoing maintenance effort.

Area 7: Ex-totara stump stockpile area (250 m²)

The area around an old stockpile of totara stumps and logs was never fully planted and remains in a state of long rank grass with a small number of isolated trees – including a small grove of celery pines (*Phyllocladus trichomanoides*). We propose to in-fill this area with mostly small leaved coprosmas that will not outcompete the slow growing celery pines.

Area 8: Small clearing on Zealandia boundary (1) (250 m²)

Several years ago, a fire originating from Zealandia Nursery killed a small area of native forest within the reserve, leaving a small clearing. We propose to re-plant this area with podocarp dominated native forest.

Area 9: Small clearing on Zealandia boundary (2) (100 m²)

A smaller area near to the Zealandia fire site (Area 8) will also be replanted with podocarp dominated forest.

Area 10: Lizard habitat establishment in dry clearing (500 m²)

Like the grass mound (Area 3), a sandy, dry clearing will be planted with native tussocks, shrubs and vines to provide habitat for lizards that needs to be salvages and translocated from other sites around Ōtautahi-Christchurch. The area will also host a series of fine-scale habitat features and lizard refuges such as log piles and stone mounds. Prior to planting and lizard release we also propose to form a chip-surfaced nature walk through this zone.

Area 11: Ka Putahi Creek confluence peninsula (50 m²)

A narrow peninsula at the confluence of Ka Putahi Creek with the Pūharakekenui-Styx River has remained as long rank exotic grasses. This area is highly visible from the Marshland Road bridge and intersection, and we intend to plant the area and maintain it as a main 'shopwindow' view into Te Waoku Kahikatea Reserve. Eventually we envisage that a pedestrian bridge will be built here to link Te Waoku Kahikatea Reserve to Janet Stewart Reserve, however this is likely many years off still.

Path edge planting

Because we found that wildfire ignition susceptibility at Te Waoku Kahikatea Reserve was more a result of lower levels of management of the long exotic grass growing along path edges rather than fuel loads produced by the restoration plantings themselves, we intend to bolster these areas with additional planting. This will suppress the exotic grass, remove an ongoing source of exotic weed, and increase indigenous vegetation and habitat throughout the reserve. Planting these unmanaged margins will also result in lower maintenance requirements for these areas.

Species suited to path-edge planting include (but not limited to) those listed in Table 7 (below). This list is based on species' fire risk ratings from Lucas Associates Indigenous Ecosystems of Ōtautahi-Christchurch. Note that only around 1/3 of the species in the Lucas Associates lists had fire risk ratings, and therefore there are likely to be other species from those lists that could be used also but will need assessed on a species-by-species and specific location/setting basis.

Table 7: Low and medium fire risk species suitable for path edge planting as listed in Lucas Associates Indigenous Ecosystems of Ōtautahi-Christchurch.

Botanical name	Common name	Fire risk
<i>Aristotelia serrata</i>	wineberry	Low
<i>Carpodetus serratus</i>	marbleleaf	Low
<i>Coprosma crassifolia</i>	thick-leaved mikimiki	Medium
<i>Coprosma propinqua</i>	mikimiki	Low
<i>Coprosma robusta</i>	karamū	Medium
<i>Fuchsia excorticata</i>	tree fuchsia	Low
<i>Griselinia littoralis</i>	kāpuka/broadleaf	Low
<i>Hoheria angustifolia</i>	houhere/South Island lacebark	Medium
<i>Leucopogon fasciculatus</i>	dwarf mikimiki	Medium
<i>Leucopogon fraseri</i>	patotōtara (a dwarf heath)	Medium
<i>Meliclytus ramiflorus</i>	māhoe/whiteywood	Low
<i>Myrsine australis</i>	red maupo	Low
<i>Pennantia corymbosa</i>	kaikōmako	Low
<i>Pittosporum eugenioides</i>	lemonwood	Medium
<i>Pittosporum tenuifolium</i>	kōhūhū	Medium
<i>Plagianthus regius</i>	mānatu/lowland ribbonwood	Low
<i>Prumnopitys ferruginea</i>	miro	Medium
<i>Prumnopitys taxifolia</i>	matai	Medium
<i>Pseudopanax arboreus</i>	five-finger	Low
<i>Pseudopanax crassifolius</i>	lancewood	Low
<i>Rubis cissoides</i>	tataramoa	Medium
<i>Schefflera digitata</i>	seven-finger	Low
<i>Sophora microphylla</i>	South Island kowhai	Low

Lake edge planting

There is approximately one kilometre of lake margin within Te Waoku Kahikatea Reserve. While some of this margin is well vegetated right to the water's edge with (E.g.) harakeke, pukio sedges and rushes, large lengths are still characterised by areas of low exotic grass (E.g. Figure 21 & 22). These areas provide ideal roosting areas for mallard ducks which dominate the ponds, especially during winter. We intend to progressively remove these roosting opportunities by beginning a programme of infill planting into these open sites using eco-sourced lake margin species. Planting around 500 plants per year and focussing on one section at a time, would complete this planting within five years. A planting list for lake margins is provided in **Appendix 6**.



Figure 19: Western/upstream pond at Te Waoku Kahikatea Reserve showing typical margin characterised by low exotic grasses amongst established restoration plantings (Photograph: A. Shadbolt 2025).



Figure 22: Eastern/downstream pond at Te Waoku Kahikatea Reserve showing typical pond margin characterised by low exotic grasses amongst established restoration plantings (Photograph: A. Shadbolt 2025).

Enrichment planting

Although there are approximately 100 species of indigenous plant established at Te Waoku Kahikatea Reserve, many are represented by only a small number of individuals. While some species may have been naturally rare in local native forests, we can establish larger, more viable populations of under-represented species (**See Appendix 3**) through enrichment planting. We will also establish populations of locally appropriate species that do not yet occur at the site (**Appendix 4**) and would also be unlikely to establish on their own due to the absence of nearby seed sources. Enrichment species may include:

- ✓ Forest floor species,
- ✓ Understorey species,
- ✓ Sub-canopy species (e.g., Figure 22),
- ✓ Canopy and emergent tall species,
- ✓ Climbers (e.g. Figure 23),
- ✓ Epiphytes.

Enrichment planting will be undertaken in clusters of 3 – 7 individuals, comprising either single species or complementary species combinations, to establish a series of micro-refugia.

Clusters will be spaced at intervals of 4 – 6 metres, replicating natural regeneration patterns and enhancing local microclimates, while also supporting understorey connectivity and allowing for ongoing canopy regeneration.

Within each cluster, plants will be spaced 0.5 – 2 m apart depending on the types of plants, for example:

- ✓ Ground/low ferns & small seedlings: 0.5 – 1.0 m.
- ✓ Small shrubs and juvenile understorey trees: 1.0 – 2.5 m.
- ✓ Climbers: within 1.0 m of a support tree/shrub.

Enrichment planting will predominantly be done in Zones 1 and 2 (refer Figure 18)



Figure 23: Seven-finger (*Schefflera digitata*) planted as part of enrichment planting at Te Waoku Kahikatea Reserve (Photograph: A. Shadbolt 2025).



Figure 24: Early enrichment plantings of native clematis (*Clematis paniculata*) are now well established at Te Waoku Kahikatea Reserve (Photograph: A. Shadbolt 2025).



Figure 25: Styx Living Laboratory Trust field team worker planting enrichment species in the forest understorey at Te Waoku Kahikatea Reserve (Photograph: A. Shadbolt 2025).

Addition of woody debris

Because natural forests and woodlands have a high proportion of standing deadwood and downed woody debris in their understories, it is desirable to arrange for the importation of logs and stumps. Supply of this type of material can normally be easily arranged with local arboricultural contractors who are working in the area, as dropping it at convenient pre-arranged locations often helps them avoid transportation and disposal costs.



Figure 20: Ancient totara stumps excavated from the site during construction of the ponds and waterways have been installed throughout the lower sections of Te Waoku Kahikatea Reserve and are now supporting native seedling growth (Photograph: A. Shadbolt 2024).

Fine-scale habitat features

Over the years, several fine scale habitat features have been designed and installed at Te Waoku Kahikatea Reserve. These features have been developed and installed under the supervision of Council's ecologists, and ecologists from Manaaki Whenua Landcare Research. They have included (clockwise from top-left in Figure 27 and see also Figure 28):

- ✓ Retention of dead tree spars to replicate storm damage in forests and included the creation of artificial nest cavities. Although these cavities were installed mainly for interpretation/educational purposes, they included cavities sized for the native cavity-nesting grey teal (A).
- ✓ Fine-scale excavations to create damp hollows and bio-nodes in dry parts of the site to provide summer refuge for invertebrates and lizards (B).
- ✓ A gabion basket filled with ponga logs, harakeke flower stems, bundled ti-kouka leaves, woody debris and river stones submerged in the main pond to provide a high degree of underwater complexity that could be colonised by (e.g.) fish, koura/freshwater crayfish and other aquatic invertebrates (C).
- ✓ Creation of small islets out from the lake margins to create a more diverse/complex lake margin environment. These islets were planted with pukio sedge (*Carex secta*) (D).
- ✓ Harakeke flower stems and ponga logs installed/inserted along the lake margin to trap debris and create a higher level of riparian margin diversity. Where ponga logs were inserted, these were quickly colonised by pukio sedge (*Carex secta*) which are now well-established (E).
- ✓ Clay bricks stacked and partially buried to provide cool damp refuges from predators for native lizards and terrestrial invertebrates (F).

Note that apart from the quick colonisation of the ponga logs by pukio sedge, use of dead spars by cormorants and paradise shelducks, and use of artificial cavities by introduced passerine birds, the other habitat features have yet to be assessed to determine their success.

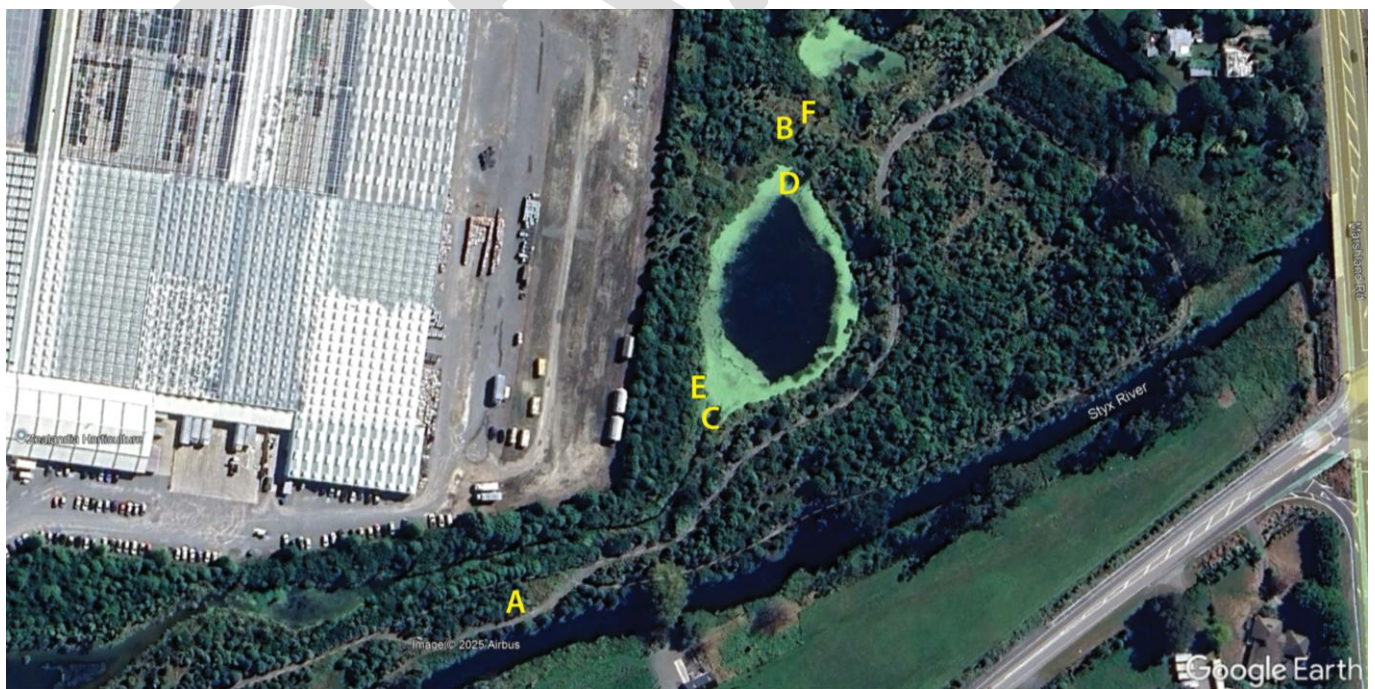


Figure 27: Location of six fine scale habitat enhancement features at Te Waoku Kahikatea Reserve (See also Figure 13).



Figure 28: Six fine-scale habitat features installed at Te Waoku Kahikatea Reserve, including (clockwise from top-left): A) Dead tree spars and decay cavities, B) careful creation of fine scale topography in the form of damp hollows/biota nodes, C) debris-filled gabion basket submerged in pond, D) creation of planted islets, E) insertion of harakeke flower stems and ponga logs to trap debris and create complex lake margins, and F) partially buried red bricks and organic matter for lizard and invertebrate refuges (Photographs: A. Shadbolt).

Ongoing management

Ongoing management of the site following the initial 24-month maintenance period shall be limited to the following activities.

- ✓ Ongoing planting of understorey species and enrichment plantings as appropriate microclimates develop.
- ✓ Encourage the establishment and growth of podocarps, other emergent species, and under-represented tree species by creating canopy openings through the selective removal or pruning of competing trees.
- ✓ Control of woody weeds and vines throughout planted areas (E.g., karo, grey willow, sycamore, Chilean mayten, cherry, North Island lacebark, old man's beard, ivy).
- ✓ Control of grass and herbaceous weeds around the periphery of the forest areas, and particularly along pathways for both aesthetics and wildfire mitigation.
- ✓ Ongoing pest animal control by either the New Zealand Conservation Trust, or as part of Council's Parks Operational Pest Animal Management Plan.
- ✓ Monitor feral pigeon populations and continue to remove.
- ✓ Monitoring of lizard populations and pest animal control as required by Lizard Management Plans.
- ✓ Removal and disposal of off-site (or re-use on-site) of plant guards.
- ✓ Removal and disposal (off-site) of rubbish and debris.
- ✓ Careful/strategic preemptive pruning and vegetation clearance along the walkway to ensure the walkway remains un-obstructed whilst still maintaining the natural form of plants and natural character of the reserve (E.g., Figure 29)

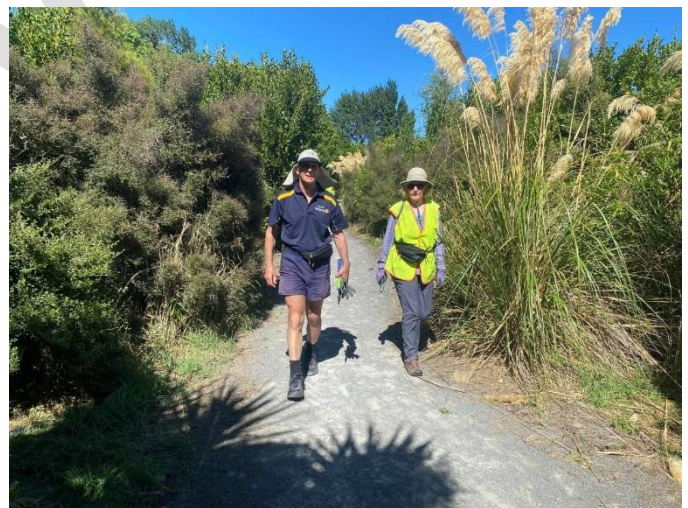


Figure 29: Volunteers from Riccarton Rotary maintaining path edges (Photograph: A. Shadbolt 2024).

Supporting restoration efforts on adjacent sites

Restoration efforts have also been carried out on several immediately adjacent sites (Refer Figure 30), including:

- ✓ Council's Kā Pūtahi Confluence Conservation Reserve (26,000 m²) (1)
- ✓ A 300 m strip along the true left bank of Kā Pūtahi Creek behind Zealandia Nursery (1500 m²) (2)
- ✓ A naturalised stormwater pond at 283 Radcliffe Road (6000 m²) (3)
- ✓ A 190 m extension of Radcliffe Road Drain upstream from the reserve (3000 m²) (4)
- ✓ A 100 m strip along the Pūharakekenui-Styx River at 743 Hawkins Road (1700 m²) (5)
- ✓ A 175 m strip along the Pūharakekenui-Styx River at 745 Hawkins Road (5000 m²) (6)
- ✓ A 330 m strip along the Pūharakekenui-Styx River at 777 Hawkins Road (4500 m²) (7)

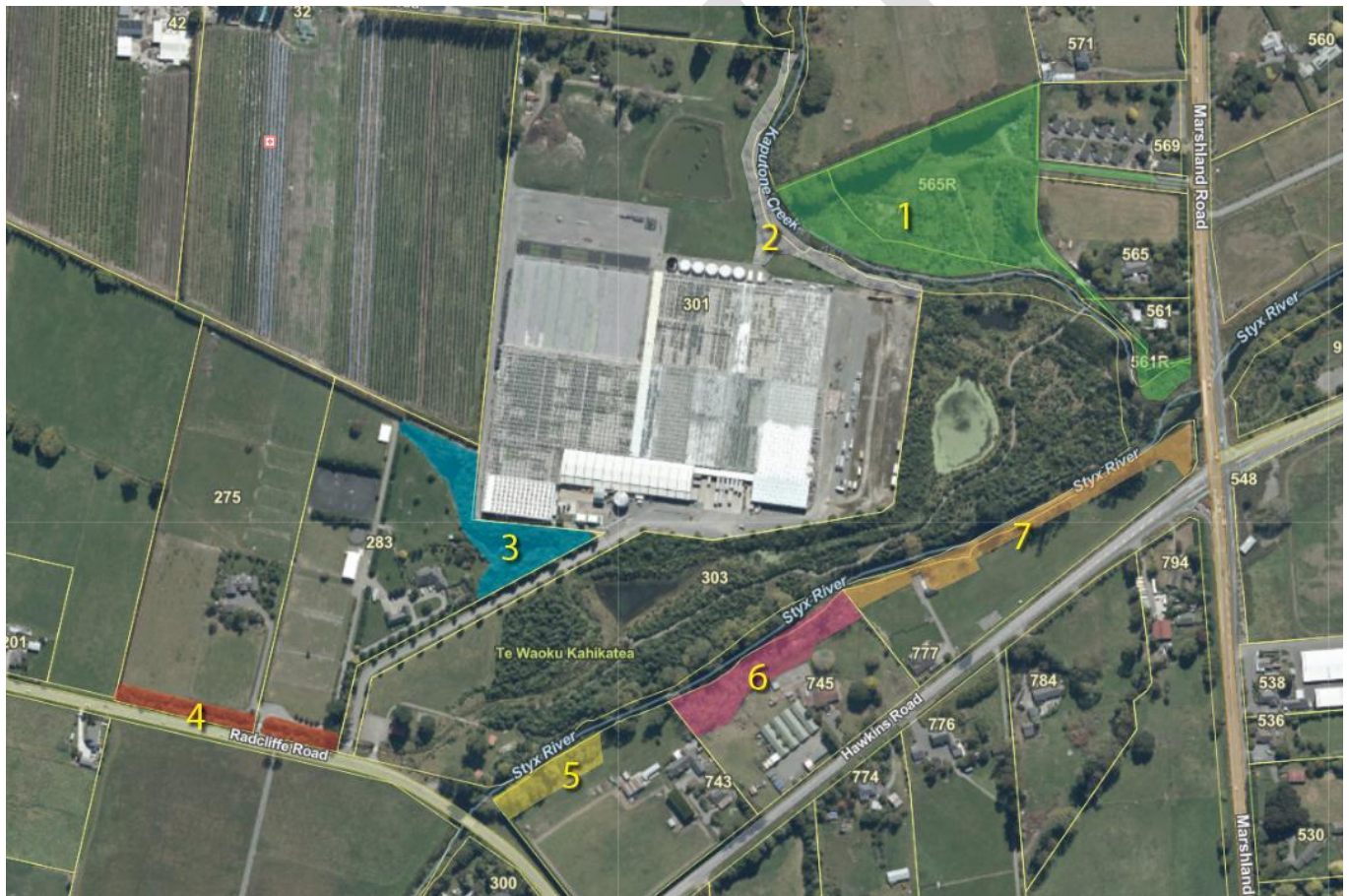


Figure 30: Other restoration sites immediately adjacent to Te Waoku Kahikatea Reserve that help increase the effective area of the reserve and buffer it from the effects of adjacent land uses (Refer above for description of sites).

Together, these additional restoration sites cover more than 4.7 hectares and help increase the effective area of Te Waoku Kahikatea Reserve and help buffer it from the effects of nearby land uses. We intend to continue to work with landowners and land managers to support their efforts to restore and further enhance biodiversity values on their properties. Because most of these sites are fully within private land, we anticipate that much of this work will be led and funded by third parties, including (but not limited to) the Styx Living Laboratory Trust and/or the landowners themselves. Council staff will continue to provide ecological restoration advice to these parties.

Kā Pūtahi Confluence Conservation Reserve (1)

Continue to support the Kahu Kura Rongoa Māori Trust to manage their restoration plantings. Because this is also a Council Regional Park, restoration activities will be very similar to those described for Te Waoku Kahikatea Reserve, including (e.g.) pest plant and animal control, enrichment planting, and provision of fine-scale habitat features.

Kā Pūtahi Creek margin at Zealandia Nursery (2)

This site - including a natural freshwater spring - was fenced and planted as a partnership between Council and the Wylaars family who own and manage Zealandia Nursery. Little maintenance/management of these plantings has been done since planting and support for restoration at this site would mainly include woody weed control and in-fill planting with appropriate riparian species.

Naturalised stormwater ponds at 283 Radcliffe Road (3)

These ponds were excavated and naturalised at the same time as the lakes/ponds within Te Waoku Kahikatea Reserve were constructed. The ponds and plantings sit within a drainage easement on the private property, and the plantings are currently maintained to a good standard by the landowner. Future restoration activities at this site could include enrichment planting, woody weed surveillance and control, and support for pest animal control from either the NZ Conservation Trust or the Styx Living Laboratory Trust's trap library.

Radcliffe Road Drain (4)

Plantings along this 190 m stretch of naturalised drain upstream from Te Waoku Kahikatea Reserve pre-date the plantings within the reserve itself and are well established. As with the ponds at 283 Radcliffe Road, these plantings also sit within drainage easements within the privately owned 275 and 283 Radcliffe Road properties. Further Restoration activities here would mostly include ongoing pest plant/woody weed control and management/enhancement of in-stream habitat as directed by a freshwater ecologist. There is also scope for enrichment planting – including understorey species and climbers - and scope also exists to extend the plantings into grass berms within the road reserve area to increase the waterway's buffer width. Planting within the road reserve will require permission from Council's City Streets team.

743 Hawkins Road (5)

A small (3000 m²) willow woodland area at the west end of the property was prepared and planted several years ago. As part of this initial project, some willow control was carried out, however there has been significant re-growth over the intervening years and willow is now compromising restoration efforts within this area. Further restoration activities at this site should prioritise the control of crack, grey willow, and other woody weed species, and infill planting with podocarp-dominated riparian/floodplain forest. Scope may exist to discuss with the landowner any potential for extending planting further downstream to link to restoration plantings at 745 Hawkins Road and beyond.

743 Hawkins Road (6)

In 2024 the Styx Living Laboratory Trust entered into a private landowner agreement to carry out willow control and restoration planting to further enhance a previously planted site that had deteriorated following the Christchurch 2010/2011 earthquakes. The Trust engaged Wai Ora Landscapes to carry out willow control, and the Trust's paid field crew completed the planting that year. The site is currently just 12 months into a 24-month establishment period, but once this maintenance contract has finished, the site will require ongoing work to manage woody weeds, hand and/or spray release slow growing species, and continue to carry out infill and enrichment planting. Support for pest animal control from either the NZ Conservation Trust or the Styx Living Laboratory Trust's trap library would be beneficial for this site given its significant size (5000 m²) that extends >25 m back from the river's edge through much of its length.

777 Hawkins Road (7)

This site (Figure 31) has been planted in two stages: 1) an initial Council-led and funded planting dominated by sedges and harakeke with a previous landowner more than five years ago, and 2) a more recent (2023) planting by the Styx Living Laboratory Trust to enrich/bolster the original planting and extend it up and down stream to cover the full length of the property. This planting is almost out of its 24-month establishment period with the Styx Living Laboratory Trust however ongoing work is needed to in-fill recent plantings to achieve full coverage of the site. Future restoration work at 777 Hawkins Road will include working with the landowners to discuss the potential for a phased removal of gum trees within the riparian planting, surveillance and control of woody weeds, enrichment planting, extending the planting at the downstream end of the site in the vicinity of Canal Reserve Drain, and options for pest animal control.



Figure 31: View looking upstream along the Pūharakekenui River from the Marshland Road bridge showing wide riparian plantings along the true right bank (left) on private property at 777 Hawkins Road (Photograph: A. Shadbolt 2025).

Implementation plan

We intend to continue to establish and further enhance restoration plantings and habitat at Te Waoku Kahikatea Reserve through various funding streams, including:

- ✓ Council's capital (CAPEX) budgets for Regional Park green assets (E.g., planting new areas),
- ✓ Council's operational (CAPEX) budgets for Regional Parks management (E.g., in-fill and weed control),
- ✓ Third-party funding and/or in-kind support, for example:
 - Styx Living Laboratory Trust
 - New Zealand Conservation Trust
 - Conservation Volunteers New Zealand
 - Trees for Canterbury
 - Corporate support
- ✓ Council's rolling programme of urban forest planting (E.g., for the Radcliffe Road frontage area),
- ✓ Council's programme of establishing habitat for translocated lizard populations.

All activities will be subject to Council's Long-Term Plan (LTP) and Annual Plan budgets, and/or third-party support. Suggested implementation timeframes are shown in Table 8 (below).

Table 8: An indicative implementation programme for Te Waoku Kahikatea Reserve.

Action	Lead	Timing
Pest control		
Pest animal control	New Zealand Conservation Trust	Ongoing
Pest plant control	Christchurch City Council	Ongoing
Feral pigeon control	Christchurch City Council	2026
Exotic tree removal/replacement along Pūharakekenui-Styx River	Christchurch City Council	2026 - 2036
Restoration planting		
Establish lizard habitat	Christchurch City Council	2026 - 2027
Plant specimen trees at Radcliffe Rd Frontage	Christchurch City Council	2026 - 2027
Plant remaining un-planted forest/shrubland areas	Styx Living Laboratory Trust	2026 - 2030
Bolster lake margins with emergent species to discourage mallard	Christchurch City Council	2026 - 2030
Track edge planting	Styx Living Laboratory Trust	2028 - 2033
Enrichment planting	Styx Living Laboratory Trust	Ongoing
Habitat features		
Incorporate woody debris into site to support invertebrates	Christchurch City Council	2027
Install fine scale habitat features in and around lakes	Christchurch City Council	2027
Research needs		
Commence permanent monitoring plot (PSP) monitoring	Styx Living Laboratory Trust	2025
Commence terrestrial invertebrate surveys	Styx Living Laboratory Trust	2026
Commence freshwater aquatic and water quality monitoring	Styx Living Laboratory Trust	2026
Other		
Commence programme of invertebrate reintroductions	Styx Living Laboratory Trust	2027
Waitaha gecko and jeweled gecko reintroduction	Community partner	2027
Construct bird viewing hide overlooking main lake	Christchurch City Council	2030

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Appendix 1: Ecological significance assessment

Despite its human-constructed nature, Te Waoku Kahikatea Reserve has been evaluated against the criteria for determining significant indigenous vegetation and significant habitat of indigenous fauna listed in Appendix 3 of the Canterbury Regional Policy Statement (Environment Canterbury, 2013). Under these criteria the site has been listed as a Site of Ecological Significance (SES) in the Christchurch District Plan because it meets the representativeness (criteria 1 & 2), rarity/distinctiveness (criteria 3 & 4), and ecological context criteria (criterion 8) discussed further below:

Representativeness

Criterion 1: Te Waoku Kahikatea Reserve contains indigenous vegetation or habitat of indigenous fauna that is *representative, typical or characteristic* of the natural diversity of the Low Plains Ecological District. This can include degraded examples where they are some of the best remaining examples of their type or represent all that remains of indigenous biodiversity in some areas. Young riparian, forest and shrubland plantings within Te Waoku Kahikatea Reserve contain 84 species of locally sourced indigenous flowering plants and ferns, including 38 of the 50 local tree and shrub species recorded from Riccarton Bush (see Molloy 1995), as well as a range of other native tree and shrub species identified as likely to have naturally occurred locally by Lucas Associates⁷. Therefore, young the restoration plantings within this reserve are representative of local indigenous forest vegetation in the Low Plains Ecological District.

Criterion 2: The reserve supports Indigenous vegetation or habitat of indigenous fauna that is a *relatively large* example of its type within the relevant ecological district. The site is significant under this criterion. The extent of locally sourced and planted indigenous forest and riparian areas within the reserve covers an area of approximately 6.90 hectares and is larger than the area of Riccarton Bush (the largest natural forest patch of its type in the Low Canterbury Plains Ecological District). The site is therefore a relatively large example of its type in the region



⁷ <https://www.lucas-associates.co.nz/christchurch-banks-peninsula/christchurch-ecosystems/>

Rarity/Distinctiveness

Criterion 3: The site contains indigenous vegetation or habitat of indigenous fauna that has been *reduced to less than 20%* of its former extent in the region, or relevant land environment, ecological district, or freshwater environment. The Threatened Environment Classification reports that less than 10% of indigenous cover remains in the Low Plains Ecological District (See Walker *et al.* 2007; Lloyd *et al.* 2013). Lloyd *et al.* (2013) identify that “any indigenous vegetation on the Canterbury Plains” meets this Rarity/Distinctiveness criterion.

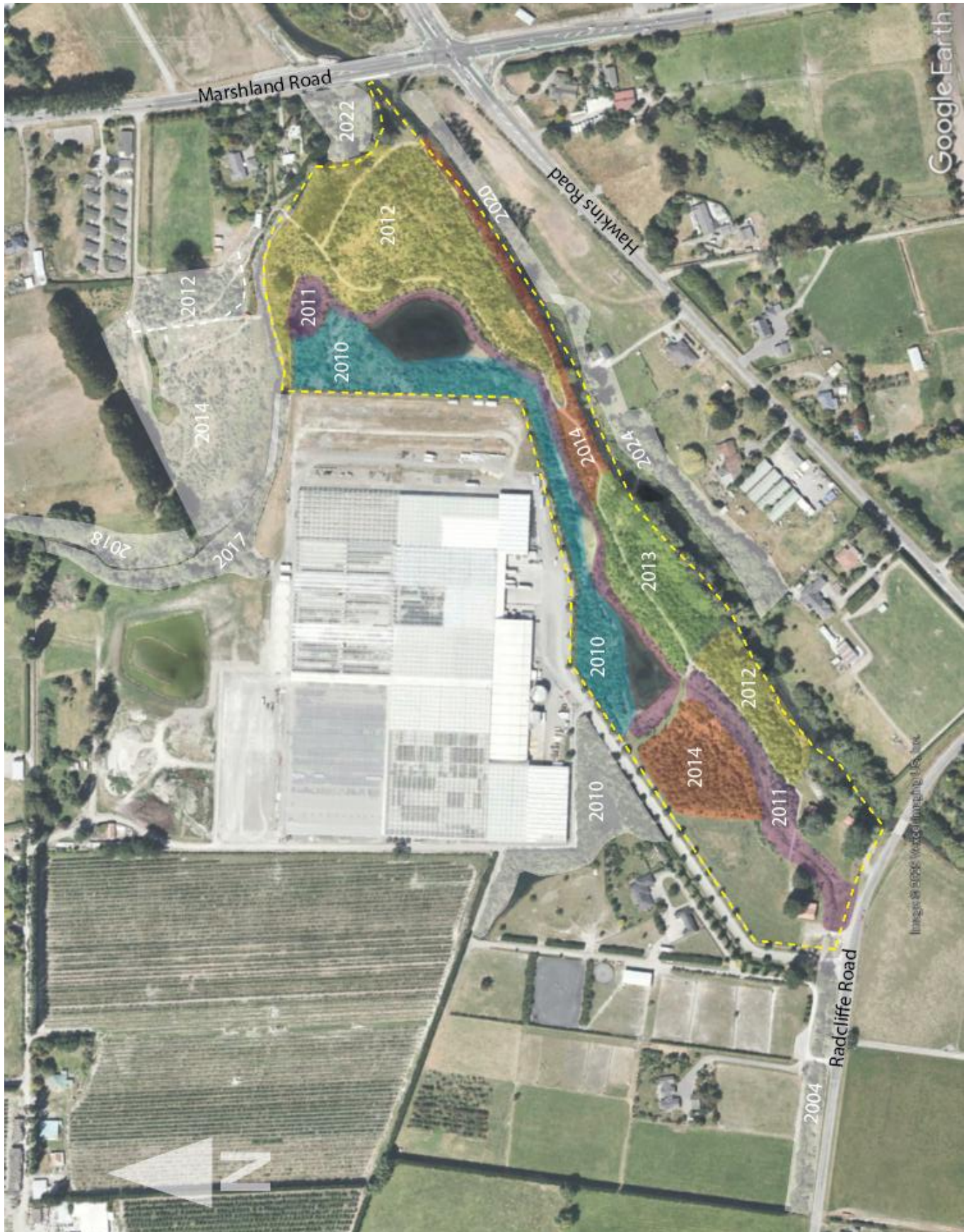
Te Waoku Kahikatea Reserve is significant under this criterion, where more than 6.5 hectares of kahikatea (*Dacrycarpus dacrydioides*), matai (*Prumnopitys taxifolia*) and totara (*Podocarpus totara*) dominated forest have been planted; communities that once accounted for between 2 and 10% of the Low Plains Ecological District, but now combined are represented by less than 1% of the district (Harding 2009). These podocarp forest communities have been reduced to less than 20% of their former extent.

Criterion 4: Te Waoku Kahikatea Reserve *contains the At Risk/Declining* plant *Urtica persconfusa* (climbing nettle) along the margins of Ka Putahi Creek. This species is considered to have a large population (>100,000 mature individuals), but with a predicted 10 – 70% decline (de Lange *et al.* 2013) and is abundant within this part of the Pūharakekenui-Styx River and Ka Putahi Creek corridor. The lakes and adjacent waterways support the Threatened/Nationally Critical Grey Duck (*Anas supercilliosa*), and the At Risk/Naturally Uncommon Black Cormorant (*Phalacrocorax carbo novaehollandiae*) (Refer Crossland 2014b; Robertson *et al.* 2012). Common grass skinks (at-risk/declining) were recorded by Council staff within the site in 2014, and immediately downstream at Janet Stewart Reserve by McClure (2010).

Ecological context

Criterion 8: Vegetation or habitat of indigenous fauna that provides or contributes to an *important ecological linkage or network* or provides an important buffering function. Dense plantings provide a buffering function for natural values in the Pūharakekenui-Styx River, Kā Pūtahi Creek, Radcliffe Road Drain and Mundy’s Road Drain which pass through the site. This contributes to an important ecological linkage and network throughout the Pūharakekenui-Styx River catchment and is linked to other areas of ecological significance by the river corridors and associated riparian vegetation (including willow dominated riparian woodlands with regenerating and/or remnant native under-storey). At 6.9 hectares in area, the riparian and forest plantings within the Te Waoku Kahikatea Reserve also make a significant contribution towards the landscape-scale forest patch configuration in terms of providing a core wildlife sanctuary (refer Meurk and Hall 2006).

Appendix 2: Restoration planting stages



Appendix 3: Indigenous plant species of Te Waoku Kahikatea Reserve

Note: Species marked with asterisks (**) indicate species considered local to the area but not listed as ever being present in Pūtaringamotu-Riccarton Bush. Species underlined represent species that were once recorded from Pūtaringamotu-Riccarton Bush but are now locally extinct there (Refer Lovis 1995, and Molloy 1995).

Monocot herbs (sedges, grasses & rushes)

Species	Common name	Comment	Population (est.)
<i>Aciphylla subflabellata</i>	spaniard		1
<i>Anemanthele lessoniana</i>	hunangamoho/ wind grass		10 - 50
<i>Apodasmia similis</i>	wiwi/jointed wire rush		100 - 500
<i>Astelia fragrans</i>	bush flax/kahaka		10 - 50
<i>Astelia grandis</i>	swamp astelia		<10
<i>Astelia nervosa</i>	bush flax/kahaka		
<i>Austroderia richardii</i>	toetoe		100 - 500
<i>Carax coriacea</i>	sedge/rautahi		
<i>Carex flagelifera</i>	shining sedge/mania		
<i>Carex geminata</i> **			
<i>Carex maorica</i> **			
<u><i>Carex raoulii</i></u>	sedge		
<i>Carex secta</i>	sedge/purei		>1000
<i>Carex solandri</i>	sedge		
<i>Carex virgata</i>	swamp sedge		
<i>Cyperus ustulatus</i>			100 - 500
<i>Eleocharis acuta</i>	spike sedge		500 - 1000
<i>Libertia ixioides</i>	mikoikoi		10 - 50
<i>Phormium tenax</i>	harakeke/NZ flax		500 - 1000
<i>Poa cita</i>	silver tussock		100 - 500
<i>Schoenoplectus tabernaemontani</i>			<20
<i>Uncinia uncinata</i>	hook sedge		<10

Climbers & scramblers

Species	Common name	Comment	Population (est.)
<i>Brachyglottis sciadophila</i>	climbing groundsel		<20
<i>Clematis paniculata</i>	NZ clematis/puawananga	Rare	<10
<i>Clematis quadribacteolata</i>		At Risk – Naturally Uncommon	<10
<i>Metrosideros diffusa</i>	white rata		<10
<i>Muehlenbeckia australis</i>	pohuehue/Maori vine		<10
<i>Muehlenbeckia axillaris</i>	pohuehue		<10
<i>Muehlenbeckia complexa</i>	shrubby pohuehue		<10
<i>Muehlenbeckia ephedroides</i>	leafless pohuehue		<10
<i>Parsonsia capsularis</i>	kaiwhiria, NZ jasmine		<10
<i>Parsonsia heterophylla</i>	kaiwhiria, NZ jasmine		<10
<i>Passiflora tetandra</i>	kōhia/native passionfruit		<10
<i>Ripogonum scandens</i>	supplejack		<10
<i>Rubus australis</i>	bush lawyer/tataramoa		<10
<i>Rubus cissoides</i>	bush lawyer/tataramoa		<10
<i>Rubus schmidelioides</i>	bush lawyer/tataramoa	Common east end of reserve	10 - 50
<i>Urtica persconfusa</i>	swamp/climbing nettle	Along Styx River & Ka Putahi	

Ferns

Species	Common name	Comment	Population (est.)
<i>Azola rubra</i>	water fern	Seasonally abundant in lakes	>1000
<i>Blechnum discolor</i>	crown fern		<10
<i>Blechnum fluviatile</i>			
<i>Blechnum minus</i>	kiokio fern		<10
<i>Blechnum penna marina</i>	button fern		
<i>Dicksonia squarrosa</i>	wheki/rough tree fern		<10

Trees & shrubs

Species	Common name	Comment	Population (est.)
<i>Alectryon excelsus</i>	titoki/New Zealand ash	Rare	<10
<i>Aristotelia serrata</i>	wineberry/makomako	Common throughout	100 - 500
<i>Carmichaelia robusta</i>	NZ broom/makaka	Common in drier areas	10 - 50
<i>Carpodetus serratus</i>	marbleleaf/putaputaweta	Common throughout	100 - 500
<i>Cassinia leptophylla</i> **	tahinu	Common in drier areas	10 - 50
<i>Coprosma areolata</i>	thin leaved coprosma		
<i>Coprosma crassifolia</i>	stiff-stemmed coprosma		
<i>Coprosma linarifolia</i> **	long-leafed coprosma		
<i>Coprosma lucida</i>	karamu		
<i>Coprosma propinqua</i>	mingimingi		500 - 1000
<i>Coprosma rhamnoides</i> **	twiggy coprosma/mingimingi		
<i>Coprosma robusta</i>	karamu		500 - 1000
<i>Coprosma rotundifolia</i>	round leaved coprosma		100 - 500
<i>Coprosma rubra</i> **	red stemmed coprosma		
<i>Coprosma virescens</i> **	mingimingi		10 - 50
<i>Cordyline australis</i>	cabbage tree/ti kouka	Common throughout	500 - 1000
<i>Corokia cotoneaster</i>	korokio		<10
<i>Dacrycarpus dacrydioides</i>	kahikatea/white pine	Common throughout	>1000
<i>Discaria toumatu</i> **	matagauri		10 - 50
<i>Dodonaea viscosa</i> **	akeake		10 - 50
<i>Elaeocarpus dentatus</i>	hinau	Common throughout	10 - 50
<i>Elaeocarpus hookerianus</i>	pokaka	Common throughout	100 - 500
<i>Fuchsia excorticata</i>	tree fuchsia/kotukutuku	One specimen	<10
<i>Griselinia littoralis</i>	broadleaf/kapuka	Common throughout	500 - 1000
<i>Hebe salicifolia</i>	koromiko	Common throughout	500 - 1000
<i>Hebe strictissima</i> **	banks Peninsula hebe	To be removed	<10
<i>Hoheria angustifolia</i>	narrow leaved lacebark/houhere	Common throughout	100 - 500
<i>Kunzea serotina</i>	white tea tree	Common throughout	100 - 500
<i>Leptospermum scoparium</i> **	manuka	Common throughout	50 - 100
<i>Lophomyrtus obcordata</i>	NZ myrtle/rohutu	Common throughout	100 - 500
<i>Melicytus alpinus</i>	porcupine shrub		<10
<i>Melicytus micranthus</i>	shrubby mahoe		<10
<i>Melicytus ramiflorus</i>	mahoe/whiteywood	Sparse	<10
<i>Melicope simplex</i>	poataniwha		
<i>Muehlenbeckia astonii</i> **	shrubby pohuehue		<10
<i>Myrsine australis</i>	red matipo		50 - 100
<i>Myrsine divaricata</i> **	weeping maupo		50 - 100
<i>Neomyrtus pedunculata</i>	NZ myrtle/rohutu		
<i>Olearia avicenniaefolia</i> **	tree daisy		10 - 50
<i>Olearia paniculata</i> **	golden akeake	Common throughout	50 - 100

<i>Pennantia corymbosa</i>	kaikomako	Common throughout	100 - 500
<i>Phyllocladus trichomanoides</i>	celery pine	Confined to one small area	<10
<i>Pittosporum eugenoides</i>	lemonwood/tarata	Common throughout	100 - 500
<i>Pittosporum tenuifolium</i>	kohuhu/black matipo	Common throughout	100 - 500
<i>Plagianthus regius</i>	ribbonwood/manatu	Common throughout	>1000
<i>Podocarpus totara</i>	totara	Common throughout	>1000
<i>Prumnopitys ferruginea</i>	miro/brown pine	Rare	<10
<i>Prumnopitys taxifolia</i>	matai/black pine	Common throughout	500 - 1000
<i>Pseudopanax arboreus</i>	five-finger/pauhou	Common throughout	100 - 500
<i>Pseudopanax crassifolius</i>	lancewood/horoeka	Common throughout	100 - 500
<i>Pseudowintera colorata</i>	pepper tree/horopito		10 - 50
<i>Schefflera digitata</i>	seven finger		<10
<i>Sophora microphylla</i>	south Island kowhai	Common throughout	100 - 500
<i>Streblus heterophylla</i>	turepo/milk tree		<10
<i>Urtica ferox</i>	tree nettle/ongaonga	Confined to one small area	<10

Appendix 4: Proposed plant introductions

[illegible]

Appendix 5: Invertebrates

Invertebrate species recorded at Te Waoku Kahikatea Reserve as listed from iNaturalist website.

Common Name	Scientific Name	Indigenous
Order Araneae (spiders)		
<i>Dolomedes spp</i>	Fishing spider	✓
<i>Dolomedes minor</i>	NZ nursery web spider	✓
<i>Sidymella spp</i>	Square-ended crab spider	✓
<i>Socca pustulosa</i>	Knobbled orb weaver	
<i>Cryptachaea veruculata</i>	Diamond comb-footed spider	✓
Subfamily <i>Theridiinae</i>		
<i>Trite planiceps</i>	Black-headed jumping spider	✓
<i>Dysdera crocata</i>	Woodlouse spider	
<i>Adoxotoma fosteri</i>	Endemic spider	✓
Order <i>Entelegynae</i>	Entelegyne spiders	
Order Opiliones (harvestmen)		
<i>Phalangium opilio</i>	European harvestman	
Order Diptera (flies)		
Family <i>Chironomidae</i>	Non-biting midge	?
Family <i>Mycetophilidae</i>	Fungus gnat	?
<i>Calliphora spp</i>	Bluebottle flies	
<i>Melangyna novaezelandiae</i>	Large hoverfly	✓
<i>Helophilus hochstetteri</i>	Metallic blue hover fly	✓
<i>Parentia spp.</i>	Long-legged fly	✓
<i>Limoniidae spp.</i>	Limoniid crane fly	?
<i>Zelandotipula novarae</i>	Swamp crane fly	✓
<i>Anatopynia debilis</i>		
<i>Discobola dohrni</i>	Native crane fly	✓
<i>Poecilohetaerella spp.</i>		
<i>Sapromyza spp</i>		
Order Hymenoptera (bees, wasps & ants)		
<i>Apis mellifera</i>	Western honey bee	
<i>Vespula vulgaris</i>	Common European yellowjacket	
<i>Polistes chinensis</i>	Asian paper wasp	
<i>Trichopria spp</i>	Parasitic wasp	

Cont'd

Common Name	Scientific Name	Indigenous
Order Hemiptera (true bugs)		
<i>Suphanta acuta</i>	Torpedo bug/leaf hopper	
<i>Monteithiella humeralis</i>	Pittosporum shield bug	✓
<i>Paraferisa podocarpi</i>	Kahikatea mealybug	✓
<i>Sigara spp.</i>		
<i>Microvelia macgregori</i>	Water strider	✓
Superfamily Aphidoidea	Aphids	
Order Lepidoptera (butterflies & moths)		
<i>Elachista spp</i>	Grass miner moth	?
<i>Orocrambus flexuosellus</i>	Common grass moth	✓
<i>Pieris rapae</i>	Cabbage white butterfly	
Family Depressariidae	Fat bodied moth	
Family Hepialidae	Swift moth	?
Order Coleoptera (beetles)		
<i>Laemostenus complanatus</i>	Cosmopolitan ground beetle	
<i>Megadromus antarcticus</i>	Alexander beetle	✓
Subfamily Corticariinae		
Order Neuroptera (lacewings)		
<i>Micromus tasmaniae</i>	Tasmanian brown lacewing	✓
Order Mantodea (praying mantis)		
<i>Orthodera novaezealandiae</i>	New Zealand mantis	✓
Order gastropoda (snails & slugs)		
<i>Oxychilus draparnaudi</i>	Draparnaud's glass snail	
<i>Cornu aspersum</i>	Garden snail	
Order Acari (mites)		
<i>Cecidophytes rouhollahi</i>	Galium gall mite	
Order Odonata (damselflies & dragonflies)		
<i>Xanthocnemis zealandiza</i>	Red damselfly	✓
Order Auchenorrhyncha		
Superfamily Cicadoidea	Cicada	

Appendix 6: Restoration planting species lists

Area 1: Wetland planting around wellhead (300 m² at 1.0 m centres)

Species	Common name	Number	Grade
<i>Astelia grandis</i>	swamp astelia	5	2.5L
<i>Carex secta</i>	pukio sedge	300	RX90
<i>Coprosma propinqua</i>	mikimiki	10	2.5L
<i>Juncus pallidus</i>	wiwi	25	RX90
<i>Leptospermum scoparium</i>	manuka	10	RX90
TOTAL		350	

Area 2: Specimen tree planting in grass field (2500 m²)

Species	Common name	Number	Grade
<i>Dacrycarpus dacrydioides</i>	kahikatea	20	>1.5 m
<i>Kunzea serotina</i>	kanuka	15	2.5L
<i>Plagianthus regius</i>	ribbonwood	7	>1.5 m
<i>Podocarpus totara</i>	totara	26	>1.5 m
<i>Sophora microphylla</i>	South Island kowhai	27	>1.5 m
TOTAL		350	

Area 3: Lizard habitat establishment on mound (2000 m² at 0.8 m centres)

Species	Common name	Number	Grade
<i>Anemanthele lessoniana</i>	wind grass	70	RX90
<i>Austroderia richardii</i>	toetoe	50	RX90
<i>Carmichaelia australis</i>	New Zealand broom	100	RX1L
<i>Coprosma crassifolia</i>	mikimiki	25	RX1L
<i>Coprosma intertexta</i>	mikimiki	25	RX1L
<i>Coprosma propinqua</i>	mikimiki	200	RX1L
<i>Coprosma rhamnoides</i>	twiggy coprosma	50	RX1L
<i>Cyathodes juniperina</i>	prickly mikimiki	30	2.5L
<i>Discaria toumatu</i>	matagouri	300	2.5L
<i>Helichrysum lanceolatum</i>	niniaio	25	RX90
<i>Kunzea serotina</i>	kanuka	50	RT
<i>Melicytus alpinus</i>	porcupine shrub	75	RX1L
<i>Muehlenbeckia axillaris</i>	pohuehue	200	RX90
<i>Muehlenbeckia complexa</i>	pohuehue	225	RX90
<i>Poa cita</i>	silver tussock	1800	RX90
<i>Pteridium esculentum</i>	bracken fern	50	RX90
<i>Sophora microphylla</i>	South Island kowhai	25	2.5L
TOTAL		3300	

Area 4: Sandy lake margin planting (350 m2 at 1.2 m centres)

Species	Common name	Number	Grade
<i>Apodasmia similis</i>	oioi	50	RX90
<i>Cassinia leptophylla</i>	tauhinu	25	RX90
<i>Hebe salicifolia</i>	koromiko	15	RX90
<i>Kunzea serotina</i>	kanuka	10	RT
<i>Leptospermum scoparium</i>	manuka	25	RT
<i>Phormium tenax</i>	harakeke/NZ flax	15	RX1L
<i>Pteridium esculentum</i>	bracken fern	25	RX1L
<i>Scirpoides nodosa</i>	knobby club rush	50	RX90
<i>Coprosma propinqua</i>	mikimiki	20	2.5L
<i>Cordyline australis</i>	ti kouka/cabbage tree	15	RT
TOTAL		250	

Area 5: Large clearing (400 m2 at 1.5 m centres)

Species	Common name	Number	Grade
<i>Coprosma propinqua</i>	mikimiki	25	2.5L
<i>Cordyline australis</i>	ti kouka/cabbage tree	15	RT
<i>Dacrycarpus dacrydioides</i>	kahikatea	5	2.5L
<i>Elaeocarpus dentatus</i>	hinau	5	2.5L
<i>Elaeocarpus hookerianus</i>	pokaka	5	2.5L
<i>Griselinea littoralis</i>	kapuka/broadleaf	15	RX1L
<i>Kunzea serotina</i>	kanuka	20	RT
<i>Myrsine divaricata</i>	weeping maupo	20	2.5L
<i>Pennantia corymbosa</i>	kaikomako	15	2.5L
<i>Phormium tenax</i>	harakeke/NZ flax	20	RX1L
<i>Plagianthus regius</i>	ribbonwood	15	RT
<i>Podocarpus totara</i>	totara	15	2.5L
<i>Prumnopitys taxifolia</i>	matai	5	2.5L
<i>Pseudopanax crassifolius</i>	lancewood	25	2.5L
<i>Sophora microphylla</i>	South Island kowhai	10	2.5L
TOTAL		175	

Area 6: Small grass area by dead pines (140 m2 at 1.2 m centres)

Species	Common name	Number	Grade
<i>Austroderia richardii</i>	toetoe	5	RX90
<i>Carex secta</i>	pukio sedge	25	RX90
<i>Coprosma propinqua</i>	mikimiki	20	2.5L
<i>Cordyline australis</i>	ti kouka/cabbage tree	50	RX1L
TOTAL		100	

Area 7: Ex-totara stump stockpile area (250 m2 at 1.2 m centres)

Species	Common name	Number	Grade
<i>Coprosma propinqua</i>	mikimiki	20	2.5L
<i>Elaeocarpus dentatus</i>	hinau	5	2.5L
<i>Elaeocarpus hookerianus</i>	pokaka	5	2.5L
<i>Fuchsia excorticata</i>	tree fuchsia	10	RX1L
<i>Griselinea littoralis</i>	kapuka/broadleaf	25	RX1L
<i>Hebe salicifolia</i>	koromiko	25	RX90
<i>Leptospermum scoparium</i>	manuka	40	RT
<i>Phormium tenax</i>	harakeke/NZ flax	20	RX1L
<i>Podocarpus totara</i>	totara	10	2.5L
<i>Prumnopitys ferruginea</i>	miro	5	2.5L
<i>Prumnopitys taxifolia</i>	matai	5	2.5L
<i>Sophora microphylla</i>	South Island kowhai	10	2.5L
TOTAL		180	

Area 8: Small clearing on Zealandia boundary (1) (250 m2 at 1.2 m centres)

Species	Common name	Number	Grade
<i>Alectryon excelsus</i>	titoki	10	2.5L
<i>Cordyline australis</i>	ti kouka/cabbage tree	20	2.5L
<i>Elaeocarpus dentatus</i>	hinau	5	
<i>Elaeocarpus hookerianus</i>	pokaka	5	2.5L
<i>Fuchsia excorticata</i>	tree fuchsia	10	RX1L
<i>Griselinea littoralis</i>	kapuka/broadleaf	20	RX1L
<i>Hebe salicifolia</i>	koromiko	20	RX90
<i>Kunzea serotina</i>	kanuka	40	RT
<i>Lophomyrtus obcordata</i>	rohutu	15	RX1L
<i>Phormium tenax</i>	harakeke/NZ flax	10	2.5L
<i>Podocarpus totara</i>	totara	10	2.5L
<i>Prumnopitys taxifolia</i>	matai	5	2.5L
<i>Sophora microphylla</i>	South Island kowhai	10	2.5L
TOTAL		180	

Area 9: Small clearing on Zealandia boundary (2) (100 m2 at 1.2 m centres)

Species	Common name	Number	Grade
<i>Alectryon excelsus</i>	titoki	5	2.5L
<i>Cordyline australis</i>	ti kouka/cabbage tree	5	RX1L
<i>Dacrycarpus dacrydioides</i>	hinau	9	2.5L
<i>Elaeocarpus dentatus</i>	pokaka	3	2.5L
<i>Elaeocarpus hookerianus</i>	tree fuchsia	3	2.5L
<i>Fuchsia excorticata</i>	kapuka/broadleaf	5	RX1L
<i>Griselinea littoralis</i>	koromiko	5	RX1L
<i>Hebe salicifolia</i>	kanuka	5	RT
<i>Leptospermum scoparium</i>	rohutu	20	RT
<i>Phormium tenax</i>	harakeke/NZ flax	10	RX1L
<i>Podocarpus totara</i>	totara	5	2.5L
TOTAL		75	

Area 10: Lizard habitat establishment in dry clearing (500 m² at 1.2 m centres)

Species	Common name	Number	Grade
<i>Anemanthele lessoniana</i>	wind grass	25	RX90
<i>Carmichaelia australis</i>	NZ broom	10	RT
<i>Coprosma crassifolia</i>	mikimiki	10	2.5L
<i>Coprosma intertexta</i>	mikimiki	10	2.5L
<i>Coprosma propinqua</i>	mikimiki	10	2.5L
<i>Coprosma rhamnoides</i>	twiggy coprosma	10	2.5L
<i>Discaria toumatu</i>	matagouri	15	RX1L
<i>Helichrysum lanceolatum</i>	ninia	10	RX1L
<i>Melicytus alpinus</i>	porcupine shrub	10	2.5L
<i>Muehlenbeckia axillaris</i>	pohuehue	20	RX90
<i>Muehlenbeckia complexa</i>	pohuehue	20	RX90
<i>Poa cita</i>	silver tussock	200	RX90
<i>Cyathodes juniperina</i>	prickly mikimiki	10	RX1L
TOTAL		360	

Area 11: Ka Putahi Creek confluence peninsula (350 m² at 1.2 m centres)

Species	Common name	Number	Grade
<i>Anemanthele lessoniana</i>	wind grass	50	RX90
<i>Austroderia richardii</i>	toetoe	10	RX90
<i>Carex secta</i>	pukio sedge	50	RX90
<i>Coprosma crassifolia</i>	mikimiki	10	2.5L
<i>Coprosma propinqua</i>	mikimiki	25	2.5L
<i>Coprosma rhamnoides</i>	twiggy coprosma	5	2.5L
<i>Cyperus ustulatus</i>	umbrella sedge	10	RX90
<i>Leptospermum scoparium</i>	manuka	25	RT
<i>Myrsine divaricata</i>	weeping maupo	5	2.5L
<i>Phormium tenax</i>	harakeke/New Zealand flax	10	RX1L
<i>Sophora microphylla</i>	South Island kowhai	50	2.5L
TOTAL		250	

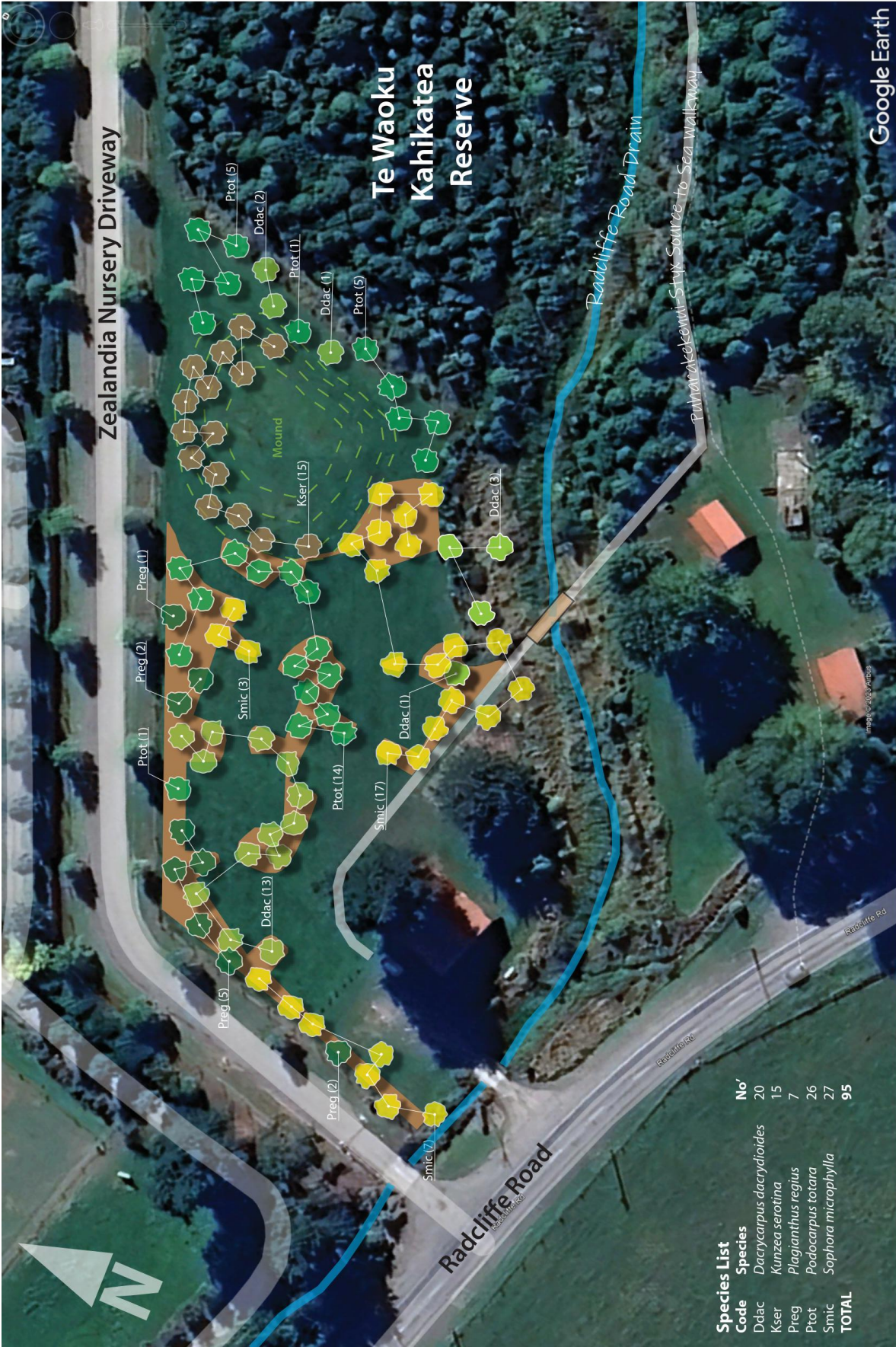
Lake margin species (1000 m x 1.5 m [1500 m²] at 0.8 m centres)

Species	Common name	Number	Grade
<i>Astelia grandis</i>	swamp astelia	20	RX1L
<i>Austroderia richardii</i>	toetoe	50	RX90
<i>Carex secta</i>	pukio sedge	800	RX90
<i>Coprosma propinqua</i>	mikimiki	50	2.5L
<i>Coprosma robusta</i>	karamu	100	RT
<i>Cordyline australis</i>	ti kouka/cabbage tree	50	TY
<i>Cyperus ustulatus</i>	umbrella sedge	100	RX90
<i>Dacrycarpus dacrydioides</i>	kahikatea	120	2.5L
<i>Juncus edgariae</i>	wiwi	220	RX90
<i>Juncus pallidus</i>	wiwi	220	RX90
<i>Leptospermum scoparium</i>	manuka	400	RT
<i>Myrsine divaricata</i>	Weeping maupo	20	2.5L
<i>Phormium tenax</i>	harakeke	200	RX1L
<i>Polystichum vestitum</i>	Prickly shield fern	50	RX1L
<i>Schoenoplectus tabernaemontani</i>	lake clubrush	50	RX90
<i>Schoenus pauciflorus</i>	bog rush	50	RX90
TOTAL		2500	

Summary (Areas 1 - 11)

Location	Area	Number of plants
Restoration plantings		
Area 1: Wetland planting around wellhead	300 m ²	350
Area 3: Lizard habitat establishment on mound Sandy lake margin planting	2000 m ²	3300
Area 4: Sandy lake margin planting	350 m ²	250
Area 5: Large clearing	400 m ²	175
Area 6: Small grass area by dead pines	140 m ²	100
Area 7: Ex-totara stump stockpile area	250 m ²	180
Area 8: Small clearing on Zealandia boundary (1)	250 m ²	180
Area 9: Small clearing on Zealandia boundary (2)	100 m ²	75
Area 10: Lizard habitat establishment in dry clearing	500m ²	360
Area 11: Ka Putahi Creek confluence peninsula	350 m ²	250
Lake margin planting	1500 m ²	2500
Total restoration plantings	4640 m²	7720
Specimen trees		
Area 2: Specimen tree planting in grass	2500 m ²	350

Appendix 7: Reserve frontage tree planting



Te Waoku Kahikatea Reserve Specimen Tree Planting Plan (Draft - Sept 2023)

Appendix 8: Planting & establishment guidelines

Site preparation

Herbicide application

- ✓ Spray all proposed forest/woodland areas with a broad-spectrum herbicide to achieve total kill of all grass and broadleaved weeds.
- ✓ Contractor to follow all best-practice agrichemical application procedures and council guidelines for working in parks.
- ✓ Where possible, use a **stale seedbed** methodology whereby two applications of herbicide are done, consisting of 1) an initial application to achieve total kill of existing weeds, and 2) a second follow-up application (e.g. 6 – 8 weeks later) to kill any new weed-cover that has established resulting from seeds that have germinated following the first herbicide application.

Supply & spread mulch

- ✓ Where funding allows, arrange for the supply, delivery and spreading of 100 mm compacted/settled depth of arbor mulch across new forest/woodland areas within the site. Mulch will help suppress further weed growth and help retain soil moisture.
- ✓ Where available budget will not allow for the entire site to be mulched, recommend limiting mulch to a 5 – 10 m wide band around the edges of the planted areas, and particularly along pathways. Mulching these areas will help the site look tidy and cared-for, making the restoration plantings more acceptable to the public.

Planting

Plant collection and delivery

- ✓ Contractors, staff, and/or volunteers collecting plants from nurseries must contact the nursery ten working days prior to plant pick-up to allow for their planting stock to be sorted and weeded before dispatch.
- ✓ Where contractors, staff or volunteers are concerned about the size of nursery plants being too small (or of otherwise poor quality/health) to establish well, they should contact Council's parks ecologist for advice.
- ✓ Ensure that only the number of plants that can be planted on the day are collected unless the contractor, staff or volunteers have facilities to ensure plants are watered and remain in good health prior to planting.
- ✓ When transporting plants to the planting site, foliage should be covered with (e.g.) hessian or wind break material to reduce wind damage and excessive transpiration/water loss.

Plant set-out

- ✓ Contractors, staff, and/or volunteers shall contact Council's parks ecologist to meet on site at time of planting to assist with set-out and/or provide plant set-out advice.
- ✓ All plants to be laid out in natural/random patterns, avoiding straight lines.

- ✓ Shrubs such as harakeke/lowland flax (*Phormium tenax*), small-leafed coprosmas (*Coprosma propinqua* & *C. rubra*), toetoe (*Austroderia richardii*), koromiko (*Hebe salicifolia*) and korokio (*Corokia cotoneaster*) shall be planted towards the edges of new plantings to achieve a natural forest edge ecosystem.
- ✓ Ensure that harakeke/lowland flax is planted no closer than 3 m from the edge of any path to maintain sightlines and avoid tripping hazards from their long strappy leaves.
- ✓ Climbers and scramblers, including NZ jasmine (*Parsonsia spp.*), bush lawyer/tataramoa (*Rubus spp.*) and clematis (*Clematis paniculata*) will require mature plants to support them and will therefore need to be planted at the bases of existing trees and large shrubs that can offer them structural support to eventually climb.

Planting

- ✓ Planting must follow industry best-practice for restoration plantings whereby holes are sufficiently wider than the plant container size, straight sided, deep enough and having broken through any sub-surface pans or compacted soils beneath the level of the pot.
- ✓ Where local schools with younger children (<10-year-olds) are involved with planting, recommend that holes are pre-dug by others prior to the planting event, and that follow-up planting checks are carried out and any issues rectified immediately.
- ✓ Ideally, all plants (except for grasses) should have cardboard plant protectors installed, including bamboo stakes and wool mulch mats to assist their establishment and enable easier location line-trimming and/or follow-up herbicide application.
- ✓ Where cardboard plant guards are not used, each plant shall have a one-metre above-ground length bamboo cane installed to help contractors, staff and/or volunteers find plants amongst weeds. Suggest that all stakes are installed on the (e.g.) north side of each plant to further aid in plant location amongst weeds.
- ✓ Fertiliser tabs shall be added to the base of each planting hole according to manufacturer's recommendations to help sustain healthy and vigorous plant growth.

24-month establishment period

Weed control

- ✓ Contractors, staff, and/or volunteers shall ensure that weed growth at the site does not compromise native plant health and vigor, and that the site is maintained in a tidy state that is accepted by the community.
- ✓ Recommend site receives a minimum of four maintenance passes per year during the 24-month establishment period involving (where necessary) locating and hand releasing plants where they have become overrun with weeds, and an application of an approved systemic herbicide to control weeds throughout site.

Watering

- ✓ Even given the dry nature of the reserve, based on experience at nearby sites (e.g., McLeans Island Grassland Park), it is not anticipated that plantings at Te Waoku Kahikatea Reserve will require watering. Instead, plants shall be selected based on their ability to withstand Canterbury's harsh and droughty conditions.

Pruning

- ✓ Pruning shall not be carried out on any plantings during the 24-month maintenance period.

Pest animals

- ✓ Often restoration plantings are impacted by pest animals such as rabbits, hares, possums and pūkeko. Given the rural nature of Te Waoku Kahikatea Reserve, it can be expected that such pest animals will be an ongoing threat to native plantings at the site, and control measures may need to be initiated as damage becomes evident.

Rubbish removal

- ✓ In some situations, restoration plantings can trap rubbish (E.g., plastic bags, paper, or even plant guards) that is discarded or blows through sites. Although it is expected that this will be minimal at Te Waoku Kahikatea Reserve, any rubbish or other debris encountered during routine maintenance shall be collected and disposed of off-site appropriately.

DRAFT

