Pourewa Valley Integrated Plan

Restoration Plan

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Version 1.2

recreation solutions limited

Contents

1. Introduction

Recreation Solutions Ltd has developed a restoration plan as part of the Pourewa Valley Integrated Plan Project, with support and technical input from Nga Kaitiaki Hapori o Pourewa.

The Pourewa Valley is located in the suburb of Orakei, 6km south-east of Auckland's CBD. The project area has been defined as the natural drainage catchments feeding into the Pourewa Stream. The project area includes residential, green and open space on the south-facing slopes between Kepa Road and Pourewa Creek, as well as some residential land to the north of Kepa and Ngapipi Roads. To the south of Pourewa Stream, the project area takes in residential, green and open space on the north facing slopes between St Johns Road and Pourewa Stream. Waterbodies within the project area include the Pourewa Stream, as far downstream as Hobson Point and Tamaki Drive, but does not include the Ōrākei basin. The project area is outlined in Figure 1 below.

The purpose of this restoration plan is to outline the requirements for restoration and enhancement of the stream banks and surrounding reserves. This plan outlines a scheduled work programme for the removal and control of pest plants, rubbish removal, and planting that is required in the lead up to and following future planting seasons in the winter of 2023 onwards.

This report includes:

- A description of the wider ecological context of the project area, and the flora present
- Objectives for restoration of the valley
- Statutory context
- Discussion of the issues and threats relating to the valley
- Management recommendations to deal with the issues identified
- Wider opportunities for the restoration of the valley, to meet defined objectives

***Figure 1**: Project area covered by the restoration plan*

2. Objectives

The purpose of this restoration plan is to outline the requirements for restoration and enhancement of the Pourewa stream banks and its tributaries and surrounding reserves.

The objectives of the restoration plan are outlined below:

- To support the enhancement of a resilient forest and riparian ecosystem by:
  - Ensuring pest plant species no longer threaten the integrity of native plantings
  - Using plant release (and future native plantings) to support a land-to-stream sequence of native vegetation.

- To improve water quality of the Pourewa stream and its tributaries by:
  - Stabilising the stream banks and reducing erosion
  - Enhancing the riparian margin that will filter overland flow to the stream.

- To encourage community stewardship of the Pourewa valley by:
  - Participation in community volunteer weed control and planting days in the reserves.
  - Encouraging behaviors that discourage littering and help to clean up rubbish in the reserves and streams.

The objectives of the wider Pourewa Valley Integrated Plan Project are outlined below:

Pourewa Valley Integrated Plan catchment recognized as a world-class urban sanctuary of local, regional and national significance

that is/has:

• Clean water (stormwater, drains, streams, intertidal, estuarine, sea);

• Restored/thriving bush, intertidal, and estuarine areas;

• Mammal pest free, abundant native plants & trees, and native fauna (birds, bugs, fish)

where:

Current and future generations can access a pathway network with different options by foot or cycle or watercraft in order to connect to the valley's historical & cultural significance and bicultural heritage, and to enjoy, manage and protect its natural features.

• Under the kaitiakitanga of Ngāti Whātua Ōrākei

• Under the stewardship of volunteer restoration groups

• With support from the Ōrākei Local Board and Auckland Council

3. Ecological Context

The project area is within the Tamaki Ecological District, which covers the Auckland City ithsmus and the North Shore of the Auckland Region. The indigenous vegetation cover of the district has been significantly reduced, with only 6.9% of the total land cover of the ecological district now remaining in native vegetation cover[1]. Approximatley 3% of the Auckland City ithsmus section of the Tamaki Ecological District remains in native forest, scrub and wetland ecosystem cover [2]

The Auckland isthmus vegetation provides habitats for native bird and animal species such as ririoriro (grey warbler; *Gerygone igata*), tauhou (silvereye; *Zosterops lateralis*) and pīwakawaka (North Island fantail; *Rhipidura fuliginosa placabilis*), and moko skink (*Leiolopisma moco*). Larger remnants of forest in the Tamaki Ecological District support species including tūī (*Prosthemadera novaeseelandiae*) and kererū (*Hemiphaga novaeseelandiae*), and play a important role within the region as corridors and 'stepping stones' for native wildlife and flora between Gulf Islands and larger habitats in the Waitakere and Hunua Ranges[3].

10.5% (53,967 ha) of vegetation in the Auckland Region contains a significant component of exotic species in the canopy (including pine, wattle, tree privet or gums) or understory (including climbing asparagus and tradescantia) [4]. These pest plant species are therefore impacting on the indigenous biodiversity of the Region. Weed species are present within a majority of vegetation sites within the project area, and present a threat to the indigenous biodiversity within this area.

The geology of the area is characterised mostly by sandstones. Soils are mainly nutrient poor clays on ridges, with richer soils in gullies due to deposition by broadleaved species.

Auckland Council GIS Biodiversity information for the Proposed Auckland Unitary Plan shows that the main indigenous ecosystem types in the catchment include: 'WF4' (coastal broadleaved forest ecosystem), 'CL1' (pohutukawa treeland/flaxland/rockland), 'SA1' (mangrove scrub and forest), and 'VS5' (broadleaved species scrub forest).

The Pourewa Creek estuary contains mangrove forest and shrubland and is part of a sequence from coastal forest to estuarine vegetation. This habitat is recognised as a Significant Ecological Area (SEA) and a 'Tranche 2 Biodiversity Focus Area'.

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[1] Myers et al. 2005. *North Shore City Ecological Survey – A Survey of Sites of Ecological Significance in Tamaki & Rodney Ecological Districts,* Piv

[2] Auckland Council Research and Evaluation Unit. 2018 *Isthmus Reporting Area – State of Auckland Terrestrial Report Card*

[3] Myers et al. 2005. *North Shore City Ecological Survey – A Survey of Sites of Ecological Significance in Tamaki & Rodney Ecological Districts,* Pv

[4] Auckland Council Research and Evaluation Unit. 2021 *Ecological Integrity of Forests in Auckland 2009 - 2019*

The Pourewa catchment hosts one of the last examples of the ‘threatened-nationally critical‘ mature Syzygium maire (swamp maire) within Selwyn Bush, providing an extremely valuable seed source. Riparian zones exist in the Pourewa stream and it’s tributaries, where kokopu have been found as well as an inanga spawning site. For a more comprehensive overview of the ecological context of the project area, refer to Wildlands Contract Report No.4751.

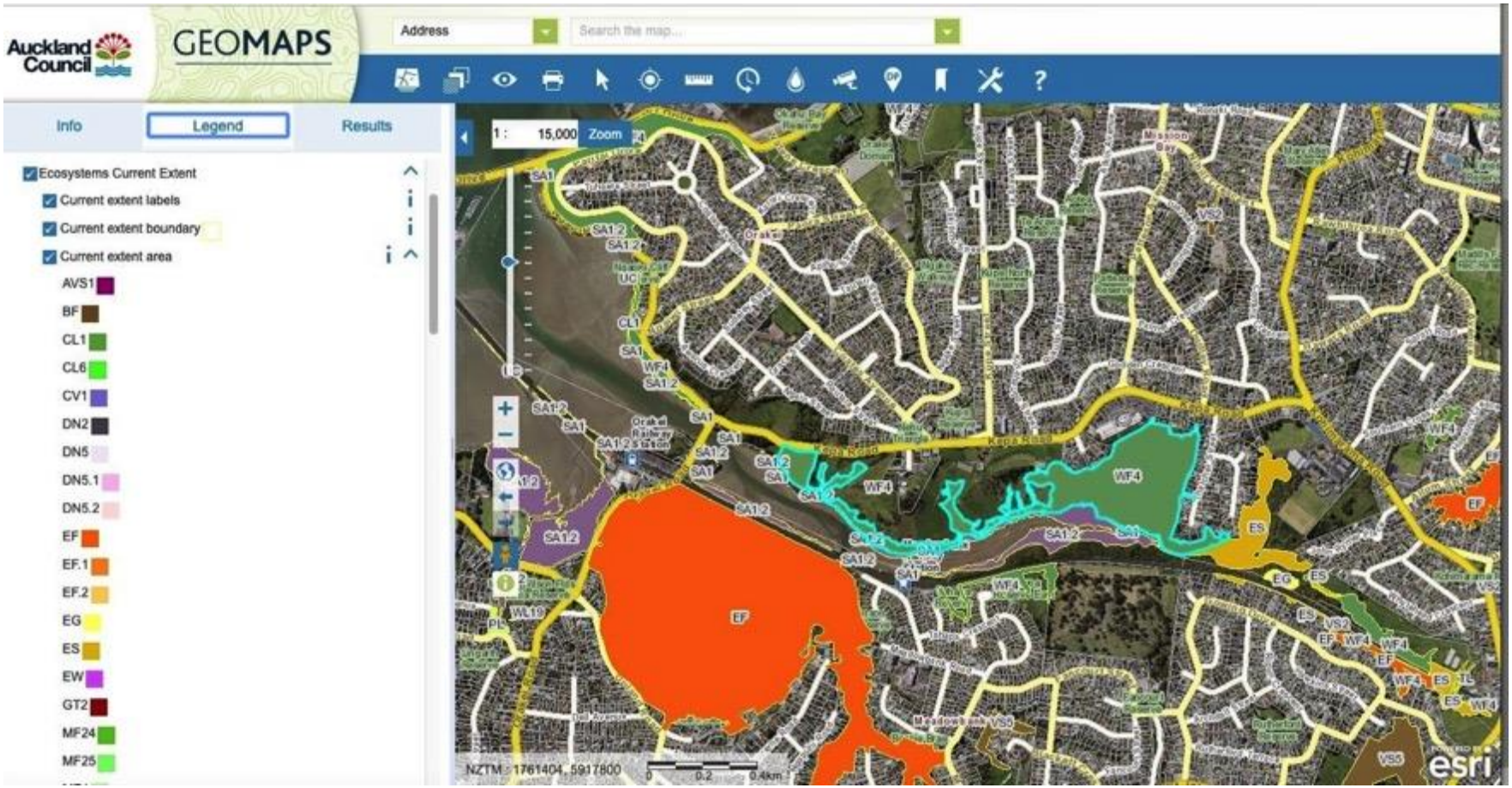

Figure 2: Auckland Council Geomaps Database – Ecological Areas

4. Current Land Use

Within the Pourewa Valley, there are 56 public reserves of varying size and nature. These reserves include Ngapipi and Ngapipi Cliff Reserves, Kepa Bush Reserve, St Johns Bush, Rutherford Reserve and Tahapa and Tahapa Reserve East. Kepa Bush Reserve is the largest remnant of indigenous forest on the Auckland Isthmus.

Other major open and/or green spaces include the Pourewa Creek Recreation Reserve. This reserve is Ngāti Whātua Orakei land co-managed by Ngāti Whātua Orakei and Auckland Council. Adjacent to this reserve is St Josephs School. Two parcels of Ministry of Education land adjacent to Selwyn College, known as “Selwyn Park” and “Selwyn Bush” contain indigenous vegetation and are under the active management of restoration groups. Selwyn Bush is also a Significant Ecological Area (SEA).

Also with SEA status and adjacent to Selwyn Bush and Kepa Bush, is a railway network corridor of land owned by the New Zealand Transport Agency – Waka Kotahi. This includes land leased by the Meadowbank Pony Club.

To the south of Pourewa Creek, other major land parcels include the Purewa Cemetery and St Johns School.

The valley’s reserves and open and green spaces provide opportunities for recreation. An existing track network in Kepa Bush, Pourewa Creek Recreation Reserve, Selwyn Park and Selwyn Bush allow visitors to access Pourewa Creek from Kepa Road. On-the-water recreation occurs in the Pourewa Creek, Hobson Bay and the adjacent Orakei Basin and out to the coast to Okahu Bay.

Pourewa Creek looking towards Orakei Basin

Track on Waka Kotahi land looking towards Kepa Bush

The valley also provides an important transport link, with vehicle traffic moving along the north and south of the valley via Kepa Road and St Johns Road. The Eastern train line also passes through the valley, with the Meadowbank and Orakei Railway stations located to the south of Pourewa Creek. The shared pathway also provides active transport access through the valley, with connections at John Rymer Place and Tahapa Reserves.

5. Planning Context Auckland Unitary Plan

The reserve areas outlined in this restoration plan are zoned as either Open Space – Informal Recreation or Open Space – Conservation Zone in the Auckland Unitary Plan (Operative in Part) (Figure 3).

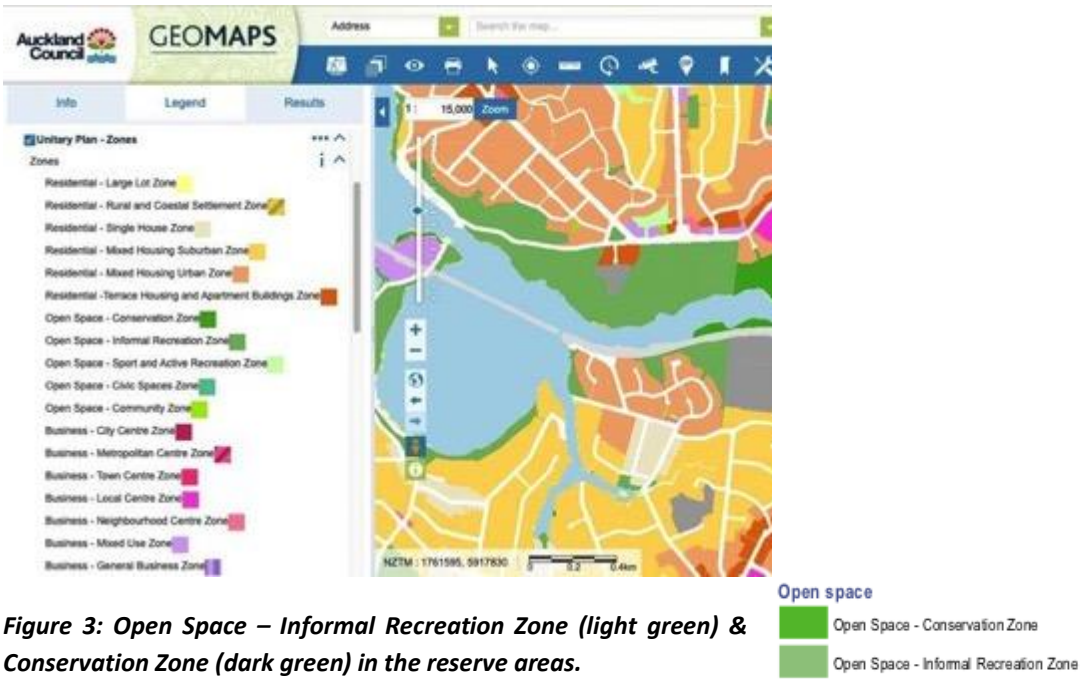

Figure 3: Open Space – Informal Recreation Zone (light green) & Conservation Zone (dark green) in the reserve areas.

In addition, Selwyn Bush and Selwyn Park (Selwyn College - Ministry of Education land) are zoned as either Residential – Mixed Housing Suburban or Urban in the Auckland Unitary Plan (Operative in Part)

Kiwirail and Waka Kotahi land adjacent to the shred pathway, Selwyn Bush, Kepa Bush, parts of Pourewa Creek Recreation Reserve, Ngapipi Cliff Reserve, Tahapa Reserves and St Johns Bush are designated as Significant Ecological Areas (SEA) (Figure 4). There is a group of trees within the project area listed as Notable trees in the Natural Heritage Notable Trees Overlay in St Johns Bush (Totara, Kauri, English Oak, Macrocarpa [3], Maritime Pines [12]) and an Italian Alder near Meadowbank Reserve.

Figure 4: Significant Ecological Areas (SEA's) in the reserve areas

5.1 Consent Requirements

Rules relating to the management of terrestrial and coastal vegetation and biodiversity values outside of scheduled significant ecological areas are found in section E15 Vegetation Management and Biodiversity of the Auckland Unitary Plan (Operative in Part). The relevant rules include:

- Vegetation alteration or removal within 10m of urban streams is a restricted discretionary activity *(Table E15.4.1 (A19)).*
- Vegetation alteration or removal of greater than 25m2 of contiguous vegetation or tree alteration or tree removal of any indigenous tree over 3m in height within 20m of mean high water springs in all zones other than in a Rural – Rural Production Zone, Rural – Mixed Rural Zone, Rural – Rural Coastal Zone, Rural – Rural Conservation Zone, Rural – Waitakere Ranges Zone and Rural –Countryside Living Zone or Future Urban Zone is a restricted discretionary activity *(Table E15.4.1 (A21)).*

The reserves are located within the Open Space – Informal Recreation Zone & Conservation Zone and therefore E16 Trees in open space zones applies. The relevant rules that apply to trees within the open space zone are shown in figure 11 below:

Rule (E16.4.1) – Trees in open space zones	**Activity status**
(A1) Biosecurity tree works	PA
(A2) Dead wood removal	PA
(A3) Emergency tree works	PA

(A4) Pest plant removal of any tree less than 4m in height and less than 400mm in girth	PA
(A5) Tree trimming or alteration	PA
(A6) Tree trimming or alteration that does not comply with Standard E16.6.2	RD
(A7) Works within the protected root zone	PA
(A8) Works within the protected root zone that do not comply with Standard E16.6.3	RD
(A9) Tree removal of any tree less than 4m in height and less than 400mm in girth	PA
(A10) Tree removal of any tree greater than 4m in height or greater than 400mm in girth	RD

Figure 5: Activity table for trees in Open Space Zones.

Some reserves are designated as Significant Ecological Areas (SEA's) and therefore D9 Significant Ecological Areas Overlay applies . Policy D 9.3.5 Vegetation Management states:

(5) Enable the following vegetation management activities in significant ecological areas to provide for the reasonable use and management of land:

(a) trimming of vegetation;

(b) vegetation removal to maintain existing open areas, including tracks;

(c) vegetation removal to establish and maintain a reasonable cleared area around a building;

(d) vegetation removal required to maintain lawfully established activities, structures and buildings;

(e) vegetation removal necessary to provide for a dwelling on a site;

(f) vegetation removal necessary to provide for marae and papakainga on Māori land;

(g) vegetation removal in areas of high wildfire risk to manage this risk; and

(h) vegetation removal necessary to provide access and exit for emergency service vehicles.

E15.6.4 Vegetation alteration or removal for routine operation, maintenance and repair of existing tracks, lawns, gardens, fences, shelterbelts and other lawfully established activities in riparian areas, coastal areas, all zones outside the RUB and in overlays identified in Table E15.4.2 [other than the significant ecological areas in the coastal marine area – SEA-M]

(1) Vegetation alteration or removal must be undertaken within **1m either side of existing tracks or fences.**

(2) Vegetation alteration or removal must **not** include trees over **6m in height, or 600mm in girth.**

(3) Vegetation alteration or removal must **not** result in greater than **25m2 of vegetation removal** from within a Significant Ecological Areas Overlay, Outstanding Natural Features Overlay, Outstanding

Natural Character Overlay, High Natural Character Overlay or the Outstanding Natural Landscapes Overlay per site.

(4) Vegetation alteration or removal must **not** result in greater **than 50m2 of vegetation removal** from areas not identified as significant ecological areas per calendar year.

Any other vegetation alteration or removal within an SEA not provided for above is a Restricted Disicretionary Activity *(Table E15.4.2 (A44)).*

5.2 Conclusion

In terms of consent requirements:

- All trees greater than 4 metres require resource consent for their removal (or over 3m in height within 20m of mean high water springs).
- Trees (including pest trees) up to 4m in height or less than 400mm girth can be removed using hand operated tools (up to 3m in height within 20m of mean high water springs).
- All earthworks and/or ground disturbance will trigger a resource consent.
- All vegetation alteration or removal within 10m of an urban stream will trigger a resource consent.
- Tree trimming is a permitted activity in accordance with the standards referenced above. However, where this tree trimming is undertaken in any contiguous area of indigenous vegetation, no greater than 25m² can be as a permitted activity.
- Any vegetation alteration or removal in an SEA that is not routine operation, maintenance and repair of existing tracks, lawns, gardens, fences, shelterbelts and other lawfully established activities will trigger a resource consent as a discretionary activity.

It is understood that Auckland Council Local Parks have applied for a global consent to cover all Council sanctioned vegetation removal in Auckland Council Local Parks. The status of this resource consent is unknown at the time of writing this report.

6. Site Description

6.1 Overview

The open and green space in the project area contains four distinct zones – streamside vegetation, coastal forest, planted vegetation and mown grass. The catchment area is approximatlely 3.7km^2.

6.2 Vegetation Types

Vegetation within the project area adjoining the Pourewa stream and tributaries can be divided into a number of main types:

- Planted vegetation (PL)
- Coastal broadleaved forest (WF4)
- Exotic Scrub (ES)
- Mangrove forest and scrub (SA1.2)
- Broadleaved species scrub/forest (VS5)

These vegetation types are described in more detail below:

6.2.1 Planted Vegetation (PL)

Some areas of vegetation along the ridges below Selwyn College (Selwyn Park) comprise a wide mix of indigenous (native restoration) plantings of species including kanuka, cabbage tree, harakeke, karaka, puiriri, and various grasses and sedges. Several pest plant species, including gorse are growing at the edge of these indigenous plantings. These areas are classified as PL because the weed biomass is less than 50% and it is a native amenity planting.

Figure 6: Selwyn Park aerial view

Figure 7: Selwyn Park

6.2.2 Coastal broadleaved forest (WF4)

The forest areas in Kepa Bush, the coastal margin of Pourewa Creek Recreation Reserve, Ngapipi Cliff Reserve and Tahapa Reserves in the mid and lower reaches of the Pourewa

Stream consists of remnant indigenous canopy trees; mainly pohutukawa, kanuka, and puriri. A discrete number of exotic canopy trees include poplar, flame tree and some tree privet are prevalent in the coastal margin of the Pourewa Creek Recreation Reserve. Indigenous trees are dominant in the canopy. An area above and opposite the John Rymer entrance to the shared path is also WF4, but does have some tree privet in the canopy.

Figure 8: Kepa Bush

Figure 9: Coastal forest canopy (Kepa Bush)

A robust understory exists beneath these canopy species; and as figure 10 shows extensive volunteer and eco-contractor pest plant control in areas like Kepa Bush is mananging pest plant incursions (climbers and ground cover species) which can prevent the regeneration of indigenous plants. This includes climbing aspararus, tradescantia and japanese honeysuckle. Some areas of pest plant incursions exisits in the Pourewa Creek Recreation Reserve, including english ivy as shown in figure 11.

Figure 10: Understory in Kepa Bush

Figure 11: English Ivy dominating the understory in Pourewa Creek Recreation Reserve

Due to greater than 50% of canopy cover being indigenous, a healthy understory and over 80% of canopy cover of trees and shrubs these coastal area are defined as coastal broadleaved forest (WF4) dominated by pohutukawa and puriri.

6.2.3 Exotic Scrub (ES)

The forest areas in Selwyn Bush and below Selwyn Park consists of exotic canopy trees including macrocarpa, privet, willow and plane trees. A discrete number of emergent indigenous canopy trees include puriri. Exotic trees are generally dominant in the canopy with over 50% cover/biomass exotic. Extensive historic indigenous understory planting by volunteers is changing the exotic/indigenous composition.

Figure 12: Selwyn Bush canopy

Figure 13: Exotic canopy with emergent native understory

A robust understory exists beneath these canopy species; however as figures 14 and 15 show pest plants are also climbing up trees and smothering them as well as forming a dense ground cover which is stopping the regeneration of indigenous plants. This includes climbing aspararus and tradescantia.

Figure 14: Climbing asparagus growing towards canopy species

Figure 15: Tradescantia dominating the understory

Due to greater than 50% of cover/biomass being exotic, and the future trajectory of composition being uncertain this area is defined as exotic scrub (ES).

6.2.4 Mangrove forest and scrub (SA1.2)

The lower reaches of the Pourewa stream is an area of frequent tidal inundation dominated by mangroves. In the salt-freshwater mixing zone, there is the presence of a number on in-stream species including tuna – eel and inanga – whitebait, the later of which spawns in the stream edge carex grasses. Pest plants present in the streamside margins includes ginger.

Figure 16: Mangroves

Figure 17: Carex and ginger in stream margins

6.2.5 Broadleaved species scrub/forest (VS5)

The forest area in St Johns Bush consists of indigenous vegetation types typical of broadleaved scrub/forest. Canopy species include karo, māhoe, kānuka, karaka, and kohekohe. Pest plant incursions include tradescantia.

Figure 18: Kohekohe

Figure 19: Karo

7. Issues

7.1 Pest Plants

Pest plants are exotic plants that have the potential to threaten the ecological integrity of the streamside planting, coastal forest and other areas of vegetation outlined in this restoration plan. The main reasons for this are that pest plants climb up trees and shrubs and smother them, and also form a dense ground cover which is stopping the regeneration of native plants. Where pest trees dominate a tree canopy, the spread of their seedlings can also impact on the succession from undergrowth to canopy (e.g. tree privet)

Of the pest plants species listed in the Auckland Regional Pest Management Plan 2020 – 2030 (ARPMP), 22 species were recorded in the project area. 4 more pest plant species not listed in the ARPMP were identified in the project area. Control of these species is recommended, with control methods outlined in Appendix 1. The type, location and extent of pest plants are mapped in section 8 of this report.

There are four categories in the ARPMP 2020 – 2030 – (i) Eradication Pest Plants, (ii) Exclusion Pest Plants (iii) Progressive Sustained Control Pest Plants, and (iii) Sustained Control Pest Plants. Pest plants not outlined in the ARPMP but that are found within the project area are also outlined.

Exclusion

Exclusion pest plants are of limited distribution or density within the Auckland region, and are of high potential threat. The aim for these plants is to prevent the establishment of a pest or group of pests.

No exclusion pest plants have been identified in the reserve area outlined in this restoration plan.

Eradication

Eradication pest plants are of limited distribution or density within the Auckland region, and are of high potential threat. The aim for these plants is to reduce the infestation level of a pest to zero levels in an area in the short to medium term.

No eradication pest plants have been identified in the reserve area outlined in this restoration plan.

Progressive Containment

Progressive Containment pest plants are abundant in certain habitats or areas in the Auckland region, which landowners/occupiers are required to treat whenever they appear on their land. The aim for these plants is to contain or reduce the geographic distribution of a pest to an area over time.

There are two categories of Progressive Containment that can be applied:

- removal – landowners/occupiers are required to completely remove Progressive Containment (removal) pest plants from their property
- boundary control - landowners/occupiers are required to maintain clearance of Progressive Containment (boundary control) pest plants to a specified distance from all property boundaries.

Sustained Control

Sustained Control pest plants include species that require the need to provide for the ongoing control of a pest to reduce its impacts on values and its spread to other properties. Community initiatives to control these pest plants are promoted and supported by Auckland Council.

Sustained Control pest plants identified in the project area are outlined below:

- Agapanthus *(Agapanthus praecox)*
- Arum lily *(Zantedeschia aethiopica)*
- Black Wattle *(Acacia mearnsii)*
- Blue Morning Glory *(Ipomoea indica)*
- Climbing asparagus *(Asparagus scandens)*
- Cape Ivy *(Senecio angulatus)*
- Cotoneaster *(Cotoneaster glaucophyllus)*
- English Ivy *(Hedera helix)*
- Gorse *(Ulex spp.)*
- Hawthorn *(Crataegus monogyna)*
- Japanese Honeysuckle *(Lonicera japonica)*
- Loquat *(Eryobotria japonica)*
- Monkey apple *(Syzgium smithii)*
- Palm grass *(Setaria palmifolia)*
- Pampas grass *(Cortaderia selloana)*

- Phoenix palm *(Phoenix canariensis)*
- Privet – Chinese *(Ligustrum sinensis)*
- Privet – Tree *(Ligustrum lucidum)*
- Sydney Golden Wattle *(Acacia longifolia)*
- Wandering willie *(Tradescantia)*
- Wild Ginger *(Hedychium gardnerianum; H. flavescens)*
- Woolly nightshade *(Solanium mauritianum)*

Other

Other pest plants present within the project area that are not listed in the ARPMS are:

- Cherry *(Prunus campanulata)*
- Coral Tree (*Erythrina x sykesii)*
- Nasturtium *(Tropaeolum majus)*
- Spider Plant *(Chlorophytum comosum)*

Control Methods

There are several methods to control pest plants, depending on the experience level of the participants, the type of pest plant being controlled, the extent of the infestation and environmental factors, such as proximity to water.

Note: permissions must be sought from the relevant landowner and consenting authority before any control methods are considered, including taking into consideration the 4m height threshold for tree alteration or removal requiring resource consent.

These methods are outlined below:

Cut and paste (CP)

This is one of the more common methods for volunteers as you are able to use the herbicide in gel form effectively without a Growsafe qualification. This method is best for a range of environmental weeds, including both vines and trees, whilst using the least amounts of herbicide. Cut the pest plant stem at the base closest to the roots. Take care when cutting not just for yourself but for others around you. Apply a thin film of cut & paste herbicide (MetGel, Bamboo Buster, Vigilant) directly to the cut stump or stem to prevent regrowth. Established pest plant sites with seed producing plants may need to be revisited for cut and paste maintenance every three months across a period of a year.

Cut - non chemical (C)

A range of non-chemical variations on the cutting of stumps of stems and trunks are being trialled. This includes “cut and cover” of tree stems with polythene and plastic pots to prevent regrowth. Also “cut and stack” of pest plants and saplings to suppress growth underneath and to act as a mulch and/or habitat for invertibrates. Another non-chemical method being trialled is to “cut and hash”, where cut stumps have a hash pattern chainsawed into them with surrounding soil from around the tree placed on the exposed stump.

Figure 20: Privet stumps covered in polythene and plastic posts (Jesse Tonar Reserve)

Figure 21: Cut and stack of privet seedlings in Ngapipi Reserve.

Ring barking (R)

The ring barking method is suitable for small to large pest trees that provide canopy. Leaving a canopy intact reduces the chance of other pest plants reestablishing in the area. It can take years for the selected pest tree to gradually break down, creating habitat for a range of birds, lizards and insects. To start, cut two horizontal rings 15cm or more apart. The cuts should be just deeper than the bark on the tree. Cut a line from the top ring to the bottom ring and work your way around removing all of the bark between the two rings, leaving an exposed cambium layer. Once all of the bark is removed exposing a section of the tree, this exposed area can be left, or a thin film of herbicide to the exposed section can be applied. There is a non chemical and chemical based option for this control method. **Note:** permissions must be sought from the relevant landowner and consenting authority before this method is considered, taking into consideration the 4m height threshold for tree alteration or removal requiring resource consent.

Foliar spray (FS)

This is a common pest plant control method for ecocontractors or volunteers with a Growsafe qualification. Herbicide can be applied over the entire surface of plant foliage. This method is very effective for a variety of applications, including instances of dense ground cover such as periwinkle, climbing asparagus and japanese honeysuckle, as well as large pest grass species, such as pampas. Before spraying, please consider variables such as weather conditions. Spraying should not proceed in the wind or rain as this may have unintended effects on non-target organisms on site. It is also important to select the appropriate herbicide for the sites, e.g. selective or nonselective, and to assess and check herbicide rates for the target plant type.

Drill and Fill (DF)

Drill 18mm holes (tangentially angled downwards) approximatley 150mm apart near the base of the stem, and inject with herbicide. Where trees are not in the vicinity of tracks or

accessible to visitors, trees can be left in-situ and can continue to provide canopy cover as part of a succession planting process for regenerating native understory and emerging old growth canopy species. **Note:** permissions must be sought from the relevant landowner and consenting authority before this method is considered, taking into consideration the 4m height threshold for tree alteration or removal requiring resource consent.

Hand remove (H)

Hand removal is suitable for small young pest plants. Simply pull or gently dig out. However, hand removal is usually only suitable if the entire root system can be removed. Soil disturbance can lead to more weeds and erosion in some places (water courses and stream banks). This method can be more challenging with resprouting species, such as wild ginger, as any remaining fragments of the root systems will regrow. Hand removed plants can be stored in composting bags with broken down material used as mulch.

Chip & Mulch (CM)

Areas with larger pest trees (e.g. wattle, privet) have been cut and material chipped by smaller chipping machines such as at Pourewa Creek Recreation Reserve. In some areas including Rosedale Park, a larger mulching attachment to an excavator is used to chip pest trees from the top down and return them to the soil to provide mulch for future restoration planting.

Figure 22: Mulching excavator at Rosedale Park

Figure 23: Cut and chipped area of tree privet on Pourewa Creek Reserve

As part of site preparation, a cover crop is sown to prevent pest plants reestablishing, with native pioneer trees planted in the following planting season. This is a non-chemical alternative for site preparation for restoration planting.

Figure 22: Cover crop planted after area mulched at Rosedale Park

Figure 23: Planting within mulched area with cover crop at Rosedale Park

7.2 Pest Animals

In the Pourewa Valley there are multiple community volunteer individuals and groups that have been suppressing the numbers of predators since 2018. In addition, some of the native bush remnants that have been classified as high value by Auckland Council are under a limited degree of predator control by professional eco-contractors.

A landscape scale eradication approach has been adopted through the Eastern Bay Songbird Project, where in the absence of oceans to act as barriers to reinvasion by predators, it is intended to follow the natural divide of the landscape and pursue a catchment-based eradication approach. Eastern Bays Songbird Project are working to connecting forest fragments via ecological corridors, and catchments are an obvious scale within which to create a areas of safe habitat surrounding significant ecological areas and ecologically important riparian land, including areas undergoing habitat restoration efforts.

The first stage of the predator eradication programme started in 2018 by John La Roche. Trap and bait station lines were set up within the Waka Kotahi land parcel (Management Unit 1) as he wanted to further reduce pest numbers being caught in Kepa Bush and Selwyn Bush. Waka Kotahi had large areas of unmanaged bush/scrub with privet, gorse and blackberry along with large sections of grassy habitat – which was identified as breeding grounds for possums and rats. Furthermore, there was also an intention to stop pests from crossing over from Meadowbank into this area via the railway.

The trapping lines start from the Meadowbank Pony Club and travel across Pourewa Valley with the last station in the bush facing the west end of Purewa Cemetery. For all lines, there is a mixture of Bait Stations (Protecta Ambush) and Possum traps (Timms). For some lines this could mean a trap is placed every station or every second bait station as distance between stations were taken into account. The initial plan was to have bait stations at every 40m, while traps were to be at every 60m intervals to account for natural rat and possum habitat range. While there were plans to start with 90 bait stations and 50 Traps, several stations has been deactivated (due to the shared pathway construction), while others have

been set up at a later time. Currently there are about 70 bait stations and 35 Timms active. More stations are currently being planned to be reactivated.

Below is a general summary of how the volunteer groups have been running their projects[5]:

Eastern Bays Songbird Project – PCBS (Predator Control Bait Stations)

For bait stations, there was 8 poison blocks used instead of the standard 4 in the Protecta Ambush Bait Station boxes. Bait lines were checked initially every week for the first year before swapping to the Council Schedule. Both Contrac and Ditrac poison blocks are used as per Council guidelines.

The results from this were uploaded to CatchIT to record their pest data.

***Eastern Bays Songbird Project* – PCTL (Predator Control Trapping Lines)**

Around the same time as the bait stations were set, trap lines were set up to deal with possums. These were set up along every 2 bait stations. The bait used on the Timms trap was 1/8th of an apple with coated cinnamon powder. Trap lines were checked initially roughly every week for the first few months before swapping to the Council Schedule

The results were also uploaded to CatchIT.

***Eastern Bays Songbird Project* – CCTT (Chew Cards/Tracker Tunnels)**

Monitoring for this area was primarily with tracker tunnels, using home-made tunnels (instead of the black tunnels). Tracker lines have been checked generally twice a year beginning from 2019. These tunnels were placed along Bait Stations that had more activity than usual.

Data was collected by noting pests prints each round in an excel sheet. Results again are uploaded to CatchIT on a special line.

***Eastern Bays Songbird Project* – BC (Bird Counts)**

Pourewa Valley bird counts are completed as part of the Eastern Bays Songbird Project - Bird Monitoring Campaign twice a year (Spring and Autumn) – these bird counts are completed as way to measure the success of the Songbird Project in their trapping efforts. They are completed as 3 x 5 minute bird counts identifying all birds observed (seen or heard).

Results are uploaded to the Songbird Project Drive and analysis is completed in Google Sheets.

The map shown below details approximate locations of control lines for rats, possums and mustelids across the catchment network. These locations relate to date uploaded to the

[5] NOTE: Across all lines, some of the trap/bait stations had to be uninstalled due to the construction of the cycleway. There is plans that once the cycleway is complete, some lines/stations may be reinstalled again to continue with trapping.

CatchIT platform. Specific trap and bait station locations are determined by the programme coordinator working on the ground in close collaboration with the field officer, volunteers and community groups.

Figure 24: Pest animal control sites in Pourewa Valley

7.3 Rubbish

There are scattered items of rubbish throught the reserves, particularly in the coastal forest understory adjacent to walkways. This rubbish appears more likely to be single discarded items, rather than being dumped rubbish. Never the less these items significantly reduce the amenity of the coastal forest and reserve areas.

Figure 25: Discarded rubbish in reserves