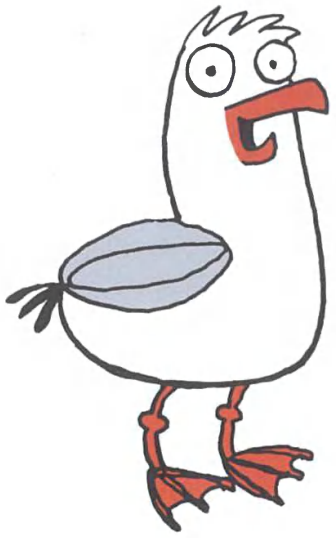
Te Pātaka o Rākaihautū
Banks Peninsula Community Board
MINUTES ATTACHMENTS

Date: Monday 10 June 2024
Time: 10 am
Venue: Lyttelton Community Boardroom, 25 Canterbury Street, Lyttelton

TABLE OF CONTENTS NGĀ IHIRANGI PAGE



Be prepared for an emergency

Lyttelton Emergency Hub
Supporting and connecting community in a disaster

Christchurch Civil Defence Emergency Management

Are you ready for a disaster?

Natural disasters are a part of life in a beautiful place, but they can strike at any time without warning. They can also disrupt essential services such as water, power, and communication. You may need to be self-sufficient for **3 days or more**. You can reduce the impact of disasters by being prepared, knowing your neighbours, and knowing where to access support in your community.

Wind, storms, flooding, fire, earthquake, tsunami – these are some of the natural disasters we might experience here. Is your household prepared to manage for a minimum of 3 days during and after an event?

Two actions to take:

1. Make a plan

Discuss with your household what to do in case of a disaster. Identify a meeting point and arrangements to pick up kids.
Choose an out-of-town contact person who can relay messages. Put a "we're okay" message on your phone.

Important Phone Numbers:

	Name	Number
Dr:		

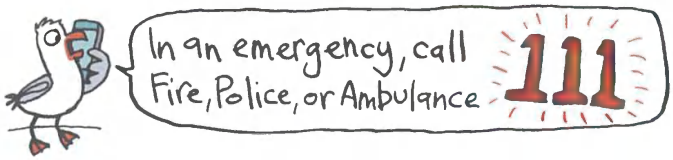
2. Build a kit

- Food *
- Medications *
- Baby care
- Animal food*
- Water (3 litres per person per
- day) including for animals *
- Toilet paper/toilet bucket
- Torch
- First Aid Kit
- Radio (battery or wind up)
- Batteries

*Refresh regularly (eg. on the 1st Sunday of month) so that they are never out of date.

Know how to turn off water, electricity and gas at main switches in your home.
For ideas and information about survival kits, evacuation kits, and disaster survival, go to:

- www.getthru.govt.nz
- survive-it.co.nz



Your neighbours are your best support in a disaster. Use this leaflet as an excuse to strike up a conversation, get to know them and work on a shared disaster preparation plan.

Activate Your Street!

Street Address	Name	Notes

When a disaster happens

- Make sure everyone is safe – if you have any concerns for yours or anyone else's safety ring 111.
- Stay informed. Listen to the radio, watch TV, or check online for the latest updates and instructions from the authorities.
- Check on your neighbours, especially the elderly and people with disabilities. Offer assistance if you can. Stay connected to people in your street/neighbours. Share resources, skills and support. Ring emergency services if needed.
- Visit the Lyttelton Emergency Hub if you want to be with others, want information, or can volunteer your help.

Lyttelton Emergency Hub

Lyttelton Emergency Hub (LEH) is part of a Christchurch and Banks Peninsula campaign initiated by Christchurch Civil Defence Emergency Management (CCDEM) and Christchurch City Council to improve local preparation for, and response to, natural disasters. In Lyttelton LEH is being developed and managed by Project Lyttelton (PL) and run by volunteers.

LEH will be a safe space where you can get support, up to date information and offers of local help after a natural disaster. It is not a front line emergency service but it will be connected to local emergency services.
LEH will be located initially at the Rec Centre. If LEH moves premises, a white board will give directions – look for the pavement flag.

Being prepared can save lives – yours/your family, your neighbours. Plan now.

If you or anyone is at risk ring 111. If you want to be with others, get some support or information go to LEH.
Email: LEH@lyttelton.net.nz **Phone:** 027 346 5010

Leaflet produced by LEH with support of CCDEM and PL.

Lyttelton Emergency Hub
Supporting and connecting community in a disaster

Lyttelton Community Litter Hunts

Undertaken with support from

We are asking for support and advocacy from the community Board to assist with the ongoing project

Duncan's story

Hunt Data

	Hunt 1	Hunt 2	Hunt 3 LCC Car Park	Hunt 3 Te Ana	Hunt 3 Total	Hunt 4	Hunt 5	Hunt 6	Comments
Date	11/12/2022	22/01/23	12/03/2023	12/03/2023	12/03/2023	26/11/2023	28/01/2024	10/03/2024	
Volunteer #	15	15	4	5	9	15	5	16	
Volume waste	0.5 m3	0.6m3	0.20 m3	0.3 m3	0.5 m3	0.4m3	0.125m3	0.6m3	Visual unpacked
Weight waste	20 kg	32.6 kg	5.45 kg	21.05 kg	26.5 kg	25.4 kg	14.35 kg	31.70kg	Bromley weighbridge Hunt 1 , hanging scales Hunt 2, 3 , 4&5
Volume recycling	0.20 m3	0.20 m3	0.2 m3	0.2 m3	0.4 m3	0.3 m3	0.125m3	0.3m3	Visual unpacked
Weight recycling	20 kg	22.0 kg	8.50 kg	11.5 kg	20.0 kg	15.85 kg	10.75 kg	26.85 Kg	Bromley weighbridge Hunt 1 , hanging scales Hunt 2, 3 & 4
Recycling % Glass	50%	40%			40%	40%	45%	20%	Visual waste assessment by volume for %
Recycling % Cans	30%	40%			40%	40%	30%	40%	Visual waste assessment by volume for %
Recycling % Plastic	5%	5%			5%	2%	5%	10%	Visual waste assessment by volume for %
Recycling % Cardboard	10%	10%			10%	16%	20%	15%	Visual waste assessment by volume for %
Recycling % Paper	5%	5%			5%	2%	0%	5%	Visual waste assessment by volume for %
Recyling % Metal								10%	Visual waste assessment by volume for %
Total collected	40 kg	54.6 kg	13.95 kg	32.55 kg	46.5 kg	41.25 kg	25.10 kg	58.55 kg	
% waste to recycling by weight waste/recy (rounded)	50/50	60/40	40/60	65/35	60/40	60/40	57/43	54/46	

What we would like

Continued support from

- Christchurch City Council ☺
- Sustainability by Design ☺
- Project Lyttelton ☺
- Lyttelton Harbour Business Association ☺

Gaining support from

- The Community Board and Christchurch City Council to assist us and advocate for the Litter Hunt Team to obtain more infrastructure in Lyttelton and Banks Peninsula to support recycling and minimising waste

Short term Goal

- Recycling bins on the main street and business areas of Lyttelton
- Designed and manufactured in Lyttelton
- Reflecting the character and edge
- Christchurch City Council to assist with servicing the bins and providing data

Not these

Botanical survey of Whakaraupō Reserve, Port Hills, Christchurch

Clockwise from top: Rock outcrops in Whakaraupō Reserve, grass convolvulus (*Convolvulus waitaha*), bullseye lichen (*Placopsis rhodophthalma*) and yellow rock daisy (*Brachyglottis lagopus*).

May 2024

Project team:
Melissa Hutchison – Field survey, mapping, report writing.
Tom Ferguson – Field survey.
Ed Wilson – Mapping.

Prepared for:
Lyttelton Community Reserves Conservation Award Group
Email: lyttcommres@gmail.com

CONTENTS

1. BACKGROUND

Whakarāupo Reserve is a public reserve covering approximately 87 hectares, situated on the south side of the Port Hills near Lyttelton (Figures 1-2). The site was purchased by the Banks Peninsula District Council in 1990 and became a gazetted reserve in 2005. Whakaraupō Reserve was managed by the Lyttelton Reserves Management Committee from 2005, but management has recently transferred to the Banks Peninsula Community Board via a Reserves Committee. Some planting of indigenous species has taken place in the reserve, but in general a passive regeneration approach has been employed, as it has been the cheapest and most realistic management option for the reserve (Couch & Downey 2012).

The vegetation and flora of Whakaraupō Reserve have been documented through two previous botanical surveys. Part of Whakaraupō Reserve was surveyed by Hugh Wilson in 1984, during his comprehensive Banks Peninsula Botanical Survey (Wilson 1984, 1992). More than 20 years later, Carol Jensen and Alice Shanks carried out a botanical survey of Whakaraupō Reserve from May 2007 to June 2008 (Jensen & Shanks 2008).

Project Lyttelton administers a fund on behalf of the former Lyttelton Reserves Management Committee. All of this funding was authorised for this project by the former Reserve Management Committee under the oversight of Brian Downey, Wendy Everingham, and Helen Greenfield. This team is referenced as the Lyttelton Community Reserves Conservation Award Group. Their role was to "employ the services of a botanist who is knowledgeable about the Canterbury flora to introduce appropriate second tier species into the existing bush based on rare, endemic, and endangered species present in Whaka Raupō Reserve."

Lyttelton Community Reserves Conservation Award Group has contracted Dr Melissa Hutchison (Ecologist/Botanist, Tenax Consulting) to undertake a botanical survey of Whakarāupo Reserve, and provide recommendation on appropriate ecological management of the reserve. This report presents the findings from the botanical survey carried out in spring 2023-summer 2024, and provides recommendations on potential management actions.

2. OBJECTIVES

The objectives of this project were to:

- Undertake a botanical survey of Whakaraupō Reserve – describe the current vegetation and habitat types and compile a list of indigenous and exotic vascular plant species.
- Map the distributions of Threatened, At Risk, locally uncommon[1] and/or notable indigenous plant species found in the reserve.
- Make incidental observations of bryophytes, lichens, and fauna in the reserve.
- Identify threats to ecological values/indigenous biodiversity in the reserve (e.g. exotic weeds), and provide recommendations on appropriate management.
- Identify opportunities for enhancement of ecological values in the reserve (e.g. planting).

[1] Locally uncommon species are those considered to be uncommon in the Port Hills Ecological District or Banks Ecological Region (Wilson 2013).

Figure 1: Location of Whakarāupo Reserve on the Port Hills, Lyttelton, Christchurch.

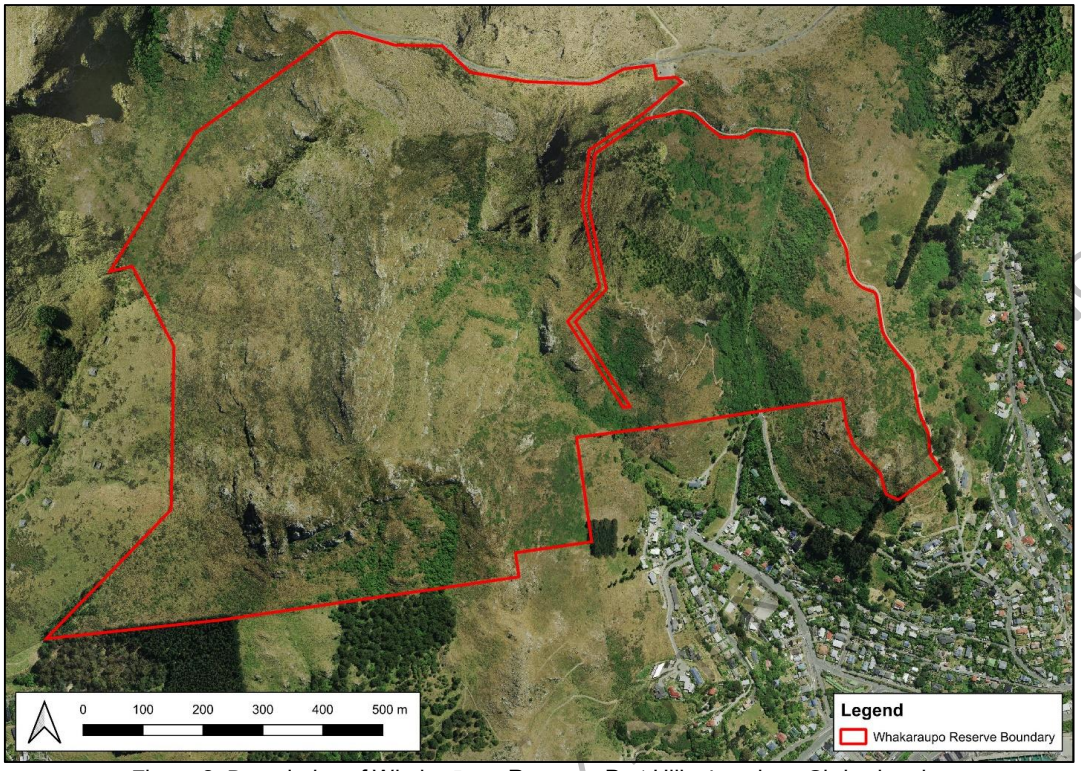


Figure 2: Boundaries of Whakarāupo Reserve, Port Hills, Lyttelton, Christchurch.

3. SITE DESCRIPTION

Whakaraupō Reserve is located on the south side of the Port Hills, near Lyttelton (Figure 1). The reserve is owned and managed by Christchurch City Council (CCC), and is open to the public for recreational use. The report by Jensen & Shanks (2008) contains an excellent general description of the site:

> "Until the early 1990s, the area now covered by the Whakaraupō Reserve was farmed. The Banks Peninsula Council bought the farm and the Lyttelton Reserves Committee [sic] has been responsible for its management. They have been responsible for the construction of tracks, considerable restoration plantings and some weed and pest control. Where stock have been excluded for about 10 years (over most of the reserve) there is an extensive [Scotch] broom cover. Sheep grazing was continued on the western grassland block for much longer but all stock have now been excluded. Goats caused a lot of damage until the final goats were shot about two years ago.
>
> Whakaraupō Reserve occupies a spectacular site overlooking Lyttelton. The steep bluffy slopes, rocky spurs and gullies are generally south facing. On three sides of the reserve are other Christchurch City Council reserves (The Tors, the Steadfast block, Castle Rock Reserve, Heathcote Valley Reserve and Mt Cavendish Reserve). Below the southern boundary the land is under freehold tenure. The historic Bridle Path track marks the eastern boundary and the Summit Road the northern boundary. Several walking tracks traverse the steep slopes and spurs linking the Crater Rim walkway with Lyttelton. An oil pipeline climbs from Lyttelton to Heathcote via the eastern gully to the Summit Road."

4. ECOLOGICAL CONTEXT

Whakaraupō Reserve is located in the Port Hills Ecological District (ED), which is part of Banks Ecological Region (McEwen 1987). Port Hills ED is bounded by Lyttelton Harbour to the south and east, the Canterbury Plains to the north and west, and Herbert Ecological District to the south. Port Hills ED consists of hills, which rise steeply from sea level on the Lyttelton Harbour side, and less steeply from the northern and western margins, and reach a maximum altitude of 573 m a.s.l (Coopers Knob/Ōmawete).

Geology, soils and climate

Rocks of the Port Hills ED consist of basaltic flows and pyroclastics from Miocene Lyttelton volcanics, with a fringe of deep Pleistocene loess of generally coarse texture (McEwen 1987). Most hill tops are rounded, but prominent tors, bluffs and rock outcrops are common along the ridges. Soils on the lower slopes consist of loess with pale-coloured compact subsoils (yellow-grey earths), which are drought-prone in summer (McEwen 1987). On higher slopes with higher rainfall, soils are derived from basalt or loess or mixtures of these; those from basalt have dark brown, blocky-structured, stony clay loam subsoils, while those from loess have yellowish-brown, friable to firm, silty subsoils. Those from mixed loess/basalt have intermediate features. There are also some small areas of recent alluvium at the mouths of some valleys. These include gley recent soils, saline gley recent soils, yellow-brown sand, and organic soils (peaty loams).

The climate of the Port Hills ED is characterised by warm summers and cool winters, with frequent frosts and occasional light snowfalls (McEwen 1987). Rainfall averages 600-700 mm per annum, and is more or less evenly spaced throughout the year, although occasional summer droughts can be harsh enough to cause severe wilting and some mortality of canopy and subcanopy trees in indigenous forests (Wilson 2013). Rainfall increases with increasing altitude and on a gradient from the northeast to the southwest of the ED. Prevailing winds are easterly, but strong, dry nor-west winds often exacerbate summer drought conditions.

Vegetation cover

The original vegetation cover of the Port Hills ED consisted of podocarp/hardwood forest in the gullies, mixed hardwood forest on the ridges, and subalpine shrubland and tussock grassland (mainly silver tussock, *Poa cita* and hard tussock, *Festuca novae-zelandiae*) in more exposed (cold and/or dry) sites (McEwen 1987; Wilson 1992, 2013). The main forest canopy species were lowland tōtara (*Podocarpus totara*), mataī (*Prumnopitys taxifolia*), kahikatea (*Dacrycarpus dacrydioides*), māhoe/whiteywood (*Melicytus ramiflorus*), broadleaf/kāpuka (*Griselinia littoralis*), kaikōmako (*Pennantia corymbosa*), pigeonwood/porokaiwhiri (*Hedycarya arborea*), lowland ribbonwood/mānatu (*Plagianthus regius*), and tree fuchsia/kōtukutuku (*Fuchsia excorticata*).

Slopes facing Lyttelton Harbour supported extensive scrub with lowland flax/harakeke (*Phormium tenax*) and mānuka (*Leptospermum scoparium*), and forests with additional coastal species such as ngaio (*Myoporum laetum*), akiraho (*Olearia paniculata*), and kawakawa (*Piper excelsum*). Montane forest with thin-bark tōtara (*Podocarpus laetus*), broadleaf, horopito/peppertree (*Pseudowintera colorata*), and soft-leaved tree fern (*Cyathea smithii*) was present above about 500 metres. The highest bluffs supported a variety of non-forest montane species, including snow tussock (*Chionochloa rigida*) and inaka (*Dracophyllum acerosum*).

Rock outcrops provided habitat for a suite of specialist plant species, including Banks Peninsula sun hebe (*Heliohebe lavaudiana*[2]), Banks Peninsula button daisy (*Leptinella minor*), Banks Peninsula aniseed (*Gingidia enysii* var. *peninsulare*), blanket fern (*Asplenium subglandulosum*), yellow rock daisy (*Brachyglottis lagopus*), and Lyttelton forget-me-not (*Myosotis lytteltonensis*). Many of these rock outcrop species are endemic to Banks Peninsula, and are classified as Threatened or At Risk nationally (de Lange *et al.* 2018). The Port Hills ED is the southern national distribution limit for the button daisy *Leptinella nana*, and the northern distribution limit for fragrant tree daisy (*Olearia fragrantissima*) (Wilson 1992).

The original vegetation of the Port Hills (like the rest of Banks Peninsula) was almost completely removed by successive waves of Māori and European colonisation, as a result of burning, logging, and farming. By 1900 only small fragments of indigenous forest remained, mainly at the southern end of the Port Hills (Wilson 1992). Since then, there has been a gradual increase in the extent of indigenous woody vegetation on Banks Peninsula, and now secondary growth kānuka (*Kunzea ericoides s.l.*[3]) forest, mixed podocarp-hardwood forest, and small-leaved shrubland cover *c.*15% of the Peninsula (Wilson 2013). Although the current vegetation on the Port Hills is still mostly exotic-dominant grassland, substantial areas of secondary growth broadleaved/hardwood forest and kānuka forest are present (Wilson 1992). Rock outcrops on the Port Hills continue to support a number of specialist plant species, although invasive exotic weeds increasingly threaten these habitats.

5. METHODS

5.1. Literature review

A review of existing ecological information relating to Whakaraupō Reserve was undertaken. This included data and photographs from the previous botanical survey in 2007-2008 (Jensen & Shanks 2008) and information from the Banks Peninsula Botanical Survey by Hugh Wilson in May 1984 (Wilson 1984). Observations of flora and fauna on the iNaturalist website made within Whakaraupō Reserve were also examined (https://inaturalist.nz/places/whakaraupō-reserve[4]). The Whakaraupō Reserve Interim Management Plan Review (Couch & Downey 2012) and a brief memo on weed control in Whakaraupō Reserve (Carter 2015) were also consulted.

5.2. Field survey

A botanical survey of Whakaraupō Reserve was carried out over three days on 13 September 2023, 8 December 2023, and 10 January 2024. The survey was undertaken by Melissa Hutchison (Ecologist/Botanist), with assistance from Tom Ferguson (Wai-Ora Forest Landscapes) on 13 September and 8 December 2023. Melissa was accompanied by Wendy Everingham on the 10 January 2024 site visit.

The reserve was traversed on foot as much as practical (given the terrain and time available), but some parts of the reserve were not able to be searched in detail (e.g. areas subject to high rock-fall danger were avoided) (see **Figure 3** for a map of routes walked during the survey).

[2] Also referred to as *Veronica lavaudiana*.
[3] Referred to as *Kunzea robusta* by de Lange (2014).
[4] A 'place' was created for Whakaraupō Reserve using a polygon downloaded from the Canterbury Maps website.

During the field survey, a list of vascular plant species was compiled, and locations of Threatened, At Risk, and locally uncommon or notable indigenous plant species were recorded with a hand-held Garmin GPS unit. Locations of exotic weeds (pest plants) were also recorded with a GPS unit, but waypoints were not saved for some widespread/common weed species (e.g. Scotch broom, *Cytisus scoparius*). Incidental observations of bryophytes (liverworts and mosses), lichens, and fauna were also made during the field visits, but comprehensive surveys of these taxa were not undertaken (specialist methods or equipment are required for accurate identification of most taxa – this was outside the scope and budget of this project).

Selected observations of flora, fauna, and lichens made by Melissa Hutchison during the botanical survey of Whakaraupō Reserve were uploaded to the iNaturalist website (see https://inaturalist.nz/observations?place_id=202086&subview=table&user_id=melissa_hutchison&verifiable=any).

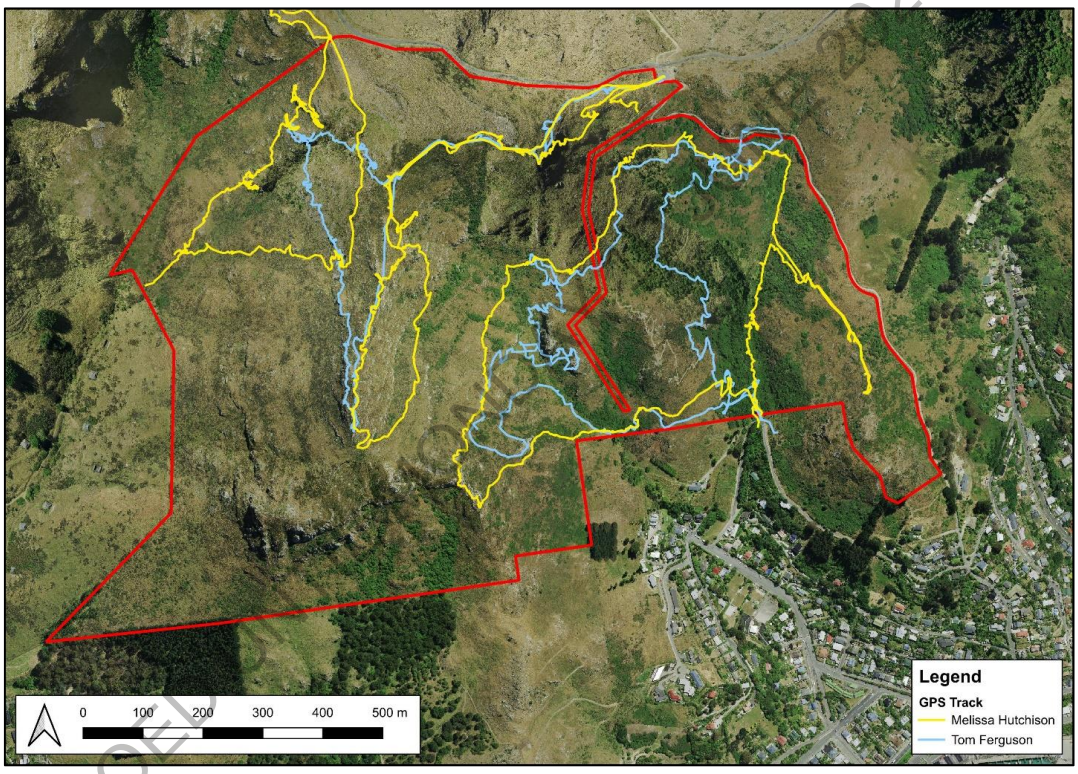


Figure 3: Routes walked during the botanical survey of Whakarāupo Reserve – September 2023 to January 2024. Data source: Garmin GPS tracks.

6. ECOLOGICAL VALUES OF WHAKARAUPŌ RESERVE

6.1. Vegetation and habitats

The original vegetation cover of Whakaraupō Reserve has been substantially modified through vegetation clearance, livestock grazing, and the invasion of exotic plants. Much of the reserve is currently dominated by exotic grassland, but the site contains several small patches of indigenous broadleaved/hardwood forest as well as extensive areas of actively regenerating flaxland, native shrubs, bracken (*Pteridium esculentum*), and indigenous treeland/scrub, especially in the gullies and on the shady slopes (see photographs below, **Figures 4-15**). The reserve is notable for its rock bluffs, outcrops, and steep rocky spurs, which support a suite of specialist indigenous plant species (Jensen & Shanks 2008) (**Figures 16-19**).

Broad vegetation and habitat types present in Whakaraupō Reserve are summarised in **Table 1**, and selected photographs are provided below. The report by Jensen & Shanks (2008) contained detailed descriptions and a map of the main vegetation types in the reserve (see **Appendix 1** of this report). Most of these descriptions are still relevant, although there have been some changes in the vegetation cover since the 2007-2008 survey. The main changes evident are:

- An increase in the density of indigenous trees and shrubs, particularly in the gullies and on moist slopes (**Figures 4-10**). The bush-clad gullies to the west of the reserve (below The Tors) provide good seed sources for a variety of indigenous woody species.
- An increase in the area and density of harakeke flaxland in the upper part of the reserve (**Figures 11-13**).
- A reduction in the density of Scotch broom (*Cytisus scoparius*) on the slopes (**Figure 14**). The cohort of broom seedlings that established when livestock were removed from the reserve is now senescent and further recruitment is being suppressed by competition with dense, tall exotic grasses (see comments by Jensen & Shanks (2008) about Scotch broom). Nevertheless, Scotch broom is still spreading in rock outcrop habitats and drier parts of the reserve with sparse grass cover.
- An increase in the densities of some exotic weed species, in particular common polypody (*Polypodium vulgare*) and spur valerian (*Centranthus ruber*) (compare distribution maps in Jensen & Shanks (2008) with **Figures 69 & 70** in this report).
- Successful establishment and growth of indigenous restoration plantings – these now form a continuous forest canopy (**Figures 21-23**). The plantings will act as a seed source for further spread of indigenous trees in the reserve.
- Replacement of short tussock grassland (which was dominated by silver tussock, *Poa cita*) with exotic grassland on the summit ridge and slopes in the western part of the reserve (this area was retired from grazing later than the rest of the reserve) (see **Figure 24**).
- Small areas of rock 'pavement' are still present on the summit ridge, but these have been heavily invaded by exotic grasses and herbs, and there is much less bare rock.

Table 1: Vegetation / habitat types present in Whakaraupō Reserve (modified from Jensen & Shanks 2008, see map in **Appendix 1**). * denotes exotic species.

Vegetation/ Habitat Type	Description	Common/Notable Plant Species
Secondary growth indigenous broadleaved/ hardwood forest/scrub	Patches of indigenous secondary growth broadleaved/hardwood forest and scrub occur in moist gullies. Occasional large, old native trees are present, along with regenerating young trees and shrubs. Ongaonga/tree nettle and *Coprosma* species are common in the understorey.	Broadleaf (*Griselinia littoralis*) Cabbage tree/tī kouka *(Cordyline australis*) Five-finger (*Pseudopanax arboreus*) Lowland ribbonwood (*Plagianthus regius*) Māhoe (*Melicytus ramiflorus*) Narrow-leaved lacebark (*Hoheria angustifolia*) Ngaio (*Myoporum laetum*) Mikimiki (*Coprosma propinqua*) Ongaonga/tree nettle (*Urtica ferox*) Red māpou *(Myrsine australis*) Small-leaved kōwhai (*Sophora microphylla*) Tree fuchsia/kōtukutuku (*Fuchsia excorticata*) Large-leaved pōhuehue (*Muehlenbeckia australis*)
Kānuka treeland	The reserve contains one small patch of secondary growth kānuka treeland, measuring *c.*50 m x 50 m, with trees up to 6 m tall. The kānuka is located on a rock outcrop, which is surrounded by dense gorse. The understorey contains young māhoe, thick-leaved coprosma/mikimiki, red māpou, large-leaved pōhuehue, bracken (*Pteridium esculentum*), blackberry (*Rubus fruticosus* agg.), and kānuka seedlings.	Kānuka (*Kunzea ericoides* s.l.) Māhoe (*Melicytus ramiflorus*) Large-leaved pōhuehue (*Muehlenbeckia australis*) Thick-leaved coprosma/mikimiki (*Coprosma crassifolia*) Red māpou *(Myrsine australis*) Gorse (*Ulex europaeus*)*
Mixed hardwood treeland	Scattered indigenous and exotic broadleaved/hardwood trees over exotic grassland on south-facing slopes and in gullies.	Broadleaf (*Griselinia littoralis*) Cabbage tree/tī kouka *(Cordyline australis*) Lowland ribbonwood (*Plagianthus regius*) Māhoe (*Melicytus ramiflorus*) Narrow-leaved lacebark (*Hoheria angustifolia*) Ngaio (*Myoporum laetum*) Small-leaved kōwhai (*Sophora microphylla*) Elder (*Sambucus nigra*)* Hawthorn (*Crataegus monogyna*)* Common polypody (*Polypodium vulgare*)*
Exotic grassland-shrubland	Exotic grassland with scattered shrubs (exotic and indigenous) on moist slopes. Scotch broom is dying off and recruitment is being suppressed by dense, tall exotic grasses (mainly cocksfoot and tall oat grass). Smaller rock outcrops have been smothered by grass and have been invaded by common polypody.	Scotch broom (*Cytisus scoparius*)* Boneseed (*Chrysanthemoides monilifera*)* Gorse (*Ulex europaeus*)* Spindle tree (*Euonymus europaeus*)* Common polypody (*Polypodium vulgare*)* Native broom (*Carmichaelia australis*) Matagouri (*Discaria toumatou*) Ongaonga/tree nettle (*Urtica ferox*) Scrub pōhuehue (*Muehlenbeckia complexa*) Cocksfoot (*Dactylis glomerata*)* Tall oat grass (*Arrhenatherum elatius*)* Browntop (*Agrostis capillaris*)* Ryegrass (*Lolium perenne*)* Sweet vernal (*Anthoxanthum odoratum*)* Yorkshire fog (*Holcus lanatus*)*

Vegetation/ Habitat Type	Description	Common/Notable Plant Species
Harakeke flaxland	Harakeke flaxland on damp south- to SW-facing slopes. The densest flaxland occurs on the upper slopes in the middle section of the reserve.	Lowland flax/harakeke (*Phormium tenax*) Ongaonga/tree nettle (*Urtica ferox*)
Rock outcrops	Rock bluffs, boulders, and rocky spurs in the reserve provide habitat for a variety of specialist indigenous plant species, including Banks Peninsula endemics like Banks Peninsula hebe, sun hebe, blue tussock, and aniseed, as well as prostrate kōwhai, porcupine shrub, yellow rock daisy, yellow groundsel, woodrush, and rock fern. Rock outcrops are highly vulnerable to invasion by exotic weeds such as Scotch broom, spur valerian, common polypody, and stonecrop.	Banks Peninsula aniseed (*Gingidia enysii* var. *peninsulare*) Banks Peninsula blue tussock (*Festuca actae*) Banks Peninsula hebe (*Hebe strictissima*) Banks Peninsula sun hebe (*Heliohebe lavaudiana*) Lyttelton forget-me-not (*Myosotis lytteltonensis*) Porcupine shrub (*Melicytus alpinus*) Prostrate kōwhai (*Sophora prostrata*) Rock fern (*Cheilanthes sieberi*) Woodrush (*Luzula banksiana* var. *orina*) Yellow groundsel *(Senecio matatini* subsp. *basinudus*) Yellow rock daisy (*Brachyglottis lagopus*) Common polypody (*Polypodium vulgare*)* Spur valerian (*Centranthus ruber*)* Scotch broom (*Cytisus scoparius*)* Stonecrop (*Sedum acre*)*
Dry grassland-shrubland	Dry grassland with a mixture of native and exotic grasses on the summit ridge and rocky spurs. Scrub pōhuehue is also common.	Scrub pōhuehue (*Muehlenbeckia complexa*) Meadow rice grass/pātiti (*Microlaena stipoides*) Danthonia (*Rytidosperma caespitosum*)* Danthonia (*Rytidosperma unarede*) Needle grass (*Austrostipa nodosa*)* Ripgut brome (*Bromus diandrus*)*
Indigenous restoration planting	Extensive plantings of indigenous trees and shrubs have been established at the bottom entrance to the reserve off Harmans Road (a project by Christchurch City Council and the former District Council in 2000) and along the oil pipeline. The trees are now up to 8 m tall and form a continuous canopy. Indigenous trees have also been planted alongside the Bridle Path.	Akeake (*Dodonaea viscosa*) Akiraho (*Olearia paniculata*) Banks Peninsula hebe (*Hebe strictissima*) Cabbage tree/tī kouka *(Cordyline australis*) Five-finger/whauwhaupaku (*Pseudopanax arboreus*) Kānuka (*Kunzea ericoides s.l.*) Karakū (*Coprosma robusta*) Kōhūhū (*Pittosporum tenuifolium*) Koromiko (*Hebe salicifolia*) Lemonwood/tarata (*Pittosporum eugenioides*) Lowland flax/harakeke (*Phormium tenax*) Lowland ribbonwood/mānatu (*Plagianthus regius*) Lowland tōtara (*Podocarpus laetus*) Mountain tōtara (*Podocarpus totara*) Ngaio (*Myoporum laetum*) Small-leaved coprosma/mikimiki (*Coprosma propinqua*) Small-leaved kowhai (*Sophora microphylla*) Wind grass (*Anemanthele lessoniana*) Wineberry/makomako (*Aristotelia serrata*) (See **Appendix 2** for a list of species planted in the reserve).

Figure 4: Secondary growth indigenous broadleaved/hardwood forest and scrub in the eastern gully above Harmans Road. 13 Sept 2023.

Figure 5: Secondary growth indigenous broadleaved/hardwood forest towards the bottom of the middle gully. 13 Sept 2023.

Figure 6: Māhoe (*Melicytus ramiflorus*) forest in the middle gully of the reserve. 13 Sept 2023.

Figure 7: Dense exotic grassland dominated by cocksfoot (*Dactylis glomerata*) in the foreground, with indigenous secondary growth broadleaved/hardwood forest and scrub on the slopes beyond. 13 Sept 2023.

Figure 8: Rocky spurs with patches of gorse (*Ulex europaeus*) and gullies with secondary growth indigenous hardwood forest/scrub. Note the small patch of kānuka (*Kunzea ericoides s.l.*) treeland on the rocky spur (red circle). 13 Sept 2023.

Figure 9: Looking over indigenous plantings (in foreground) to slopes dominated by exotic grassland, with scattered indigenous and exotic shrubs. 13 Sept 2023.

Figure 10: Scattered māhoe (*Melicytus ramiflorus*) and other indigenous trees regenerating in amongst exotic grassland. The small patch of kānuka (*Kunzea ericoides s.l.*) surrounded by gorse (*Ulex europaeus*) is visible on the edge of the rocky spur in the background. 13 Sept 2023.

Figure 11: Moist rocky slopes with regenerating harakeke (*Phormium tenax*) flaxland and indigenous hardwood scrub in the middle gully of the reserve. 8 Dec 2023.

Figure 12: Harakeke (*Phormium tenax*) flaxland in the middle gully near the top of the reserve. 8 Dec 2023.

Figure 13: Harakeke flaxland (*Phormium tenax*) regenerating on steep rocky slopes above Steadfast Reserve (Cass Bay). 10 Jan 2024.

Figure 14: Dead Scotch broom (*Cytisus scoparius*) in amongst dense exotic grassland. 13 Sept 2023.

Figure 15: Scattered native broom (*Carmichaelia australis*) in amongst exotic grassland. 8 Dec 2023.

Figure 16: Steep south-facing bluffs in the reserve provide habitat for a variety of indigenous rock outcrop species. 13 Sept. 2023.

Figure 17: Steep south-facing rock bluffs at the head of the middle gully in the reserve, with indigenous broadleaved/hardwood forest and scrub dominated by māhoe (*Melicytus ramiflorus*) below. 13 Sept 2023.

Figure 18: This rocky spur in the middle of the reserve was covered in dense patches of prostrate kōwhai (*Sophora prostrata*). 8 Dec 2023.

Figure 19: Extensive patches of meadow rice grass (*Microlaena stipodes*) and scrub pōhuehue (*Muehlenbeckia complexa*) were seen on sunny, dry slopes in the reserve. 13 Sept. 2023.

Figure 20: Large hawthorn (*Crataegus monogyna*) trees were common in amongst indigenous broadleaved/hardwood forest and scrub near the eastern edge of the reserve. Note the scattered boneseed (*Chrysanthemoides monilifera*) (yellow flowers) on the ridge beyond. 13 Sept 2023.

Figure 21: Indigenous restoration plantings in the gully above Harmans Road alongside the oil pipeline. 13 Sept 2023.

Figure 22: Indigenous restoration plantings in the gully above Harmans Road to the west of the oil pipeline. 13 Sept 2023.

Figure 23: View of indigenous restoration plantings and regenerating indigenous broadleaved/hardwood forest and scrub in the gully above Harmans Road. 13 Sept 2023.

Figure 24: Silver tussock (*Poa cita*) on the summit ridge is being outcompeted by vigorous exotic grasses. 8 Dec 2023.

6.2. Indigenous vascular plants

More than half the vascular plant species recorded in Whakaraupō Reserve are indigenous (154 species), with 116 species found in the current survey, and a further 31 species noted previously by Jensen & Shanks (2008) (see **Appendix 2** for a species list). One explanation why some of these species were not observed in 2023-2024 is that the survey by Jensen & Shanks (2008) was carried out over seven days, whereas the current survey was only three days – the number of species found in an area is likely to increase with greater survey effort. Another possibility is that some of the plants observed previously are no longer present in the reserve, as they may have been outcompeted by exotic grasses or taller woody vegetation.

Whakaraupō Reserve contains a variety of indigenous trees (26 species) and shrubs (19 species). Māhoe is still the most common tree in the reserve, with the highest densities found on moist slopes and in sheltered gullies. Occasional broadleaf/kāpuka, cabbage tree/tī kouka, ngaio, lowland ribbonwood/mānatu, small-leaved kōwhai, and tree fuchsia/kotukutuku are present. Prostrate kōwhai is one of the characteristic shrubs of the reserve, and is found on exposed, sunny rock bluffs and spurs (**Figures 18 & 25**). At least nine species of indigenous vines or lianes occur in the reserve, including NZ bindweed/pōwhiwhi (*Calystegia tuguriorum*), bush lawyer/tātarāmoa (*Rubus schmedelioides*, *R. squarrosus*), climbing fuchsia (*Fuchsia perscandens*), and pōhuehue (*Muehlenbeckia australis*, *M. complexa*).

There is a good diversity of indigenous herbs (48 species), such as everlasting daisy (*Anaphalioides bellidioides*), grass convolvulus (*Convolvulus waitaha*), native bedstraw (*Galium propinquum*), NZ harebell (*Wahlenbergia violacea*, *W. rupestris*), native iris/mikoikoi (*Libertia ixioides*), short-flowered cranesbill (*Geranium brevicaule*), yellow oxalis (*Oxalis exilis*), and yellow rock daisy, reflecting the diversity of different habitats in the reserve. Indigenous grasses such as hard tussock, silver tussock, plume grass (*Dichelachne crinita*), and native danthonia (*Rytidosperma corinum* and *R. unarede*) typically occupy open, rocky habitats (11 species in total). Fern diversity is relatively high (21 species) – many of the species present can tolerate partial shade or open conditions, e.g. ground spleenwort (*Asplenium appendiculatum*), hound's tongue (*Microsorum pustulatum*), rock fern (*Cheilanthes sieberi*), and shield fern (*Polystichum oculatum*, *P. vestitum*).

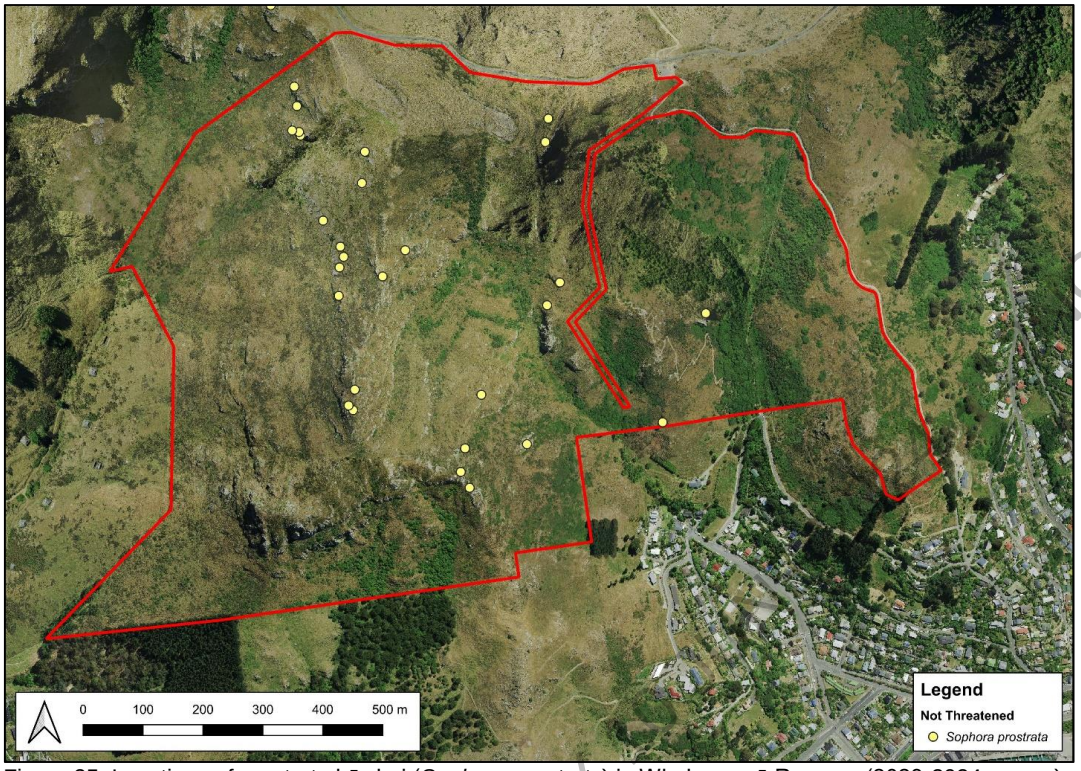


Figure 25: Locations of prostrate kōwhai (*Sophora prostrata*) in Whakaraupō Reserve (2023-2024 survey).

Six of the species recorded in the reserve are 'non-local' native species (or hybrids) that do not occur naturally in the Port Hills Ecological District (Wilson 1992). Most of these were found in the gully above Harmans Road (**Figure 28**). Some of these species are likely to be garden escapes that have been dispersed into the reserve by birds (e.g. taupata, *Coprosma repens*; karo, *Pittosporum ralphii*, **Figure 26**), while others have probably been intentionally planted in the reserve (e.g. wind grass *Anemanthele lessoniana*; *Olearia lineata* 'dartonii'; karaka, *Corynocarpus laevigatus,* **Figure 27**). Some of these species have potential to spread widely and are considered to be ecological weeds in the reserve (e.g. karo).

Figure 26: Karo (*Pittosporum ralphii*) seedlings were seen in the gully above Harmans Road. Karo is a 'non-local' native species that does not occur naturally on Banks Peninsula, and is considered to be an ecological weed in the reserve.

Figure 27: Karaka (*Corynocarpus laevigatus*) appears to have been planted in the reserve, and seedlings were seen coming up in the understorey. Karaka is a 'non-local' native species, and is not ecologically appropriate for planting in the reserve.

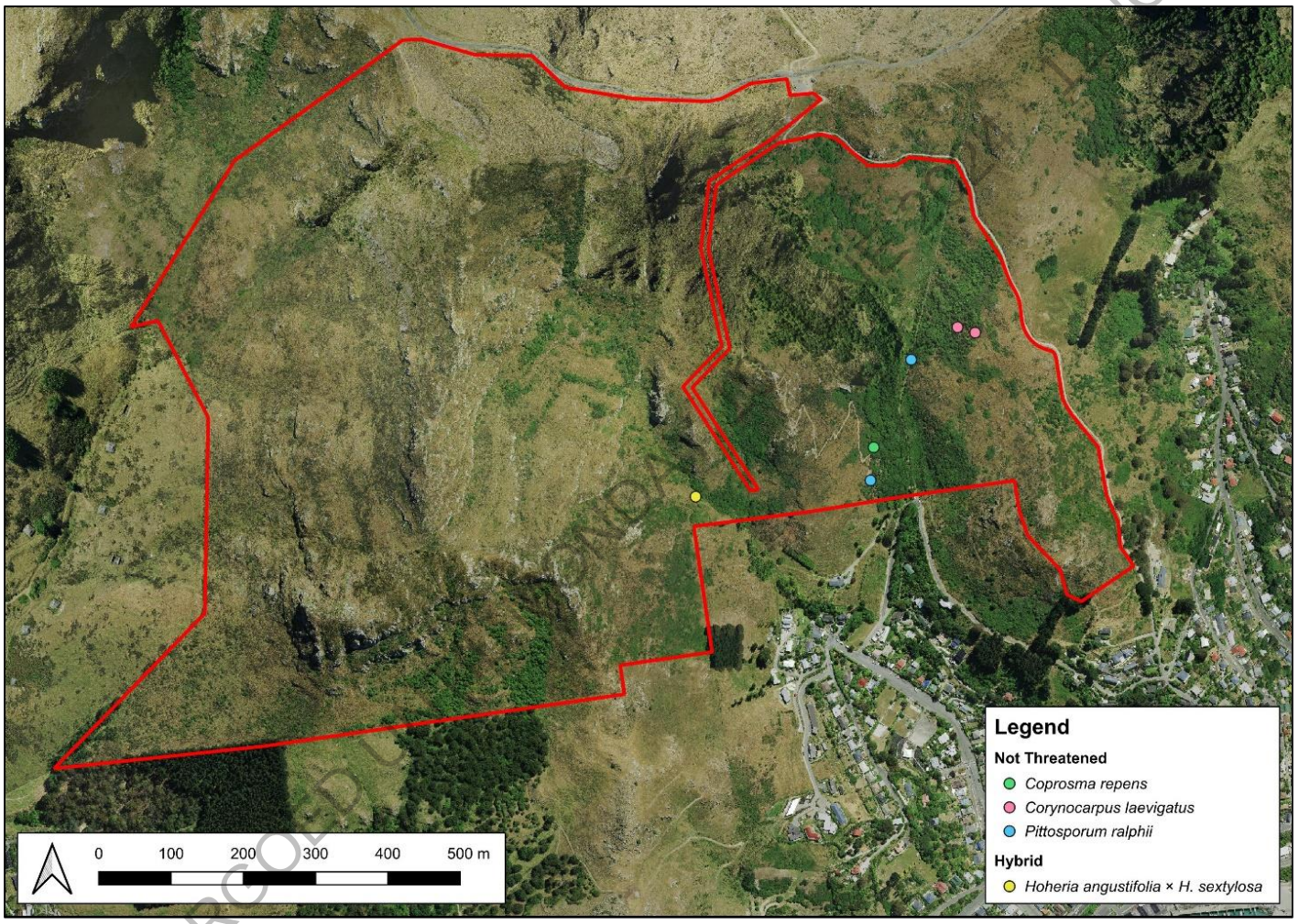


Figure 28: Locations of 'non-local' native plant species in Whakaraupō Reserve (2023-2024 survey).

- **Threatened and At Risk vascular plant species**

Whakaraupō Reserve provides important habitat for a wide range of Threatened and At Risk vascular plant species. In total, 18 Threatened or At Risk species have been recorded in the reserve, including three classified as Threatened-Nationally Critical, two Threatened-Nationally Vulnerable species, and six At Risk-Declining species (**Table 2, Figures 29-46**).

Six of the species found in the reserve are endemic to Banks Peninsula, and they are all classified as Threatened or At Risk (**Table 2**). Most of the endemic species are relatively widespread on the Peninsula, with the exception of *Myosotis lytteltonensis*, which is more or less restricted to the Lyttelton Harbour basin, and has a current population of <250 individuals (Hutchison *et al.* 2020). Only one small patch of Lyttelton forget-me-not was found in Whakaraupō Reserve during the current survey (**Figures 29 & 41**).

Three of the Threatened and At Risk species found previously by Jensen & Shanks (2008) were not observed in the current (2023-2024) survey: grassland speargrass (*Aciphylla subflabellata*), fan-leaved mat daisy (*Raoulia monroi*), and rōhutu/NZ myrtle (*Neomyrtus pedunculata*) (**Table 2**). Two of these species (*A. subflabellata* and *R. monroi*) were found previously on the summit ridge, but they may have been smothered or obscured by dense, tall exotic grass and herbaceous weeds.

Table 2: Threatened and At Risk vascular plant species found in Whakaraupō Reserve. Abundance categories: F = frequent, O = occasional, R = rare.

Conservation Status (de Lange *et al.* 2018a)		Scientific Name	Common Name(s)	Current Survey 2023-2024	Jensen & Shanks 2008
Threatened	Nationally Critical	*Lophomyrtus obcordata* [1]	rōhutu, NZ myrtle	R	-
		Myosotis lytteltonensis	Lyttelton forget-me-not [#]	R	Y
		Neomyrtus pedunculata [1]	rōhutu, myrtle	-	Y
	Nationally Vulnerable	*Kunzea ericoides s.l.* [1,2]	kānuka, rawirinui	R	Y
		Raoulia monroi	fan-leaved mat daisy	-	Y
At Risk	Declining	*Aciphylla subflabellata*	speargrass, spaniard, kurikuri	-	Y
		Coprosma virescens	lacy mikimiki	R	Y
		Discaria toumatou	matagouri, tūmatakuru	O	Y
		Heliohebe lavaudiana [3]	Banks Peninsula sun hebe [#]	O	Y
		Hypericum involutum	grassland hypericum	R	-
		Linum monogynum	NZ linen flax	O	Y
	Naturally Uncommon	*Chenopodium allanii*		O	Y
		Festuca actae	Banks Peninsula blue grass [#]	F	Y
		Gingidia enysii var. *peninsulare*	Banks Peninsula aniseed [#]	R	Y
		Hebe strictissima [3]	Banks Peninsula hebe [#]	R	Y
		Juncus distegus	wīwī	R	-
		Leptinella minor	Banks Peninsula button daisy [#]	O	Y
		Senecio matatini subsp. *basinudus*	yellow groundsel	O	Y

[#] Endemic to Banks Ecological Region.

[1] All members of the Myrtaceae family in New Zealand (including kānuka and mānuka) were classified as Threatened or At Risk by de Lange *et al.* (2018a) because of the potential threat of myrtle rust (*Austropuccinia psidii*). Some species appear to be less susceptible to myrtle rust than initially thought, therefore their threat status is likely to be revised in the upcoming conservation status assessment for vascular plants (due to be published in 2024).

[2] Referred to as *Kunzea robusta* by de Lange (2014).

[3] Placed in the genus *Veronica* by some authors.

Figure 29: One small patch of Lyttelton forget-me-not (*Myosotis lytteltonensis*) (Threatened-Nationally Critical) was found on a sheltered rocky slope in the western part of the reserve. Photo: Tom Ferguson.

Figure 30: Banks Peninsula blue tussock (*Festuca actae*) (At Risk-Naturally Uncommon) is common on damp rock outcrops throughout the reserve.

Figure 31: Banks Peninsula sun hebe (*Heliohebe lavaudiana*) (At Risk-Declining) occurs on sunny rock bluffs in the upper part of the reserve.

Figure 32: Habitat of Banks Peninsula sun hebe – sunny rock bluffs in the upper part of the reserve.

Figure 33: A patch of grassland hypericum (*Hypericum involutum*) (At Risk-Declining) was found in flower. This appears to be the first time this species has been recorded in the reserve, but it can be hard to detect when not in flower.

Figure 34: Grassland hypericum habitat (red circle) – the base of a rock outcrop near the top of the reserve above Cass Bay.

Figure 35: Banks Peninsula aniseed (*Gingidia enysii* var. *peninsulare*) (At Risk-Naturally Uncommon) was found on rock bluffs in the upper part of the reserve, but was not very common.

Figure 36: Banks Peninsula aniseed habitat (yellow triangle) – a shady rock face in the upper part of the reserve.

Figure 37: Banks Peninsula button daisy (*Leptinella minor*) (At Risk-Naturally Uncommon).

Figure 38: Banks Peninsula button daisy habitat (yellow triangle) – on the edge of a rock outcrop.

Figure 39: Yellow groundsel (*Senecio matatini* subsp. *basinudus*) (At Risk-Naturally Uncommon) is occasional on rock outcrops in the reserve.

Figure 40: Steep rock faces on bluffs and rocky spurs provide habitat for yellow groundsel.

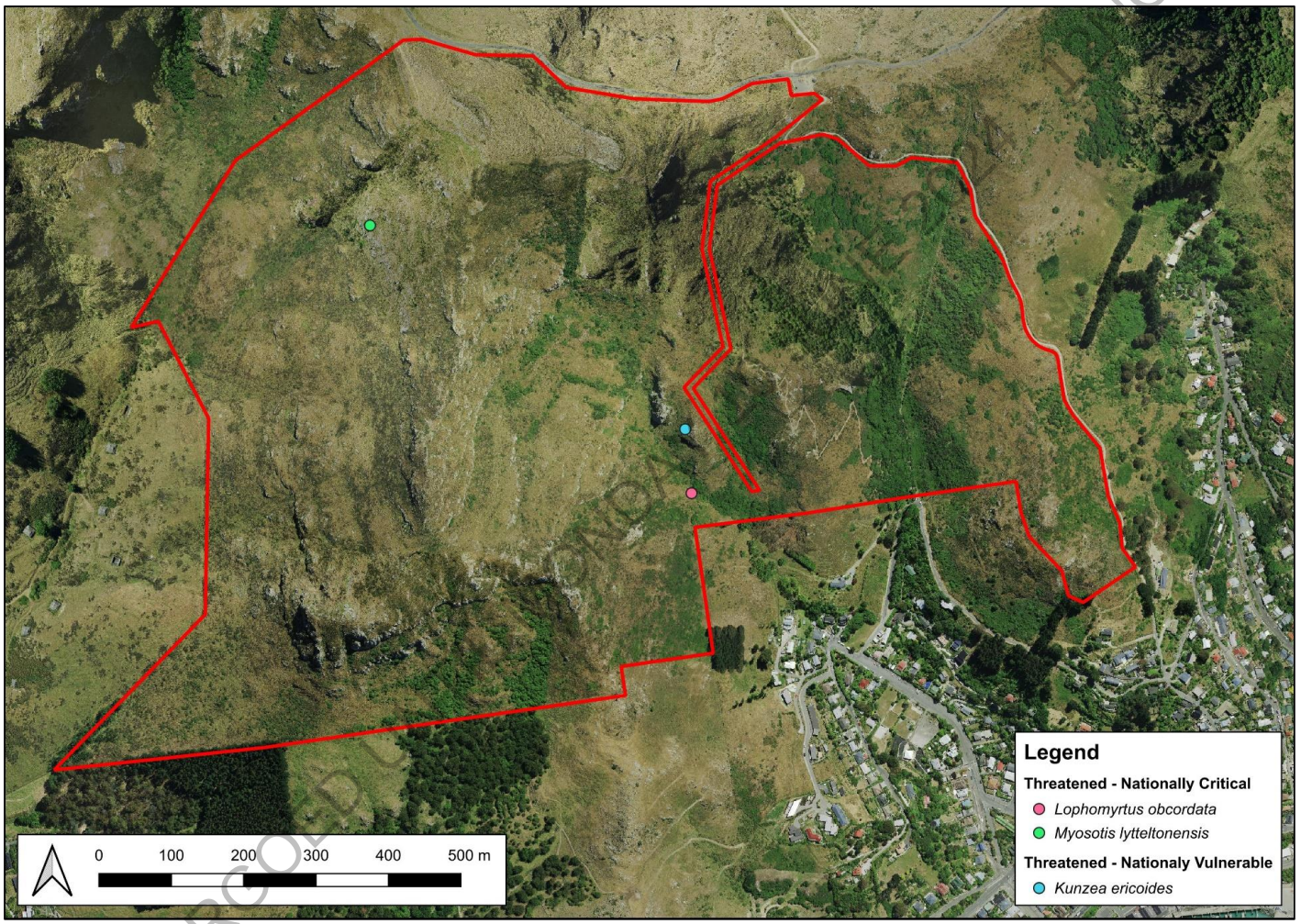


Figure 41: Locations of Threatened plant species in Whakaraupō Reserve (2023-2024 survey).

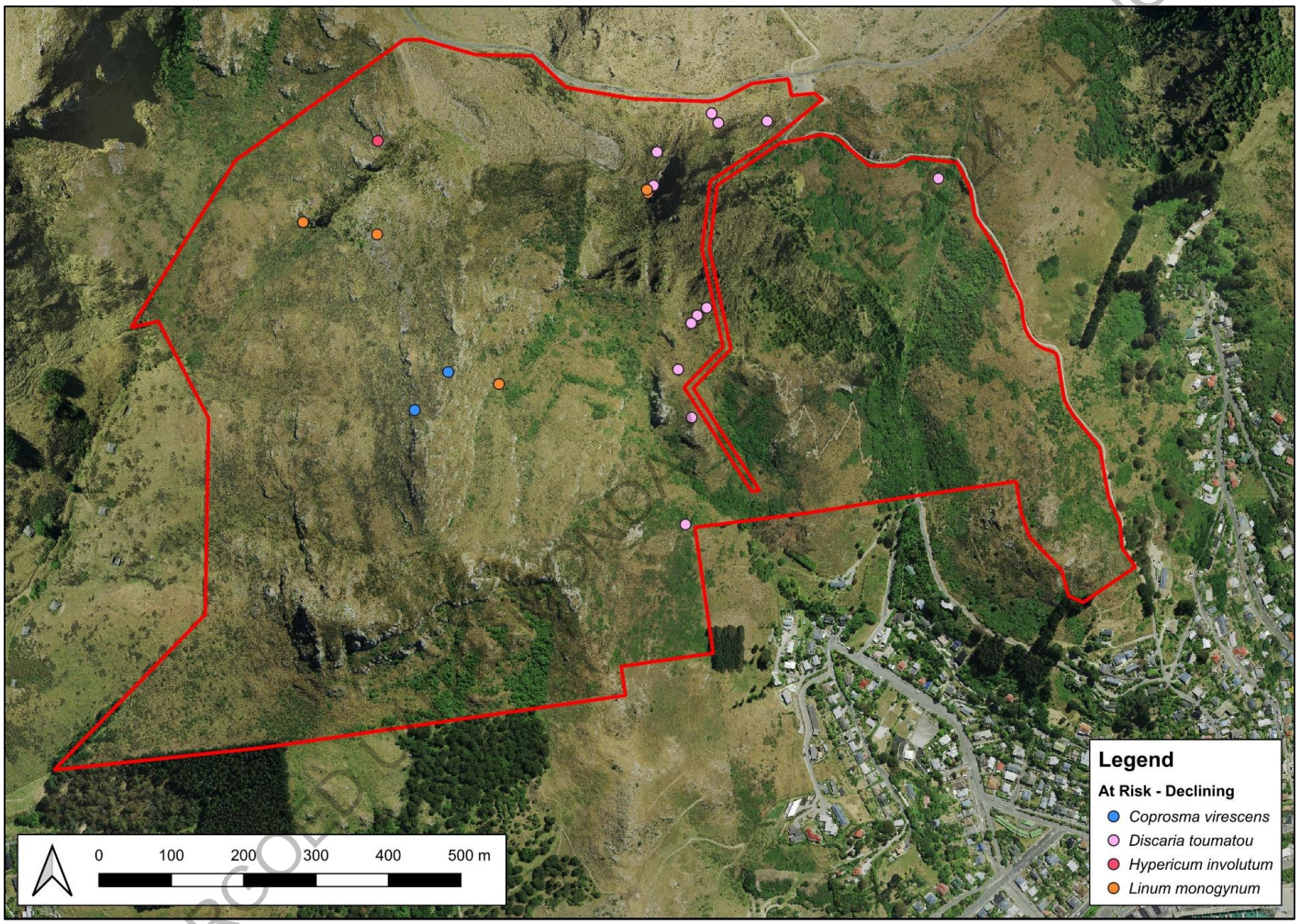


Figure 42: Locations of At Risk-Declining plant species in Whakaraupō Reserve (2023-2024 survey).

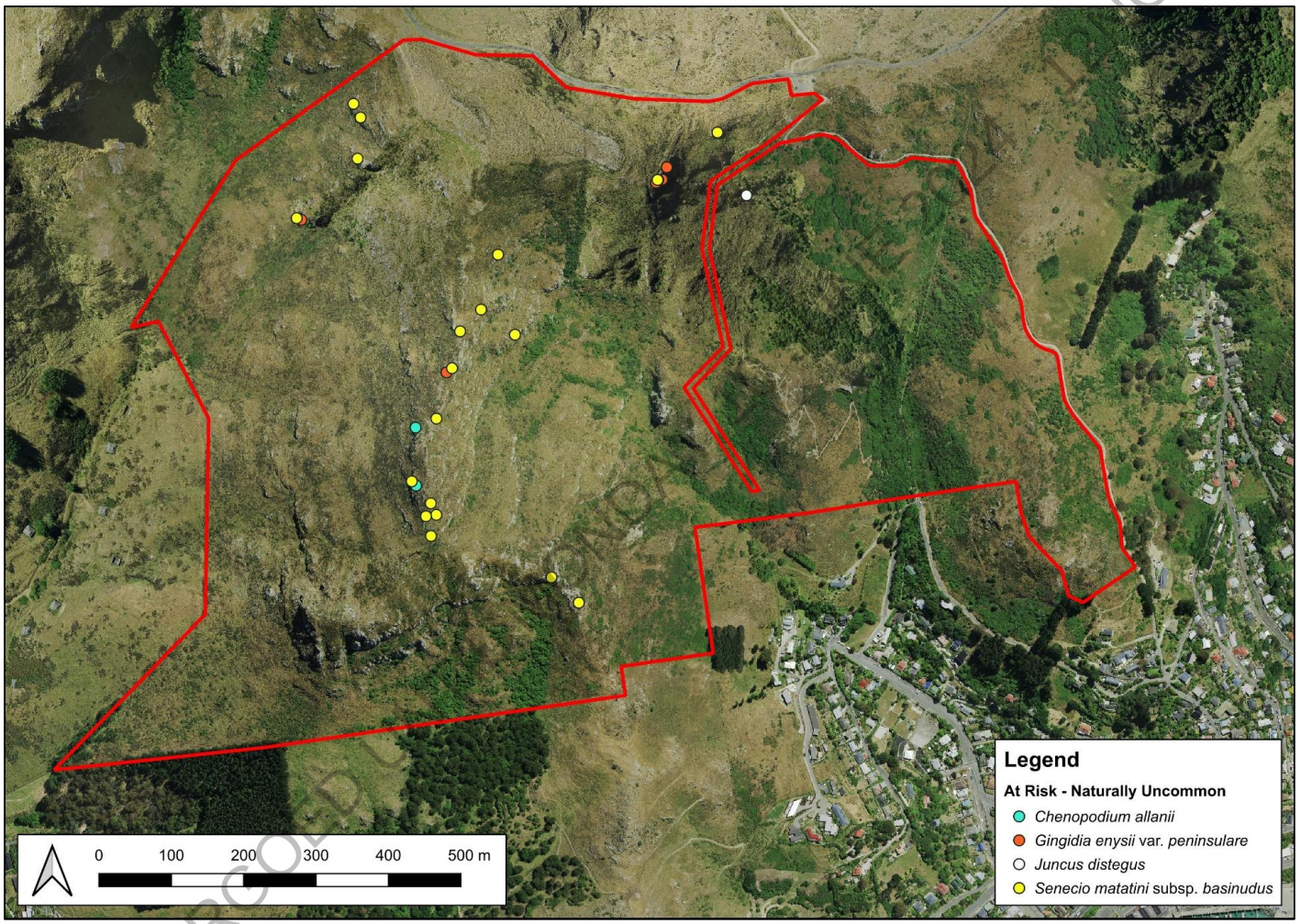


Figure 43: Locations of At Risk-Naturally Uncommon plant species in Whakaraupō Reserve (2023-2024 survey).

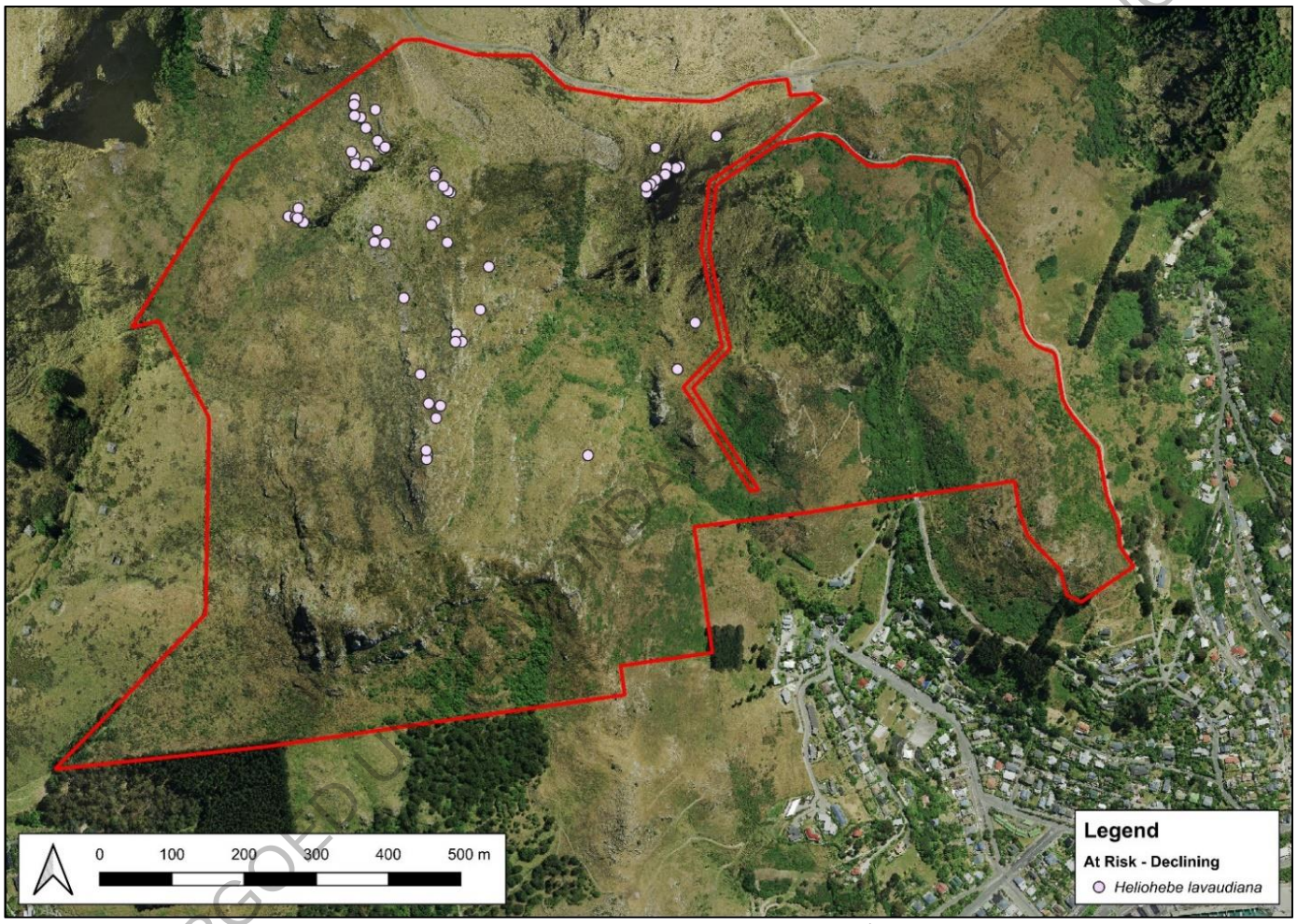


Figure 44: Locations of Banks Peninsula sun hebe (*Heliohebe lavaudiana*) in Whakaraupō Reserve (2023-2024 survey).

29

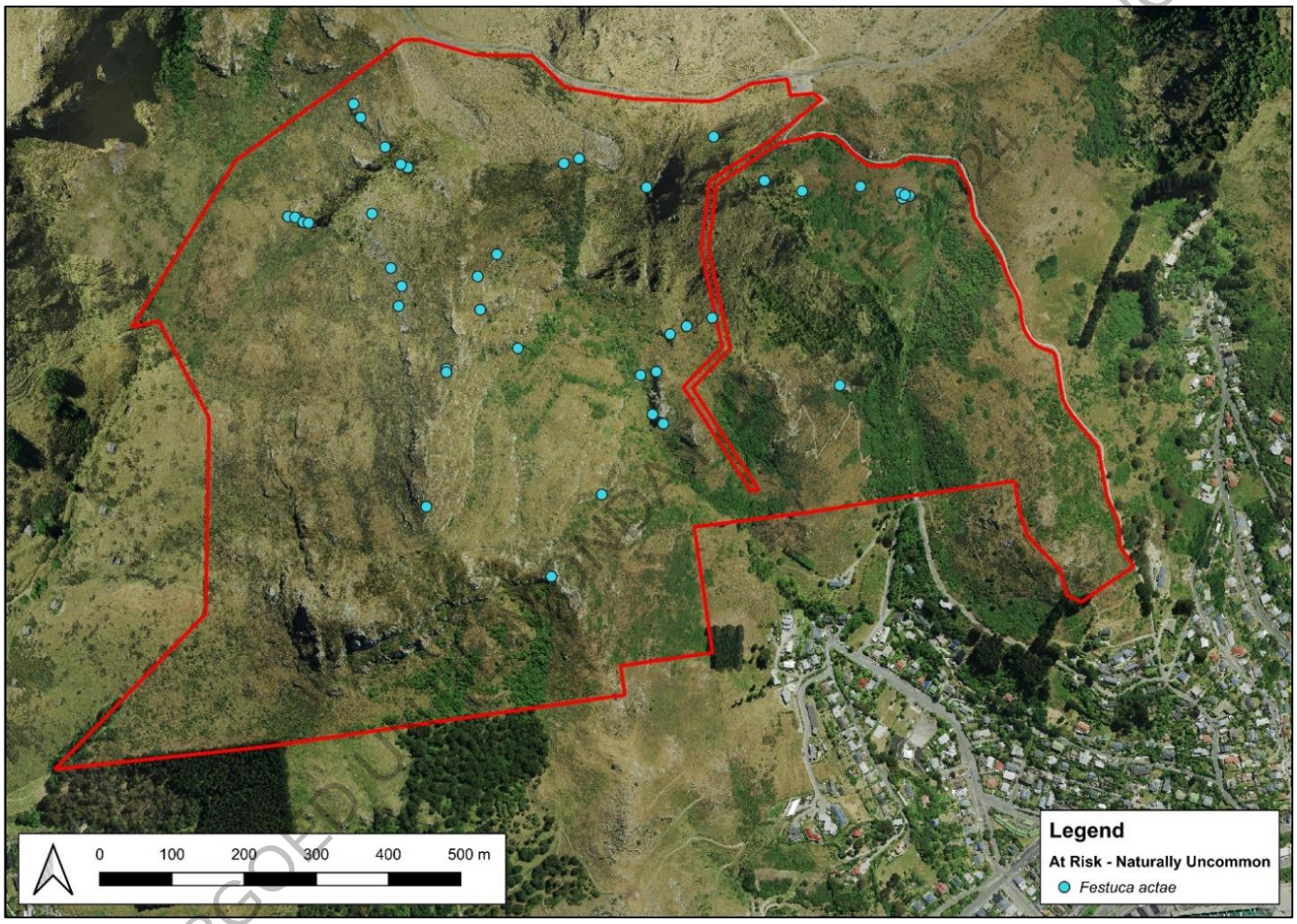


Figure 45: Locations of Banks Peninsula blue tussock (*Festuca actae*) in Whakaraupō Reserve (2023-2024 survey).

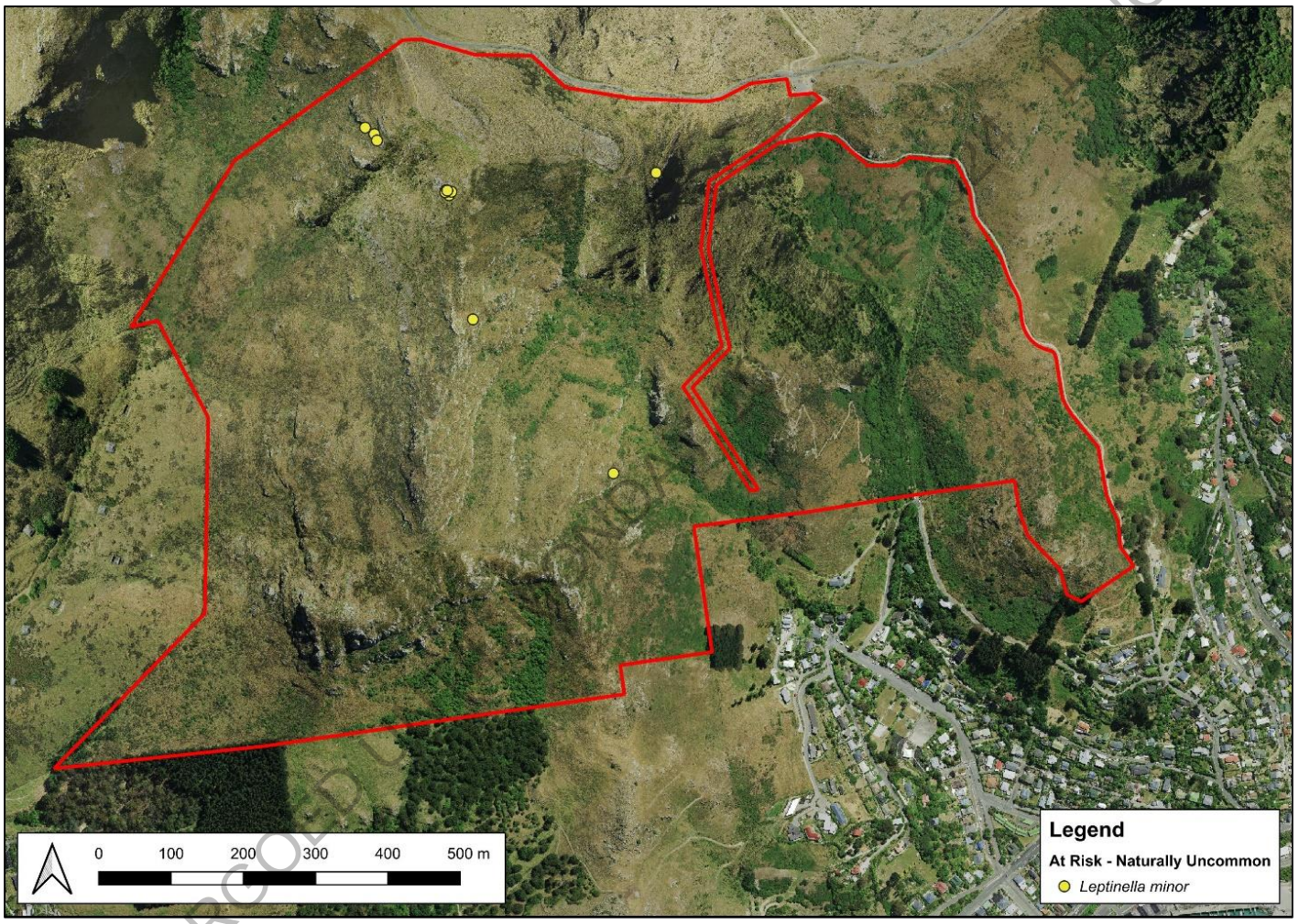


Figure 46: Locations of Banks Peninsula button daisy (*Leptinella minor*) in Whakaraupō Reserve (2023-2024 survey).

- **Other uncommon or notable vascular plant species**

Whakaraupō Reserve also provides habitat for 14 indigenous vascular plant species that are classified as 'Not Threatened' (de Lange *et al.* 2018a) but are "uncommon to rare or very local on Banks Peninsula" (Wilson 2013) (see **Table 3**). Five of these 'regionally uncommon' species were recorded by Jensen & Shanks (2008) but were not seen in the current (2023-2024) survey. Apart from *Celmisia gracilenta* (**Figure 47**), which is relatively widespread and common in Whakaraupō Reserve, most of these species are quite localised and restricted to specific habitats in the reserve, e.g. *Carex secta* was seen in a small waterway near the southern boundary of the reserve. *Leptecophylla juniperina* subsp. *juniperina* (**Figure 48**) occurs mainly on exposed, sunny rock outcrops, and *Ctenopteris heterophylla* occurs on sheltered, damp rock outcrops (**Figure 49**).

Table 3: Native vascular plant species recorded in Whakaraupō Reserve that are uncommon or rare, on Banks Peninsula (according to Wilson 2013). Y = wild plants observed.

Scientific Name	Common Name	Growth Form	Current Survey 2023-2024	Jensen & Shanks 2008
Leptecophylla juniperina subsp. *juniperina*	prickly mingimingi, mikimiki	shrub	Y	Y
Celmisia gracilenta	slender mountain daisy, pekapeka	dicot herb	Y	Y
Colobanthus strictus		dicot herb	Y	Y
Earina autumnalis	easter orchid, raupeka	orchid	-	Y
Lachnagrostis filiformis	wind grass	grass	Y	Y
Poa colensoi	blue tussock	grass	Y	Y
Rytidosperma corinum	danthonia, bristle grass	grass	Y	Y
Carex flagellifera	Glen Murray tussock	sedge	-	Y
Carex secta	pūrei, pūkio	sedge	Y	-
Carex solandri		sedge	Y	Y
Adiantum cunninghamii	maidenhair fern	fern	-	Y
Blechnum novae-zelandiae	kiokio	fern	-	Y
Ctenopteris heterophylla	comb fern	fern	Y	Y
Pellaea calidirupium		fern	-	Y

Figure 47: Slender mountain daisy (*Celmisia gracilenta*) is occasional in grassland and on rock outcrops in the reserve. This species is uncommon on Banks Peninsula (Wilson 2013).

Figure 48: Prickly mikimiki (*Leptecophylla juniperina* subsp. *juniperina*) on rock outcrops on the summit ridge. This species is uncommon on Banks Peninsula (Wilson 2013).

Three of the plant species recorded in the reserve reach their national southern distribution limits on Banks Peninsula: shining spleenwort/huruhuruwhenua (*Asplenium oblongifolium*), akeake (*Dodonaea viscosa*), and kawakawa (*Piper excelsum*).

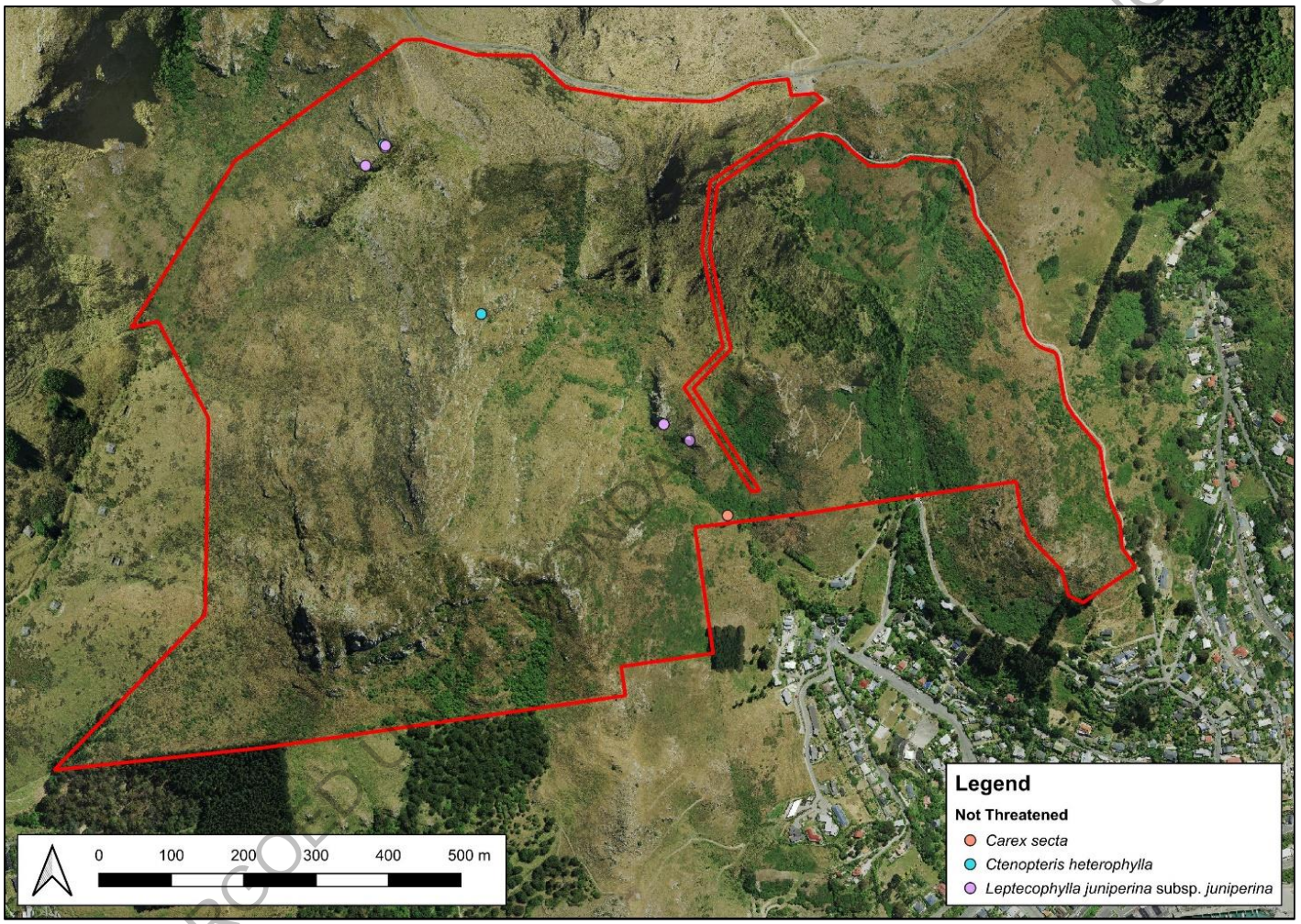


Figure 49: Locations of 'regionally uncommon' indigenous plant species in Whakaraupō Reserve (2023-2024 survey).

6.3. Exotic vascular plants

In total, 124 exotic vascular plant species have been recorded in Whakaraupō Reserve: 98 species were found in the current (2023-2024) survey (see **Figures 50-63**), and another 26 species were noted in the previous survey by Jensen & Shanks (2008) but were not seen in the current survey (see **Appendix 2**). In total, 24 exotic species found in the reserve are classified as pests or 'Organisms of Interest' in the Canterbury Regional Pest Management Plan (RPMP) (Canterbury Regional Council 2018). All of these species are listed as environmental weeds by the Department of Conservation (DOC) (Howell 2008), except for the invasive fern common polypody (*Polypodium vulgare*, **Figures 50-52**), which is a more recently recognised threat. A further 21 exotic species are on DOC's environmental weeds list (Howell 2008) (see **Appendix 2**).

Six species are subject to Sustained Control programmes under the Canterbury RPMP: boneseed (*Chrysanthemoides monilifera*, **Figure 54**), Darwin's barberry (*Berberis darwinii*), gorse (*Ulex europaeus*), Scotch broom (*Cytisus scoparius*), Montpellier broom (*Genista monspessulana*), and old man's beard (*Clematis vitalba*, **Figure 56**) – these are all woody weeds (shrubs or vines) and are primarily agricultural pests (apart from old man's beard). From an ecological perspective, nine of the species found in Whakaraupō Reserve are considered to be among the '20 least desirable exotic species on Banks Peninsula' by Wilson (1999):

- Common barberry (*Berberis glaucocarpa*)
- Darwin's barberry (*Berberis darwinii*)
- Grey willow (*Salix cinerea*)
- Hawthorn (*Crataegus monogyna*)
- Male fern (*Dryopteris filix-mas*)
- Old man's beard (*Clematis vitalba*)
- Radiata pine (*Pinus radiata*)
- Sweet cherry (*Prunus avium*)
- Sycamore (*Acer pseudoplatanus*).

Locations of selected weeds found in Whakaraupō Reserve during the current survey are mapped in **Figures 64-70**. Recommendations on weed control priorities for Whakaraupō Reserve are provided in the **Management Considerations** section below.

Figure 50: The invasive fern common polypody (*Polypodium vulgare*) has spread rapidly since the 2007-2008 survey and is now widespread on rock outcrops throughout the reserve.

Figure 51: Common polypody has invaded rock outcrops that provide habitat for Threatened and At Risk plants, such as Banks Peninsula blue tussock (*Festuca actae*) seen here.

Figure 52: Some common polypody plants in the reserve had been heavily browsed by insects. Perhaps there is some potential for biocontrol?

Figure 53: Spur valerian (*Centranthus ruber*) has also increased its distribution and abundance in the reserve, and is a major threat to indigenous flora and fauna in rock outcrop habitats.

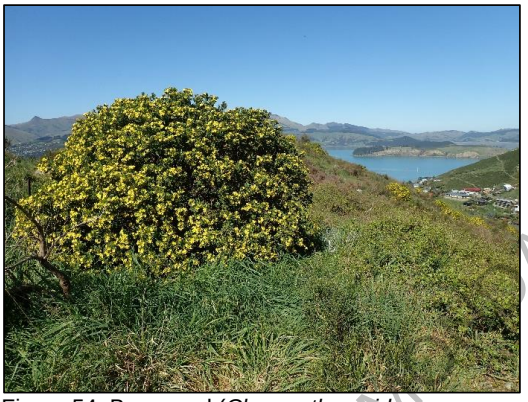


Figure 54: Boneseed (*Chrysanthemoides monilifera*) is common on the spur and west-facing slopes on the eastern edge of the reserve.

Figure 55: Scattered patches of stonecrop (*Sedum acre*) were seen on rock outcrops, mostly in the upper part of the reserve.

Figure 56: Some large patches of old man's beard (*Clematis vitalba*) (red circle) were seen climbing over exotic grassland in the lower slopes of the reserve.

Figure 57: English ivy (*Hedera helix*) was found in several places in the eastern part of the reserve.

Figure 58: Occasional common barberry (*Berberis glaucocarpa*) plants were seen on and around rock outcrops in the reserve.

Figure 59: A large *Cotoneaster coriaceus* tree was found on the forest edge next to the oil pipeline.

Figure 60: Elder (*Sambucus nigra*) trees are common in the eastern side of the reserve, and large trees were seen around the base of some rock outcrops.

Figure 61: Blackberry (*Rubus fruticosus* agg.) was seen in several places in the reserve, and dense patches have established in the understorey of the indigenous plantings to the east of the oil pipeline.

Figure 62: A small patch of orange day lily (*Hemerocaulis fulva*) was seen near the top of the reserve.

Figure 63: Rock pavements on the summit ridge have been invaded by exotic danthonia grasses (*Rytidosperma caespitosum*) and stonecrop (*Sedum album*).

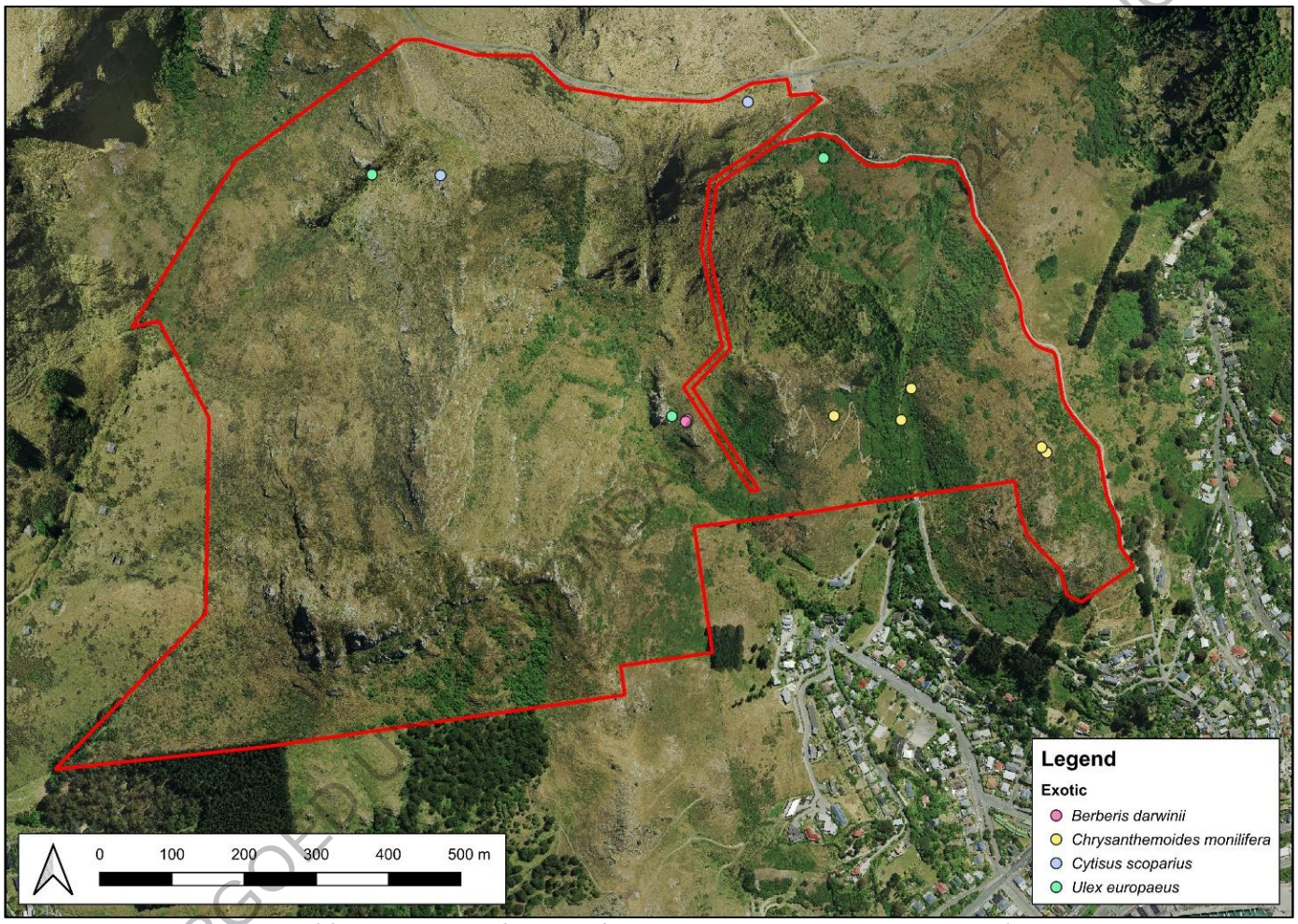


Figure 64: Locations of Canterbury RPMP Sustained Control pest plants in Whakaraupō Reserve (2023-2024 survey).
NB. Scotch broom (*Cytisus scoparius*) was widespread in the reserve, but only two GPS waypoints were saved.

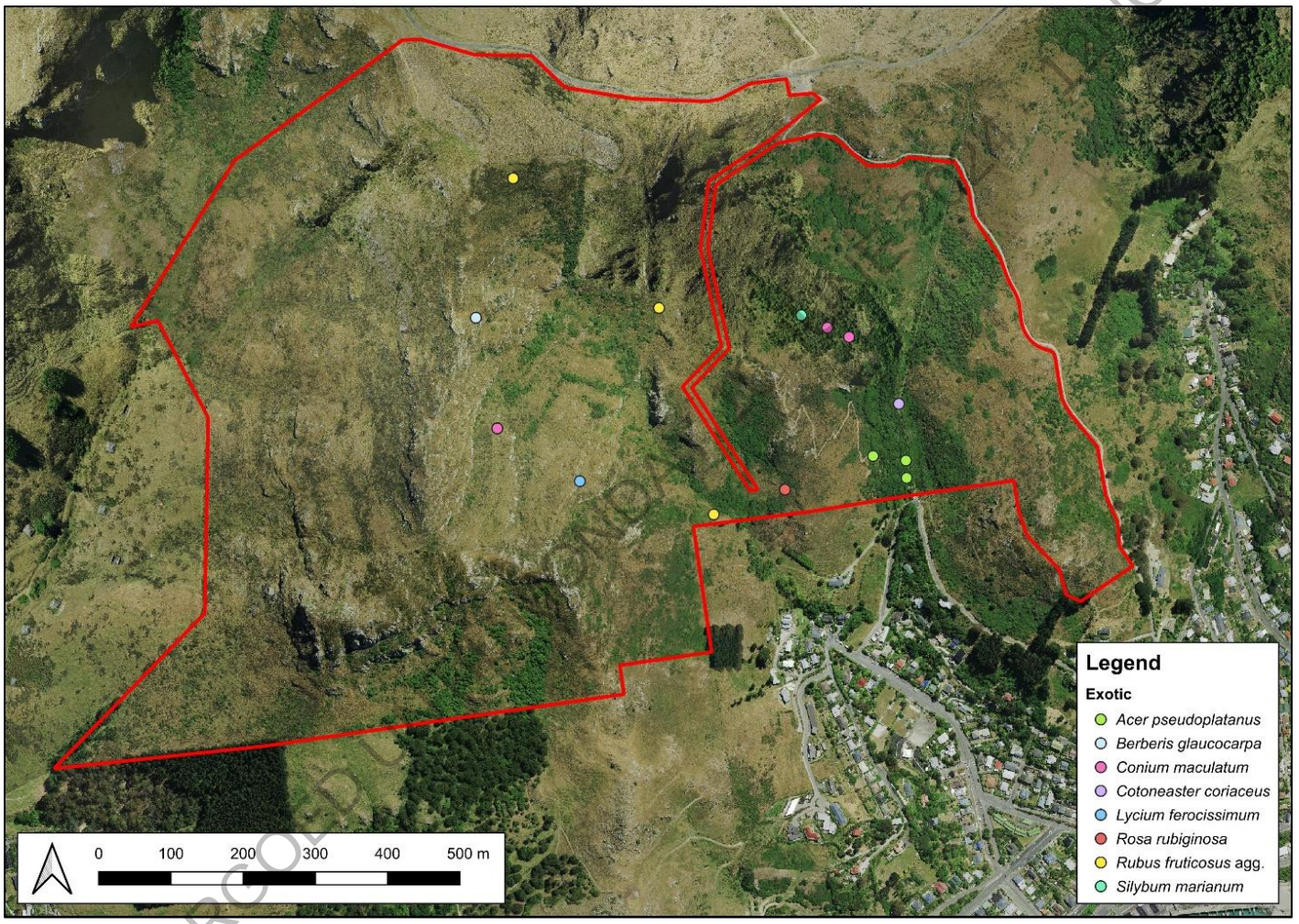


Figure 65: Locations of Canterbury RPMP Organisms of Interest in Whakaraupō Reserve (2023-2024 survey).

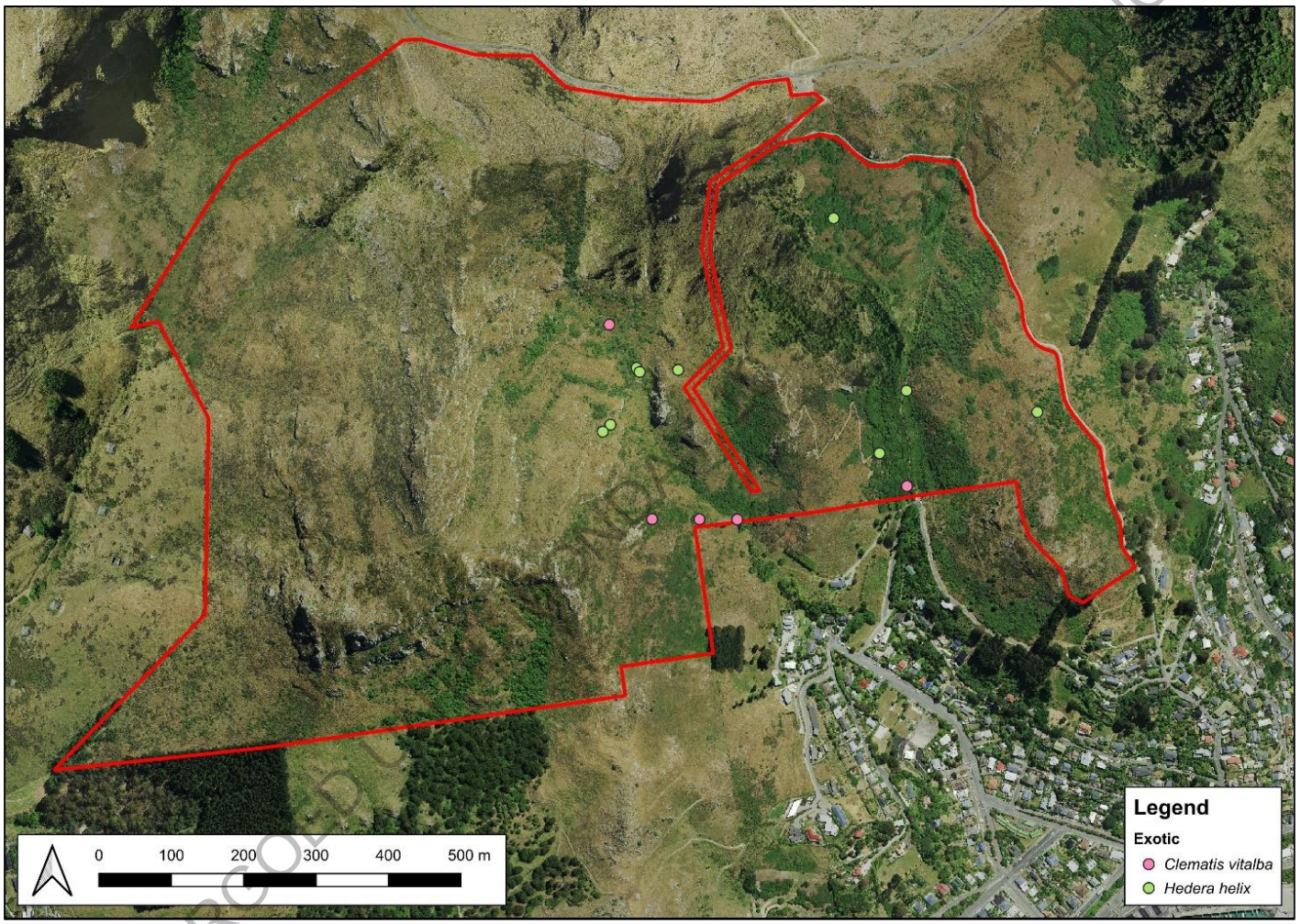


Figure 66: Locations of weedy vines in Whakaraupō Reserve (2023-2024 survey).

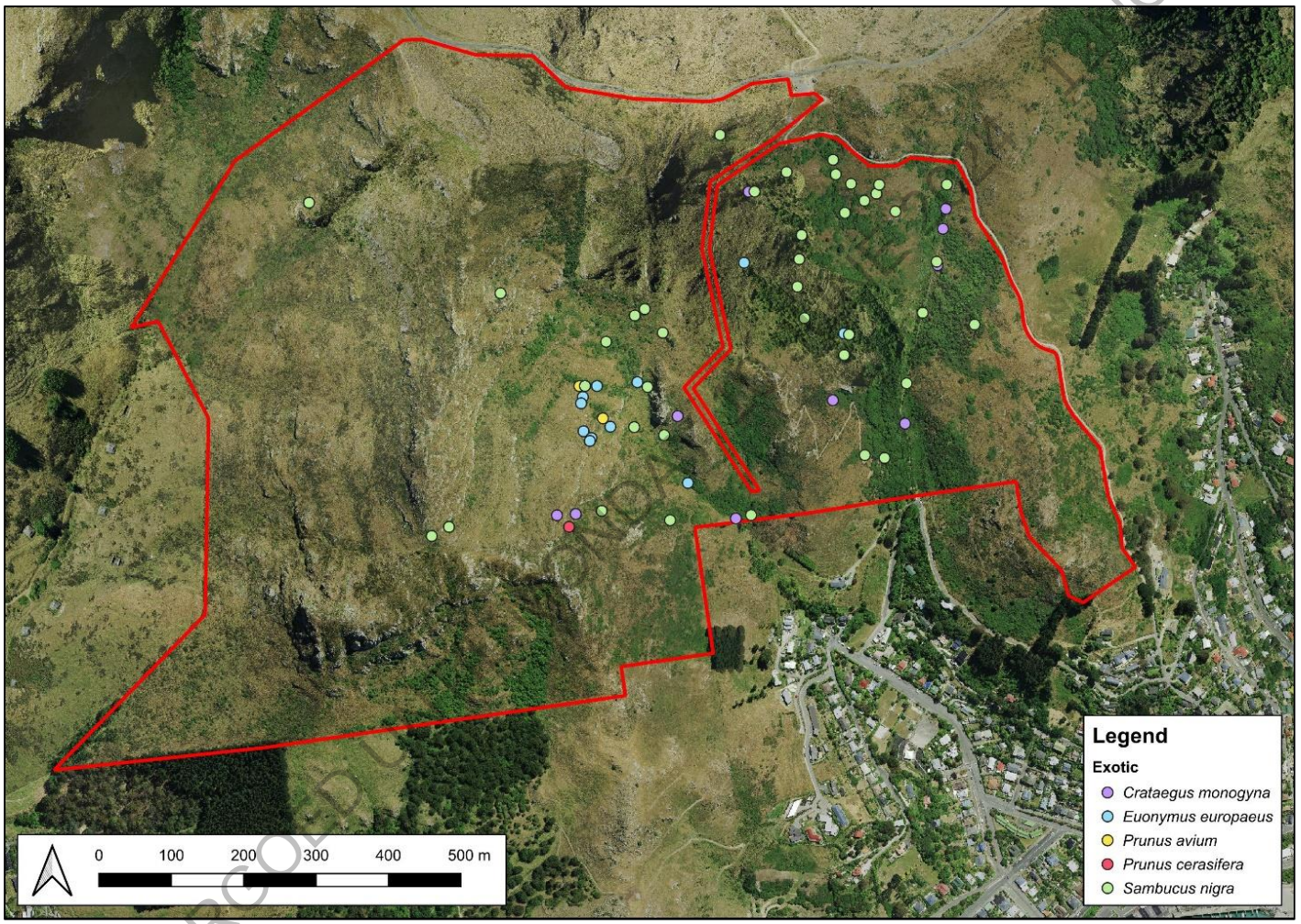


Figure 67: Locations of exotic woody weeds in Whakaraupō Reserve (2023-2024 survey).

40

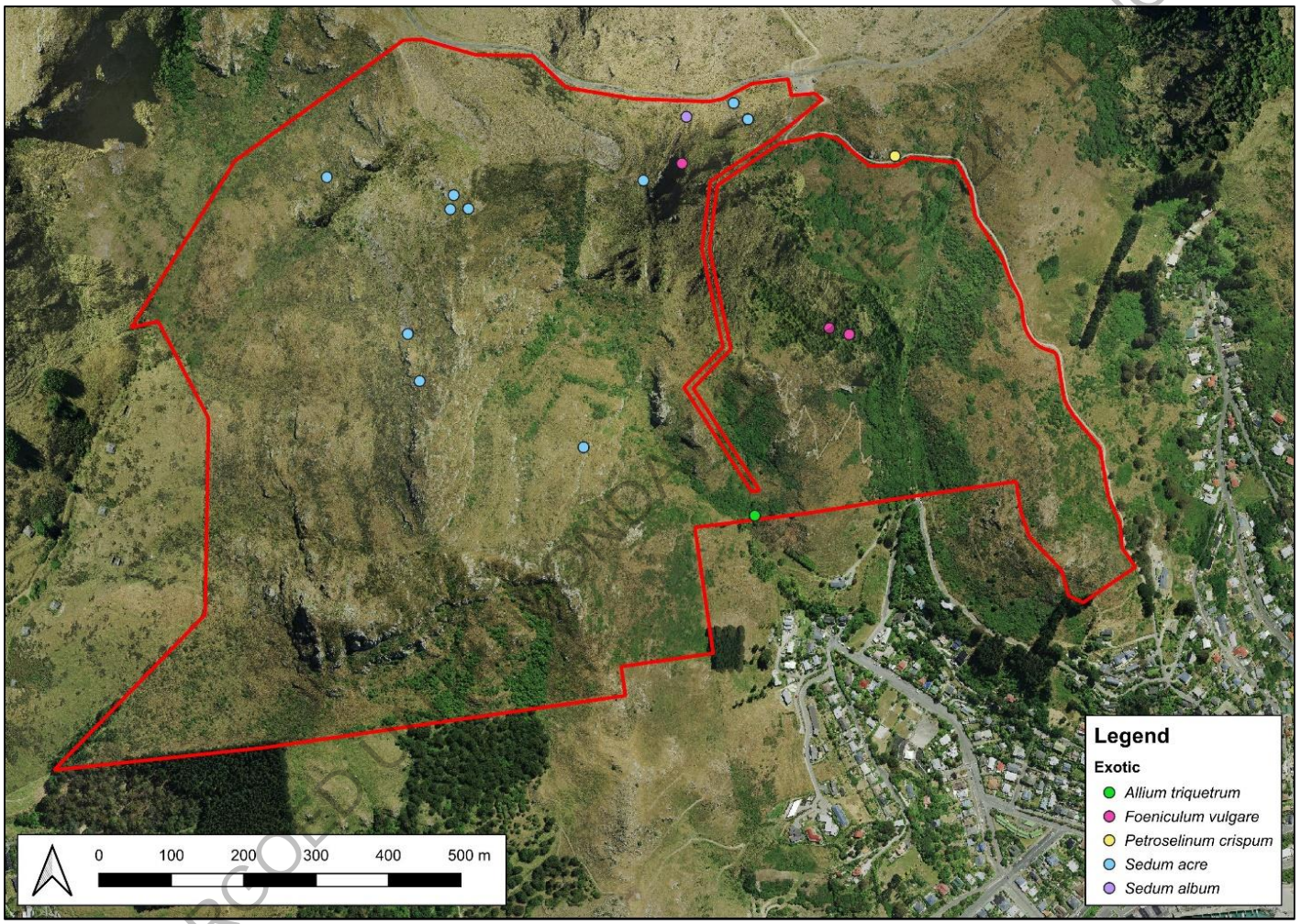


Figure 68: Locations of exotic herbaceous weeds in Whakaraupō Reserve (2023-2024 survey).

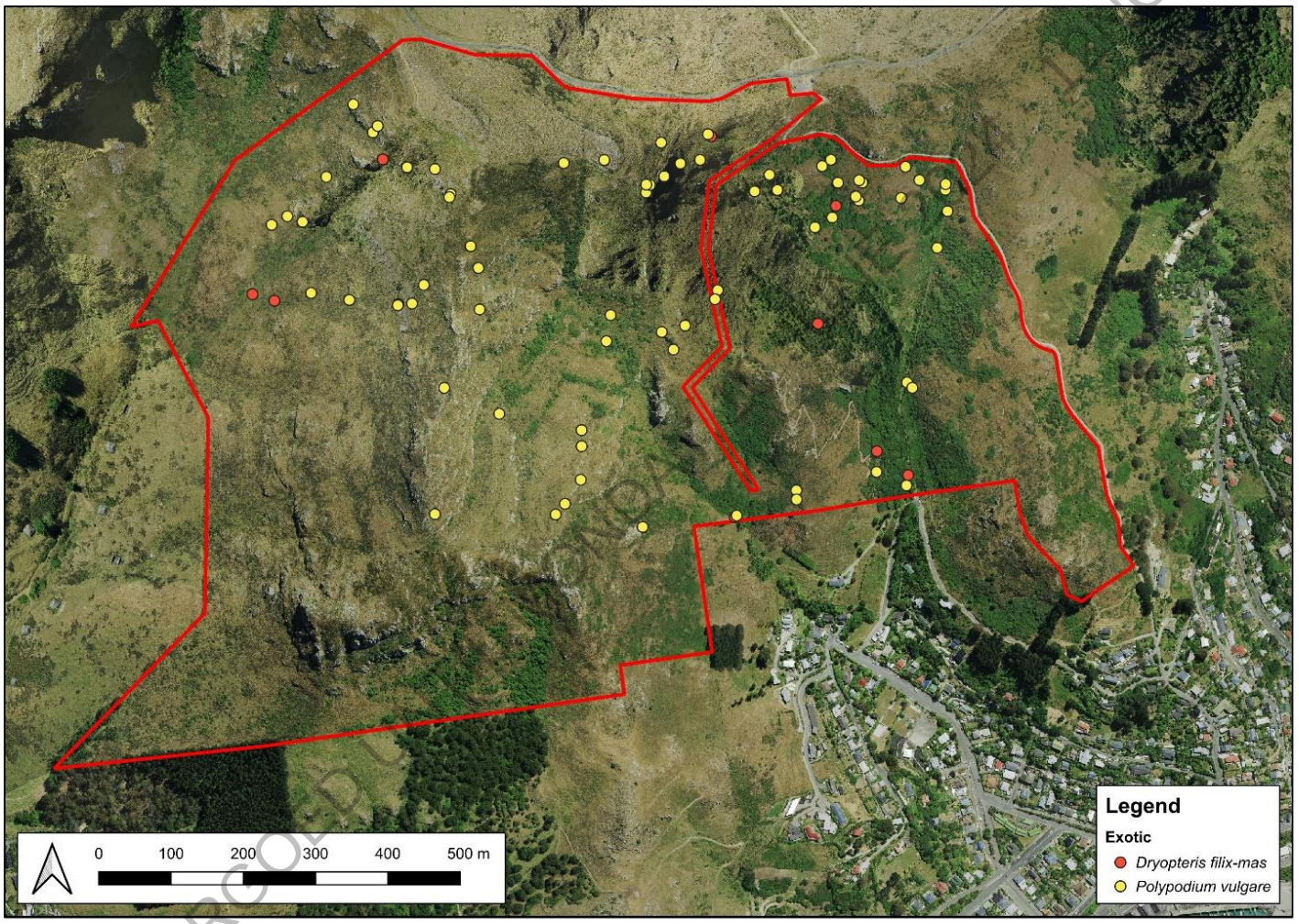


Figure 69: Locations of weedy exotic ferns in Whakaraupō Reserve (2023-2024 survey).

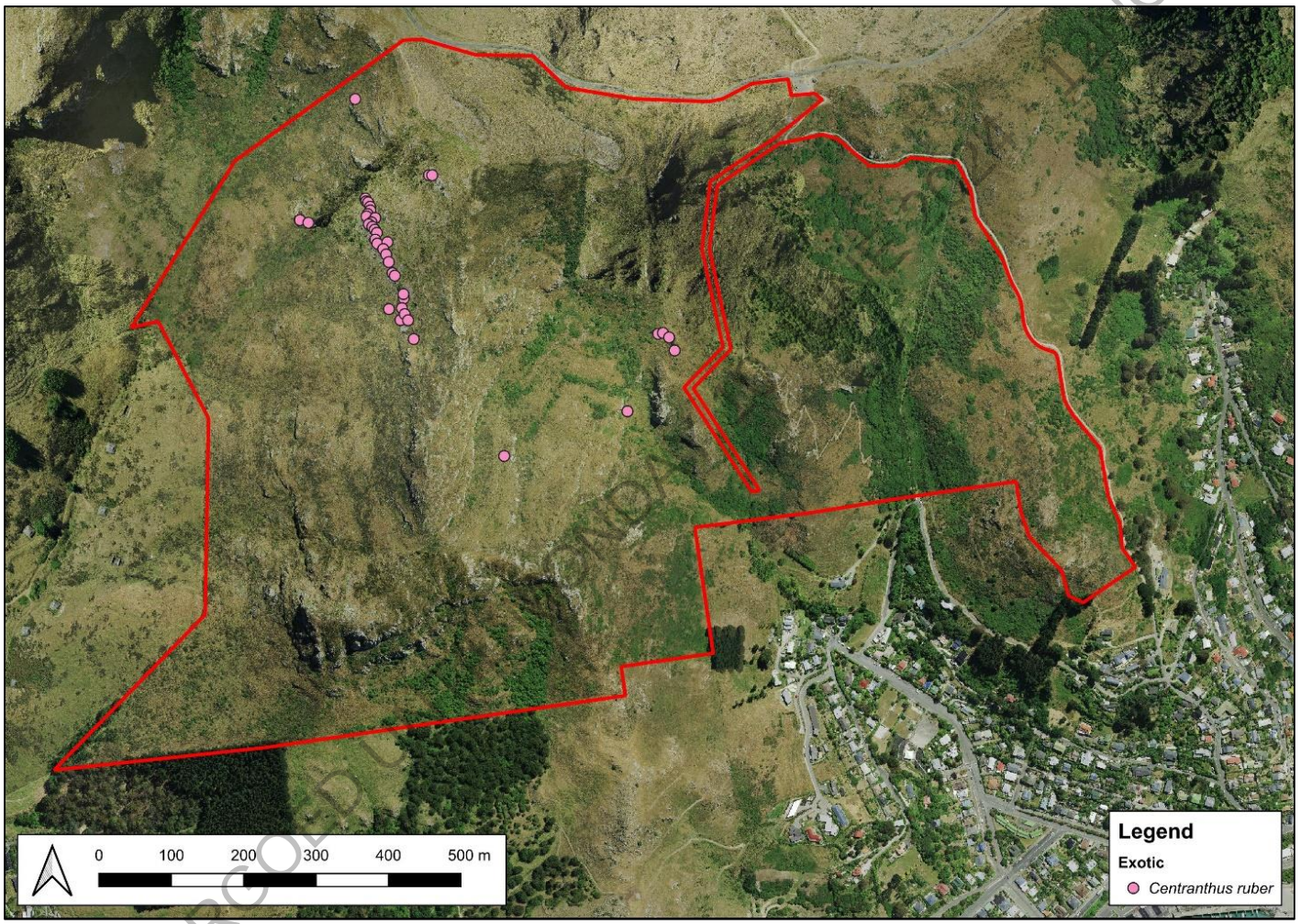


Figure 70: Locations of spur valerian (*Centranthus ruber*) in Whakaraupō Reserve (2023-2024 survey).

6.4. Bryophytes and lichens

Incidental observations of bryophytes (liverworts and mosses) and lichens were made during the botanical survey. In total, 11 species of mosses (10 indigenous, one exotic), four liverworts (three indigenous, one exotic), and 46 lichens (all indigenous) were noted in the reserve (Appendix 3).

An At Risk liverwort species was found during the survey: orobus-seed liverwort (*Targionia hypophylla*, **Figure 71)**, which is classified as At Risk-Declining (de Lange *et al.* 2020). It was found in three places in the reserve – on damp soil overlying rock on south-facing banks along the oil pipeline (**Figures 72 & 75**). The specific habitats preferred by orobus-seed liverwort are highly vulnerable to invasion of exotic weeds (including exotic liverworts), hence why the species is classified as At Risk-Declining. It is interesting that this liverwort was found only along the oil pipeline, and not elsewhere else in the reserve, as these habitats would have been modified (or perhaps even created) by excavation of soil and rock during installation of the pipeline.

None of the lichen species observed in the reserve are classified as Threatened, At Risk, or Data Deficient (de Lange *et al.* 2018b), but several species appear to be uncommon on Banks Peninsula (M. Hutchison pers. obs.). For example, *Coccocarpia palmicola* (**Figure 73**), *Lobothallia radiosa* (**Figure 74**)*, Pannaria athroophylla*, and *Placopsis rhodophthalma*.

Figure 71: Orobus-seed liverwort (*Targionia hypophylla*) was found in Whakaraupō Reserve. The species is classified as At Risk-Declining.

Figure 72: Orobus-seed liverwort occupies specific habitats in the reserve: damp soil overlying south-facing rock along the oil pipeline (red circle).

Figure 73: The lichen *Coccocarpia palmicola* was seen on rock outcrops in Whakaraupō Reserve. This species is uncommon on Banks Peninsula.

Figure 74: The lichen *Lobothallia radiosa* was seen on rock outcrops in Whakaraupō Reserve. This species is uncommon on Banks Peninsula.

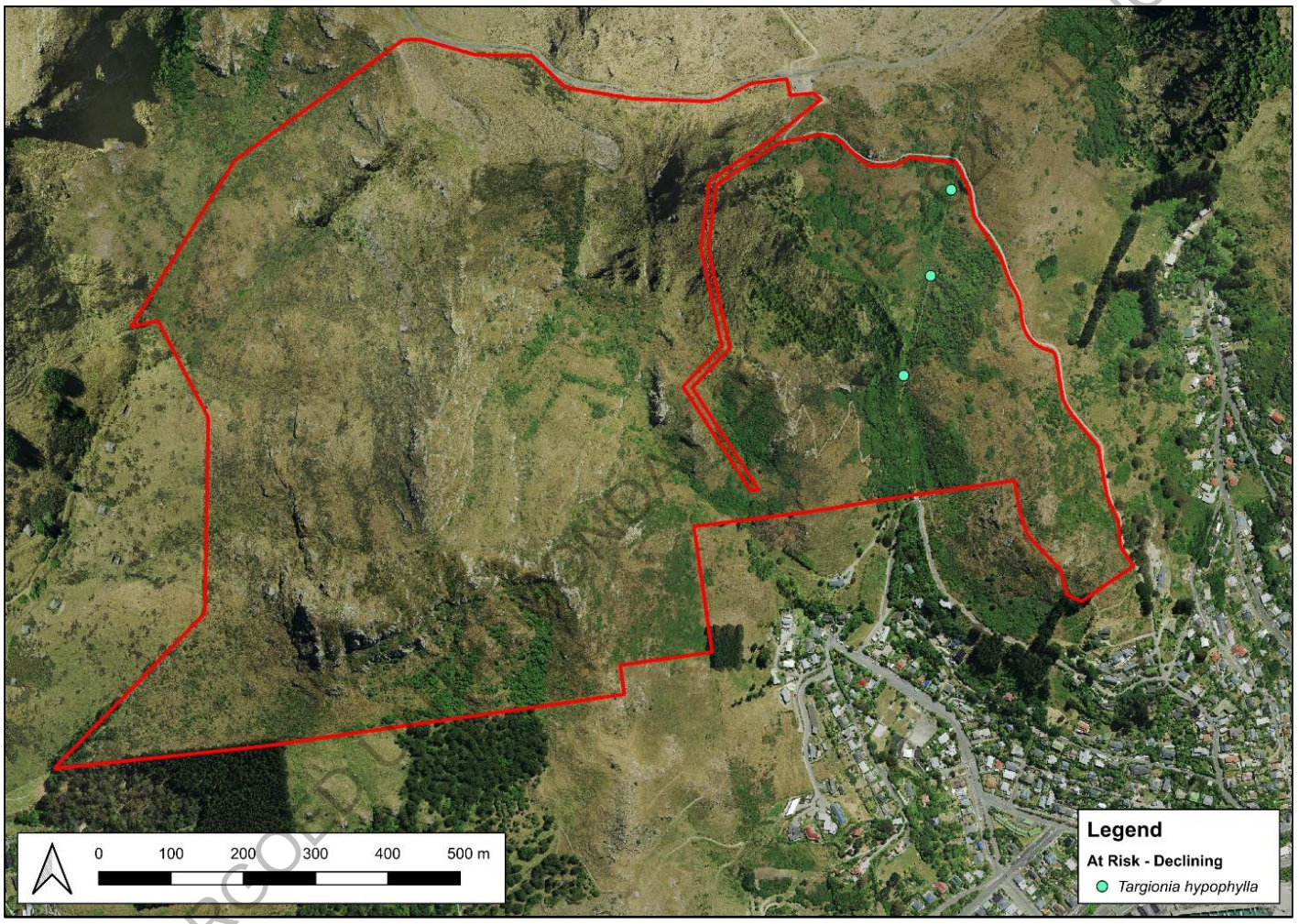


Figure 75: Locations of orobus-seed liverwort (*Targionia hypophylla*) in Whakaraupō Reserve (2023-2024 survey).

6.5. Fauna

- **Indigenous fauna**

Whakaraupō Reserve contains important habitat for indigenous animals as well as plants, and incidental observations of fauna were made during the 2023-2024 botanical survey. Seven indigenous bird species and five indigenous invertebrate species were noted in the reserve, including two At Risk species (**Table 4**). New Zealand pipits/pīhoihoi (*Anthus novaeseelandiae* subsp. *novaeseelandiae*), which are classified as At Risk-Declining (Robertson *et al.* 2021), were observed hopping around rock outcrops at the top of the reserve. A short-horned grasshopper, *Sigaus campestris*, was observed on a rock outcrop on 8 December 2023 (**Figure 76**; Hutchison 2023). This species is classified as At Risk-Declining (Trewick *et al.* 2022).

Table 4: Indigenous fauna species recorded in Whakaraupō Reserve during the 2023-2024 survey.

Scientific Name	Common Name(s)	Conservation Status
Birds		
Anthus novaeseelandiae subsp. *novaeseelandiae*	NZ pipit, pīhoihoi	Not Threatened (Robertson *et al.* 2021)
Circus approximans	Australasian harrier, kāhu	Not Threatened (Robertson *et al.* 2021)
Gerygone igata	Grey warbler, riroriro	Not Threatened (Robertson *et al.* 2021)
Hemiphaga novaeseelandiae subsp. *novaeseelandiae*	NZ wood pigeon, kererū	Not Threatened (Robertson *et al.* 2021)
Hirundo neoxena subsp. *neoxena*	Welcome swallow	Not Threatened (Robertson *et al.* 2021)
Rhipidura fuliginosa subsp. *fuliginosa*	South Island fantail, pīwakawaka	Not Threatened (Robertson *et al.* 2021)
Zosterops lateralis subsp. *lateralis*	Silvereye, tauhou	Not Threatened (Robertson *et al.* 2021)
Invertebrates		
Amphipsalta strepitans	Chirping cicada	Not Threatened (Stringer *et al.* 2012)
Lycaena sp. [1]	Canterbury winter copper butterfly	Not Threatened
Sigaus campestris	Grasshopper	At Risk-Declining (Trewick *et al.* 2022)
Vanessa gonerilla subsp. *gonerilla*	Red admiral butterfly	Not Threatened (Hoare *et al.* 2017)
Vanessa itea	Yellow admiral butterfly	Not Threatened (Hoare *et al.* 2017)

[1] This common butterfly species is currently undescribed (see Patrick & Patrick 2012).

Figure 76: A short-horned grasshopper, *Sigaus campestris* (At Risk-Declining), was seen in Whakaraupō Reserve on 8 December 2023.

Figure 77: Red admiral butterflies (*Vanessa gonerilla* subsp. *gonerilla*) were observed in Whakaraupō Reserve. Their caterpillars feed on ongaonga/tree nettle (*Urtica ferox*).

A number of other indigenous invertebrate species have been recorded in Whakaraupō Reserve by observers on the iNaturalist website, for example:

- Alexander beetle (*Megadromus antarcticus*), https://inaturalist.nz/observations/182229848
- Banks Peninsula metallic (*Sabatinca aenea*), https://inaturalist.nz/observations/191565962
- Leafroller moth (*Dipterina imbriferana*), https://inaturalist.nz/observations/198539975
- Orbweaver spider (*Novaranea queribunda*), https://inaturalist.nz/observations/193014845
- Wide-banded tiger beetle (*Neocicindela latecincta*), https://inaturalist.nz/observations/195997991.

- **Exotic fauna**

Three introduced bird species were observed in Whakaraupō Reserve during the 2023-2024 botanical surveys: Eurasian skylark (*Alauda arvensis*), California quail (*Callipepla californica*), and the house sparrow (*Passer domesticus*). These species are all relatively common on the Port Hills.

Brushtail possum (*Trichosurus vulpecula*) pellets and bark biting was also seen in the reserve.

7. MANAGEMENT CONSIDERATIONS

7.1. Weeds (pest plants)

Exotic weeds (aka pest plants) pose the greatest threat to indigenous biodiversity in Whakaraupō Reserve, therefore weed control is the highest priority management action for the reserve.

Twenty-four exotic plant species found in Whakaraupō Reserve are classified as pests or listed as Organisms of Interest in the Canterbury RPMP (see **Section 6.3**), but some of these are primarily agricultural weeds (e.g. gorse, Scotch broom, Montpellier broom), and are not necessarily a priority for control in the reserve, as the main objective is to protect indigenous biodiversity. For example, Scotch broom and gorse are considered to be beneficial if the aim is re-establishment of indigenous forest (Williams 1983, Wilson 1994, 2003). As Jensen & Shanks (2008) stated:

> "Although regarded as an exotic weed in a pastoral setting, the broom is providing shelter for the native regeneration that is actively taking place, especially on the shady slopes… Broom has a natural life span of about 15 years and broom seeds require a light open environment to germinate. Stands of even-aged dense broom tend to provide enough shade to prevent broom germination and so grow and develop to over 2 m tall with few seedlings establishing beneath. When about 15 years old the broom tends to collapse and die and then the cycle can start over again. However native seedlings can establish in the shady environment of a broom canopy and hence a broom canopy is beneficial to native regeneration and succession. If broom is burnt or sprayed then the broom cycle is started all over again and native regeneration is unable to take place. Therefore it is very important to leave the broom cover undisturbed if native regeneration is the ultimate goal and land use."

Nevertheless, some weed species found during the current survey have the potential to spread widely and have major long-term impacts on indigenous biodiversity in the reserve (and beyond). Given that resources/budgets for weed management are always limited, it is essential to prioritise weed control efforts in the reserve, so that the highest priority weeds are targeted first.

Species listed as environmental weeds by DOC (Howell 2008) or listed in the Canterbury RPMP (44 species) and one other potentially weedy species were assessed in terms of their priority for control in Whakaraupō Reserve (see **Table 5**). The highest priority is to control weed species that pose a serious threat to indigenous biodiversity and are currently at relatively low densities or have limited distributions in the reserve. The highest priority weeds for control are all woody weeds, i.e. trees, shrubs, and vines (**Table 5**).

Table 5: Exotic weeds recorded in Whakaraupō Reserve during the current survey (2023-2024). Species are listed according to their priority for control in the reserve (from high to low).

Scientific Name	Common Name(s)	Growth Form	Status in Canterbury Regional Pest Management Plan (CRC 2018)	DOC Weed (Howell 2008) [1]	Priority for Control
Acer pseudoplatanus	sycamore	tree	Organism of Interest	Weed	High
Berberis darwinii	Darwin's barberry	shrub	Sustained Control Pest [2]	Weed	High
Berberis glaucocarpa	common barberry	tree	Organism of Interest	Weed	High
Chrysanthemoides monilifera	boneseed	shrub	Sustained Control Pest [1]	Weed	High
Clematis vitalba	old man's beard	vine	Sustained Control Pest [1]	Weed	High
Cotoneaster coriaceus	cotoneaster	shrub	Organism of Interest [1]		High
Crataegus monogyna	hawthorn	tree	Organism of Interest	Weed	High
Hedera helix	ivy	vine		Weed	High
Lycium ferocissimum	boxthorn	shrub	Organism of Interest	Weed	High
Prunus avium	sweet cherry	tree		Weed	High
Prunus cerasifera	cherry plum	tree		Weed	High
Centranthus ruber	spur valerian	dicot herb	Organism of Interest		Moderate
Euonymus europaeus	spindle tree	tree		Weed	Moderate
Genista monspessulana	Montpellier broom	shrub	Sustained Control Pest	Weed	Moderate
Hemerocallis fulva	orange day lily	monocot herb			Moderate
Polypodium vulgare	common polypody	fern	Organism of Interest [1]		Moderate
Rubus fruticosus agg.	blackberry	shrub	Organism of Interest	Weed	Moderate
Sambucus nigra	elderberry	tree		Weed	Moderate
Sedum acre	stonecrop	dicot herb		Weed	Moderate
Ulex europaeus	gorse	shrub	Sustained Control Pest	Weed	Moderate
Acaena agnipila	Australian sheep's bur	dicot herb	Organism of Interest		Low
Agrostis capillaris	brown top	grass		Weed	Low
Allium triquetrum	3-cornered garlic	monocot herb		Weed	Low
Bromus catharticus	prairie grass	grass		Weed	Low
Cirsium arvense	Californian thistle	dicot herb		Weed	Low
Cirsium vulgare	Scotch thistle	dicot herb		Weed	Low
Conium maculatum	hemlock	dicot herb	Organism of Interest		Low
Cytisus scoparius	scotch broom	shrub	Sustained Control Pest	Weed	Low
Dactylis glomerata	cocksfoot	grass		Weed	Low
Dryopteris filix-mas	male fern	fern		Weed	Low
Holcus lanatus	Yorkshire fog	grass		Weed	Low
Laurus nobilis	bay	tree		Weed	Low
Lolium perenne	ryegrass	grass		Weed	Low
Pilosella officinarum	mouse-ear hawkweed	dicot herb	Organism of Interest [1]	Weed	Low
Rosa rubiginosa	sweet briar	shrub	Organism of Interest	Weed	Low
Silybum marianum	variegated thistle	dicot herb	Organism of Interest		Low

[1] Listed as an environmental weed by the Department of Conservation (Howell 2008).
[2] Classified as an 'Unwanted Organism' by the Ministry of Primary Industries.

Some other weed species in the reserve also have major adverse effects on indigenous flora and fauna, but they are already too widespread and abundant for effective control to be possible across the entire reserve, e.g. common polypody fern and spur valerian. It is more practical and cost-effective to target high-impact weed species that are currently at lower densities and/or more localised. Nevertheless, control of common polypody and spur valerian is recommended in sites occupied by some Threatened or At Risk plant species, in particular those that are rare in the reserve or wider Port Hills, i.e. *Myosotis lytteltonensis* and *Gingidia enysii* var. *peninsulare*.

Some 'non-local' indigenous species have the potential to spread widely in Whakaraupō Reserve and outcompete naturally occurring indigenous species. For example, karo (*Pittosporum ralphii*, *P. crassifolium*), North Island lacebark/houhere (*Hoheria populnea*, *H. sextylosa*), and North Island kōwhai (*Sophora chathamica*, *S. tetraptera*). Some of these 'non-local' species can hybridise with local plant species and the hybrids are often quite vigorous and invasive in natural areas. For example, hybrid lacebark (*Hoheria angustifolia* × *H. populnea*) was found in Whakaraupō Reserve during the current survey and kōwhai hybrids *S. tetraptera* × *S. microphylla*) are present on adjacent private land. From an ecological perspective, these 'non-local' species (and hybrids) are considered to be weeds in Whakaraupō Reserve and control would be desirable to prevent further spread and hybridisation.

Weed control should be carried out using appropriate methods and herbicides that minimise damage to indigenous vegetation and fauna, especially on Threatened, At Risk, and uncommon species. In general, most woody weeds should be controlled using the cut and paste method, rather than foliar spraying, as this is usually more effective, and causes less damage to non-target species. Follow-up control (i.e. more than one herbicide treatment) is likely to be needed for most of these weed species, as they can re-sprout after the initial control.

Ongoing monitoring of weeds/pest plants in Whakaraupō Reserve should be carried out (at least every 5 years), to assess the effectiveness of weed control, and allow prompt control of any new problem weeds found in the reserve.

7.2. Pest animals

Possum sign (pellets) was noted in Whakaraupō Reserve during the botanical survey. Possums cause major damage to indigenous vegetation (particularly palatable plant species) through browsing and bark biting, and they also eat indigenous fauna (Schmechel 2009). Exotic predators such as mustelids (*Mustela* spp.), rats (*Rattus rattus*, *R. norvegicus*), mice (*Mus musculus*), feral cats (*Felis catus*) and hedgehogs (*Erinaceus europaeus*) are likely to be having detrimental impacts on indigenous fauna (birds, lizards, and invertebrates) in the reserve (Schmechel 2009).

Ongoing control of possums in Whakaraupō Reserve is recommended, in order to reduce their impacts on indigenous vegetation (and fauna). Control of introduced predators (e.g. feral cats, mustelids, rats, and mice) would also be beneficial, but this is a lower priority than weed control, and ideally pest animal control should be carried out at a landscape-scale and co-ordinated with other long-term, large-scale pest control initiatives on the Port Hills (e.g. Predator Free Port Hills, which is co-ordinated by the Summit Road Society).

7.3. Regeneration of indigenous vegetation and restoration planting

In order to maintain and enhance the natural ecological values of Whakaraupō Reserve, the recommended management approach is to allow natural regeneration of indigenous vegetation to occur via successional processes, aka referred to as 'minimum interference management' (Wilson 1994, 2003). Whakaraupō Reserve is close to other reserves (owned by CCC or DOC) and private land with indigenous forest, which will act as seed sources to aid the natural regeneration process. The predominantly southerly aspect of the reserve also means that moisture levels are generally higher, and natural regeneration is likely to occur more quickly than on sunny, dry north-facing slopes. With targeted, ongoing weed control, there is good potential for indigenous woody vegetation to regenerate in the reserve through natural succession. This is also the most practical and cost-effective management approach for the reserve, as restoration planting is hugely costly (up to $100,000 per hectare), is not always successful, and does not necessarily the deliver the long-term biodiversity outcomes sought.

Despite its popularity with the general public and funding agencies, restoration planting can be a threat to the ecological integrity of natural areas, as it is often not implemented in an ecologically informed way or using best practice. For example, planting ecologically inappropriate indigenous species (e.g. North Island species, hybrids, cultivars, or species that would not occur naturally at the site) or planting into areas with existing indigenous vegetation (particularly sites with rare or threatened species) can cause damage to ecological values by disrupting natural vegetation patterns and food webs (e.g. plant-insect interactions), and making conditions less suitable for rare or threatened species. Some inappropriate species have already been planted in the Whakaraupō Reserve (e.g. karaka, wind grass).

The best approach is to allow natural regeneration to occur, however, if planting is to be carried out, then it is essential that only ecologically appropriate, 'ecosourced' plants are used, i.e. plants should be propagated from seed collected from natural/remnant indigenous vegetation in the Port Hills Ecological District (or alternatively Herbert ED) that has not been planted (note that reserves near houses and urban parks may be contaminated with seed or pollen that has come from gardens, so in some cases it may be best to collect seed from reserves further away from the site). It is recommended that specific advice should be sought from a suitably qualified and experienced ecologist/botanist before undertaking further planting in Whakaraupō Reserve.

Photo points are a quick, easy way to monitor broad changes in vegetation cover over time, and it would be useful to establish a series of permanent photo points in the reserve.

7.4. Threatened species monitoring and management

Threatened, At Risk, and uncommon plants in the reserve should be monitored on a regular basis (say every 5 years), in order to assess changes in their distribution and abundance (i.e. local population size) and to identify threats to their survival. The appropriate monitoring method varies depending on the species concerned – for species that are relatively common or widespread in the reserve, it may be sufficient just to record their locations with a GPS, whereas for rare species (say <10 locations or <100 plants), it should be possible to search all suitable habitat in the reserve and count the number of individuals at each GPS location (or at least estimate the minimum number of individuals). Each monitoring round should be carried out at the same time of year; spring-summer is best for most species.

As mentioned in **Section 7.1**, more intensive weed control may be needed to protect particular Threatened and At Risk species in Whakaraupō Reserve. For instance, *Myosotis lytteltonensis* and *Gingidia enysii* var. *peninsulare* are rare in the reserve (see **Figures 41 and 43**), and weeds such as spur valerian and common polypody pose a major threat to their survival in the reserve (and wider Port Hills). It is recommended that the *M. lytteltonensis* and *G. enysii* var. *peninsulare* sites are checked for problem weeds on a regular basis (ideally every year), and weed control carried out around the Threatened/At Risk plants, as required.

7.5. Livestock grazing and fencing

Whakaraupō Reserve was used for livestock grazing (sheep and beef cattle) in the past, but the reserve has not been grazed for at least 20 years. Removal of grazing has resulted in the growth of a dense exotic grass sward throughout much of the reserve, which can smother low-growing plant species, and inhibit regeneration of woody seedlings. However, exclusion of livestock allows palatable indigenous plant species (e.g. broadleaved trees and shrubs) to recover, and over time indigenous woody vegetation will overtop and outcompete the grass. The process of vegetation succession may take several decades, but ongoing exclusion of livestock from the reserve is recommended, in order to allow indigenous forest to recover.

7.6. Recreational use/public access

Whakaraupō Reserve is open to the public for recreation and contains several tracks that are used for walking and mountain biking (**Figures 78-81**). The historic Bridle Path marks the eastern edge of the reserve. A new walking track has recently been constructed from Cass Bay through the HMS Steadfast Reserve (owned by CCC) to the Summit Road (**Figure 78**).

The Stan Helms track is mapped as a walking track by Christchurch City Council (**Figure 78**), but it is also identified as a mountain biking track on the Trail Forks website (**Figure 79**, https://www.trailforks.com/trails/stan-helms/), which gives the following description:

> "A popular walking track connecting Lyttelton up to the Summit Road, meeting the top of the Bridle Path. It is not designed for biking, and the rules about bikes riding on it are contradictory in various places, and not clear, but some people do still ride down."

Mountain biking is a popular activity on the Port Hills, and there is ongoing pressure to develop new trails for riding. There are a number of shared use biking and walking tracks on the Port Hills, (like the Bridle Path), but many steep, narrow trails (like Stan Helms track) are not suitable or safe for dual use, especially for downhill riding.

It is essential that recreational use of Whakaraupō Reserve is compatible with protection of indigenous biodiversity, especially habitats occupied by Threatened and At Risk species. Rock outcrops in the reserve are particularly important, and tracks should be directed away from exposed rock outcrops as much as possible. In order to avoid damage to significant indigenous vegetation and habitats in the reserve, existing tracks should be retained but construction of new tracks is not recommended.

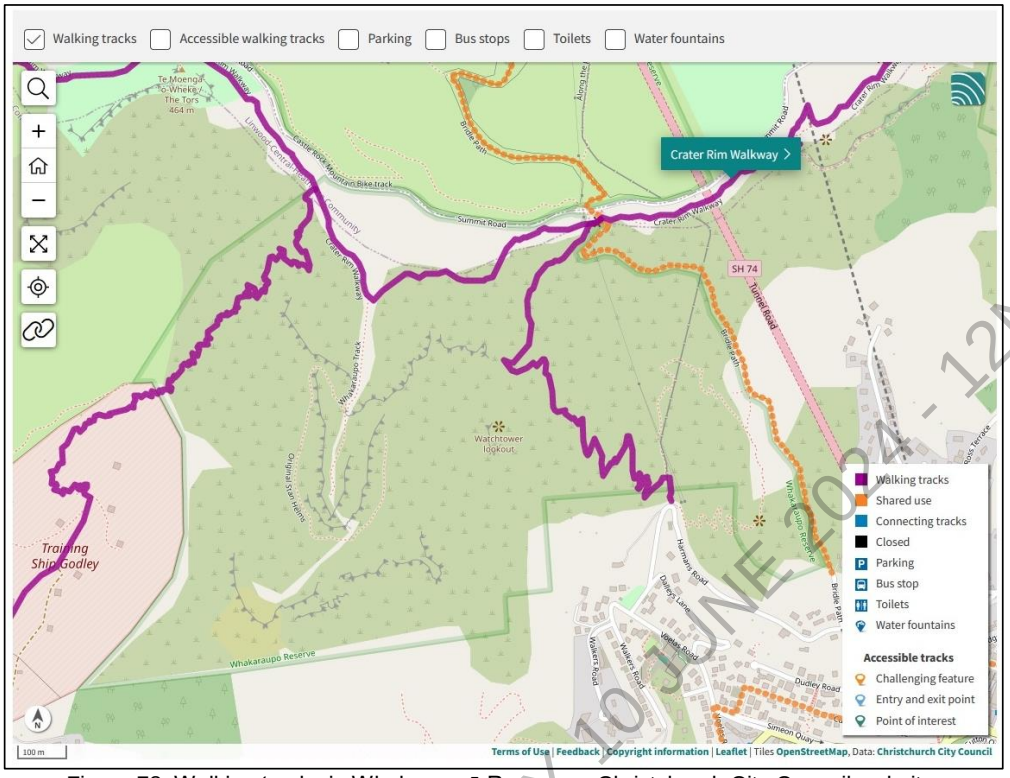


Figure 78: Walking tracks in Whakaraupō Reserve – Christchurch City Council website.

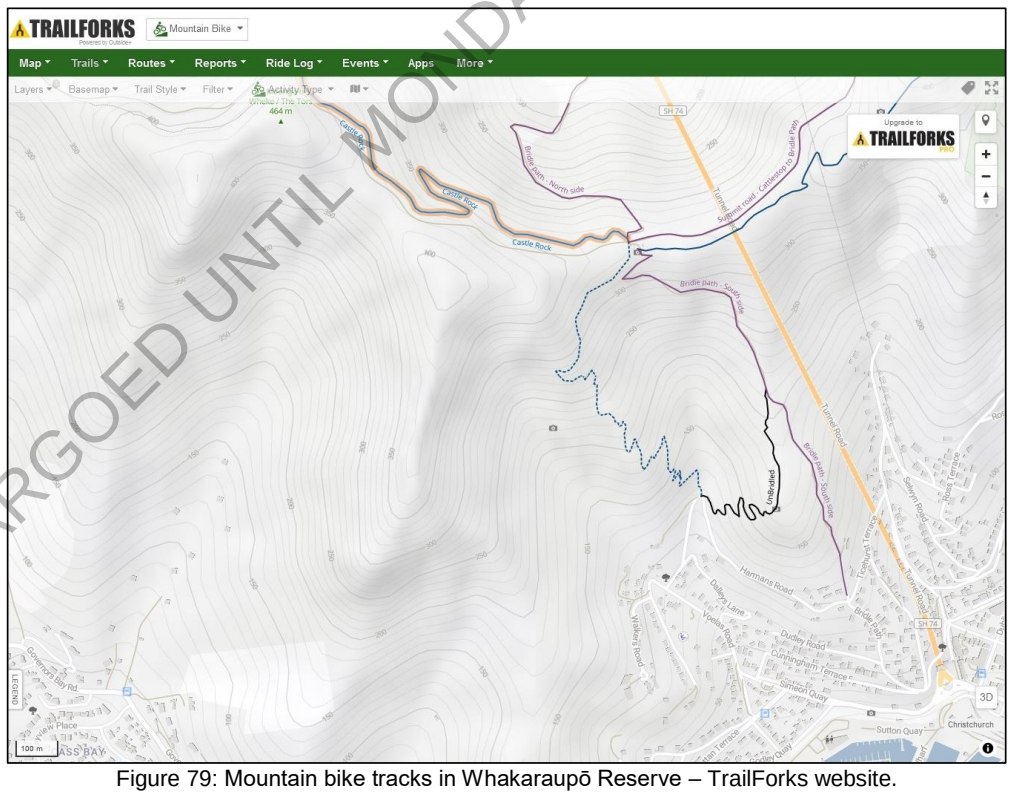


Figure 79: Mountain bike tracks in Whakaraupō Reserve – TrailForks website.

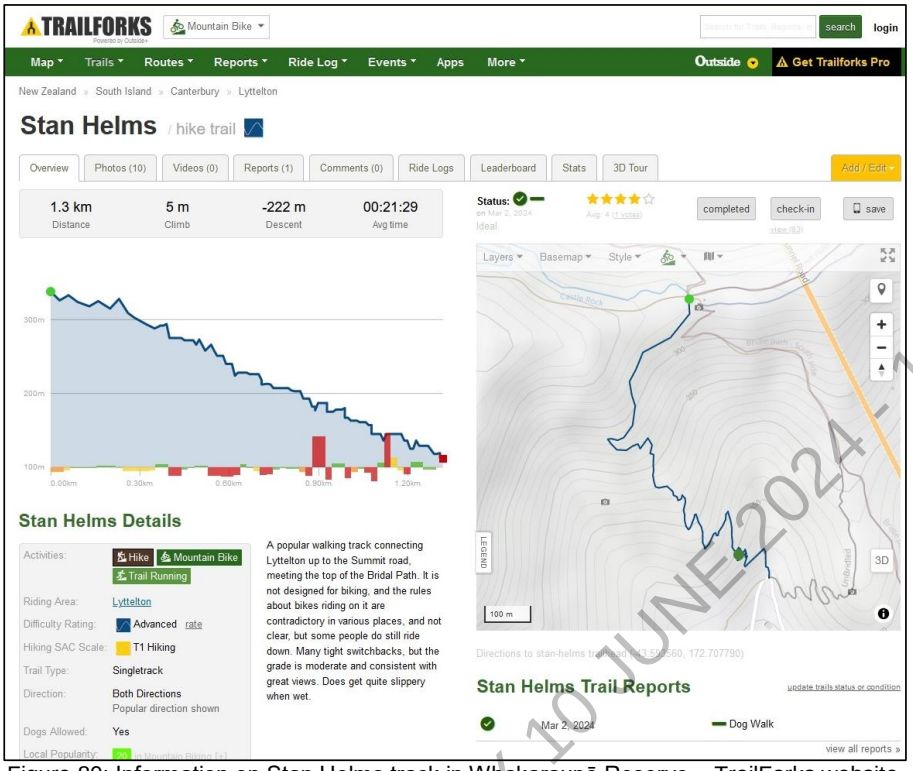


Figure 80: Information on Stan Helms track in Whakaraupō Reserve – TrailForks website.

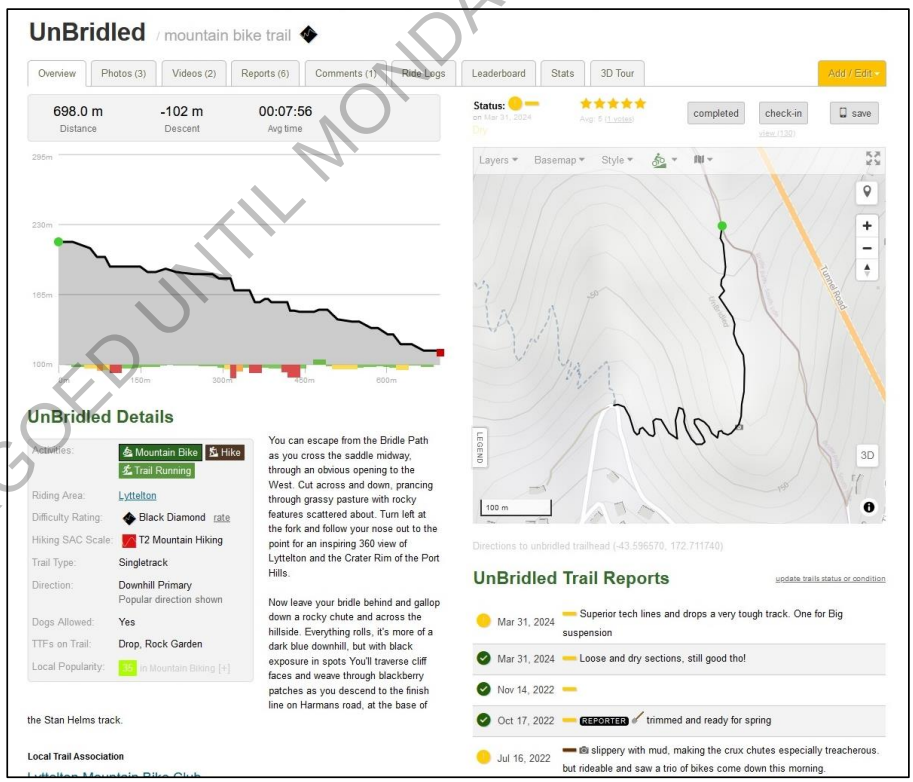


Figure 81: Information on Unbridled track in Whakaraupō Reserve – TrailForks website.

7.7. Fire

Climate change is predicted to result in increased temperatures and lower annual rainfall (more droughts) in the eastern South Island, which will increase the risk of wildfires occurring on the Port Hills. Although Whakaraupō Reserve occupies the cooler, moister side of the Port Hills, wildfires are a potential threat to indigenous vegetation in the reserve, particularly rock outcrop plants (which are not adapted to being burnt). Although grazing with livestock would reduce the growth of rank exotic grass (which is highly flammable when dry), grazing would set back the regeneration of indigenous trees and shrubs, and slow down the vegetation succession process. The recent wildfires on the Port Hills demonstrated that indigenous broadleaved/hardwood forest is much more resistant to fire than exotic grassland or shrubland, therefore the best strategy for reducing fire risk in Whakaraupō Reserve is to allow indigenous forest succession to proceed.

Planting of low flammability (and ecologically appropriate) indigenous plants (e.g. broadleaf, hebe, karamū, *Coprosma lucida*) along the southern boundary with private land would help to reduce the fire risk in that part of the reserve.

7.8. Infrastructure

Whakaraupō Reserve contains an oil pipeline and power transmission lines that run through the eastern part of the reserve in a roughly north-south direction. Construction of the oil pipeline would have required excavation of substantial amounts of rock and soil, and installation of concrete and metal structures. Regular maintenance of the pipeline route is also necessary – vegetation along the pipeline was being cleared with weed-eaters during the 13 September 2023 site visit – and this has ongoing effects on vegetation in the reserve.

Ideally, installation of further artificial structures in the reserve should be avoided. If this is not possible, however, then it is important to prevent or minimise damage to indigenous vegetation and fauna (this would require an assessment of effects by a competent ecologist/s).

7.9. Earthquakes and rockfall risk management

Following the Canterbury earthquakes in 2010-2011, a variety of geotechnical remediation works were carried out on the Port Hills, in order to mitigate levels of rockfall risk to infrastructure, property, and the public. The works involved the removal of potentially hazardous rock through scaling, blasting, and benching, as well as installation of bunds, mesh drapes, and shotcrete to contain rockfall.

These activities can have severe impacts on indigenous flora and fauna that occupy rock outcrop habitats (Hutchison & Patrick 2016), therefore it is important that ecological considerations are taken into account if any geotechnical remediation works are carried out in Whakaraupō Reserve in future.

8. CONCLUSIONS

Whakaraupō Reserve occupies a spectacular position on the Port Hills above Lyttelton. Although the present vegetation cover is dominated by exotic grasses, the reserve contains substantial areas of indigenous vegetation including secondary growth forest, flaxland, and rock outcrop vegetation. Indigenous woody vegetation is slowly regenerating on the steep slopes and rocky spurs following the exclusion of livestock more than 20 years ago. Indigenous plant diversity is high, with 154 species recorded in the current and previous botanical surveys. The reserve provides important habitat for a variety of nationally Threatened and At Risk plants, as well as species that are rare or uncommon on Banks Peninsula.

Whakaraupō Reserve is close to several other reserves and private land with indigenous forest, which will act as seed sources to aid the natural regeneration process. With targeted ongoing weed control, there is good potential for indigenous woody vegetation to regenerate in the reserve via natural succession. As the indigenous forest regenerates it will provide an increasing attraction for indigenous birds, and become a major ecological and recreational asset for Ōtautahi/Christchurch.

ACKNOWLEDGEMENTS

I thank Wendy Everingham, Brian Downey, and Helen Greenfield from Lyttelton Community Reserves Conservation Award Group for coordinating this project and providing background information on Whakaraupō Reserve. Project Lyttelton provided funding for the survey. I also thank Wendy for her company during the field work on 10 January 2024. I am grateful to Alice Shanks for sharing data from the 2007-2008 botanical survey. I thank Di Carter (Port Hills Ranger, Christchurch City Council) for assistance with site access (providing a key to the locked gate on the Summit Road). I acknowledge that the maps in this report contain data sourced from the LINZ Data Service licensed for re-use under CC BY 4.0 (i.e. Topomaps) and data sourced from the Canterbury Maps website and partners licensed for re-use under CC BY 4.0 (i.e. aerial imagery).

REFERENCES

Canterbury Regional Council 2018: *Canterbury Regional Pest Management Plan 2018-2028*. Canterbury Regional Council, Christchurch. 129 pp.

Carter D. 2015: Whakaraupō Reserve – background summary (memo). 2 pp.

Couch R. and Downey B. 2012: *Whaka Raupō Reserve Interim Management Plan Review*. Prepared for Lyttelton Reserves Management Committee, Lyttelton, Christchurch. 28 pp.

de Lange P.J. 2014: A revision of the New Zealand *Kunzea ericoides* (Myrtaceae) complex. *Phytokeys 40*: 1-185. https://doi.org/10.3897/phytokeys.40.7973.

de Lange P.J., Rolfe J.R., Barkla J.W., Courtney S.P., Champion P.D., Perrie L.R., Beadel S.M., Ford K.A., Breitwieser I., Schönberger I., Hindmarsh-Walls R., Heenan P.B. and Ladley K. 2018a: Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series 22*. Department of Conservation, Wellington. 82 pp.

de Lange P., Blanchon D., Knight A., Elix J., Lücking R., Frogley K., Harris A., Cooper J. and Rolfe J. 2018b: Conservation status of New Zealand indigenous lichens and lichenicolous fungi, 2018. *New Zealand Threat Classification Series 27*. Department of Conservation, Wellington. 64 pp.

de Lange P.J., Glenny D., Frogley K., Renner M.A.M., von Konrat M., Engel J.J., Reeb C. and Rolfe J.R. 2020: Conservation status of New Zealand hornworts and liverworts, 2020. *New Zealand Threat Classification Series 31*. Department of Conservation, Wellington. 30 pp.

Howell C. 2008: Consolidated list of environmental weeds in New Zealand. *DOC Research & Development Series 292*. Department of Conservation, Wellington. 42 pp.

Hutchison M. and Patrick B. 2016: Ecological Management Plan for the Sumner Road Re-opening Project: Zone 3B Remediation Works (SEMP6). *Wildland Consultants Contract Report No. 4108*. Prepared for Christchurch City Council. 31 pp.

Hutchison M., Gallagher E. and Lapointe M. 2020: *Myosotis lytteltonensis* survey at Mt Evans, Banks Peninsula, May 2019. *Wildland Consultants Contract Report No. 5040*. Prepared for the Department of Conservation, Mahaanui Area Office, Christchurch. 14 pp.

Hutchison M. 2023: Observation of *Sigaus campestris* on the iNaturalist website. https://inaturalist.nz/observations/206525153. Date accessed: 2 April 2024.

Jensen C. and Shanks A. 2008: *Whakaraupō Reserve. A Botanical Study. May 2007-June 2008*. Prepared for Christchurch City Council. 25 pp.

McEwen W.M. 1987: Ecological Regions and Districts of New Zealand. Third revised edition in four 1:500 000 maps. Descriptions of districts in central New Zealand, from eastern Wairarapa to Akaroa, also Chathams. *New Zealand Biological Resources Centre Publication No. 5 (in four parts): Part 3*. Department of Conservation, Wellington, New Zealand. 137 pp.

Patrick B. and Patrick H. 2012: *Butterflies of the South Pacific*. Otago University Press, Dunedin. 240 pp.

Robertson H.A., Baird K.A., Elliott G.P., Hitchmough R.A., McArthur N.J., Makan T., Miskelly C.M., O'Donnell C.J., Sagar P.A., Scofield R.P., Taylor G.A. and Michel P. 2021: Conservation status of birds in Aotearoa New Zealand, 2021. *New Zealand Threat Classification Series 36*. Department of Conservation, Wellington. 43 pp.

Rolfe J.R., Fife A.J., Beever J.E., Brownsey P.J. and Hitchmough R.A. 2016: Conservation status of New Zealand mosses, 2014. *New Zealand Threat Classification Series 13*. Department of Conservation, Wellington. 16 pp.

Schmechel F. (ed.) 2009: *The War on Pests: Dealing to key pest plants and animals that threaten native species. A landowners guide for Banks Peninsula and Kaitorete Spit*. Environment Canterbury and Banks Peninsula Conservation Trust. 74 pp.

Trewick S., Hegg D., Morgan-Richards M., Murray T., Watts C., Johns P. and Michel P. 2022: Conservation status of Orthoptera (wētā, crickets and grasshoppers) in Aotearoa New Zealand,

2022. *New Zealand Threat Classification Series 39*. Department of Conservation, Wellington. 28 pp.

Williams P.A. 1983: Secondary vegetation succession on the Port Hills Banks Peninsula, Canterbury, New Zealand. *New Zealand Journal of Botany 21*: 237-347.

Wilson H.D. 1992: Banks Ecological Region. *Protected Natural Areas Programme Survey Report No. 21*. Department of Conservation, Christchurch. 342 pp.

Wilson H.D. 1994: Regeneration of native forest on Hinewai Reserve, Banks Peninsula. *New Zealand Journal of Botany 32*: 373-383.

Wilson H.D. 1999: *Naturalised vascular plants on Banks Peninsula*. Canterbury Botanical Society Special Publication. 51 pp.

Wilson H.D. 2003: Nature Not Nurture; Minimum Interference Management and Forest Restoration on Hinewai Reserve, Banks Peninsula. *Canterbury Botanical Society Journal 37*: 25-41.

Wilson H.D. 2013: *Plant Life on Banks Peninsula*. Manuka Press, Cromwell. 411 pp.

Appendix 1 – Vegetation types in Whakaraupō Reserve (2007-2008 survey)

The botanical survey report by Jensen & Shanks (2008) included this map of the vegetation types in Whakaraupō Reserve.

Jensen & Shanks (2008) stated that "The Port Hills Environmental monitoring carried out in association with Environment Canterbury Pest Management in 2005 forms the basis of this map, with added information from our survey in 2007."

Map legend:

C+6 = Mixed second-growth hardwood forest
D12 = Kānuka treeland
F+21 = Lowland flaxland
F17 = Short tussockland
F18a = Dry pasture
F24 = Native shrubland
H31 = Exotic leguminous scrub (Scotch broom)
J+37 = Scattered plants on lowland rock (not delineated on map but includes the major spurs and rock outcrops)
M = Restoration planting.

Appendix 2 – Vascular plant species in Whakaraupō Reserve

Vascular plant species recorded in Whakaraupō Reserve by Melissa Hutchison on 13 September 2023, 8 December 2023 and 10 January 2024, and by Jensen & Shanks (2008). Species recorded in the current survey (2023-2024) are shown in **bold**. P = planted, X = wild, Y = present.

A1.1 Indigenous vascular plant species

Scientific Name	Common Name(s)	Growth Form	Conservation Status (de *Lange et al.* 2018)	Current survey 2023-2024		Jensen & Shanks 2008
Aristotelia serrata	**wineberry, makomako**	**tree**	**Not Threatened**	**-**	**P**	**Y**
Coprosma robusta	**karamū**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Coprosma rotundifolia	**round-leaved coprosma, mikimiki**	**tree**	**Not Threatened**	**X**	**-**	**Y**
Coprosma virescens	**mikimiki**	**tree**	**At Risk-Declining**	**X**	**-**	**Y**
Cordyline australis	**cabbage tree, tī kōuka**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Discaria toumatou	**matagouri, tūmatakuru**	**tree**	**At Risk-Declining**	**X**	**-**	**Y**
Dodonaea viscosa	**akeake**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Fuchsia excorticata	**tree fuchsia, kōtukutuku**	**tree**	**Not Threatened**	**X**	**-**	**Y**
Griselinia littoralis	**broadleaf, kāpuka**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Hoheria angustifolia	narrow-leaved lacebark, houhere	tree	Not Threatened	-	-	Y
Kunzea ericoides s.l.	**kānuka, rawirinui**	**tree**	**Threatened-Nationally Vulnerable [1]**	**X**	**P**	**Y**
Lophomyrtus obcordata	**rōhutu, NZ myrtle**	**tree**	**Threatened-Nationally Critical [1]**	**X**	**-**	**-**
Melicytus ramiflorus	**māhoe, whiteywood**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Myoporum laetum	**ngaio**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Myrsine australis	**red māpou, red matipo**	**tree**	**Not Threatened**	**X**	**-**	**Y**
Neomyrtus pedunculata	rōhutu, myrtle	tree	Threatened-Nationally Critical [1]	-	-	Y
Olearia avicenniifolia	**mountain akeake**	**tree**	**Not Threatened**	**X**	**-**	**-**
Olearia paniculata	**akiraho**	**tree**	**Not Threatened**	**-**	**P**	**Y**
Pennantia corymbosa	kaikōmako, ducks foot	tree	Not Threatened	-	-	Y
Piper excelsum	**kawakawa**	**tree**	**Not Threatened**	**X**	**-**	**-**
Pittosporum eugenioides	**tarātā**	**tree**	**Not Threatened**	**-**	**P**	**Y**
Pittosporum tenuifolium	**kōhūhū, black matipo**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Plagianthus regius	**lowland ribbonwood, mānatu**	**tree**	**Not Threatened**	**X**	**-**	**Y**
Podocarpus laetus	**thin-bark tōtara, Hall's tōtara**	**tree**	**Not Threatened**	**-**	**P**	**Y**
Podocarpus totara	**lowland tōtara**	**tree**	**Not Threatened**	**-**	**P**	**Y**
Pseudopanax arboreus	**five-finger, whauwhaupaku**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Sophora microphylla	**small-leaved kōwhai**	**tree**	**Not Threatened**	**X**	**P**	**Y**
Carmichaelia australis	**native broom, common broom**	**shrub**	**Not Threatened**	**X**	**-**	**Y**

Scientific Name	Common Name(s)	Growth Form	Conservation Status (de *Lange et al.* 2018)	Current survey 2023-2024		Jensen & Shanks 2008
Coprosma areolata	**mingimingi, mikimiki**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Coprosma crassifolia	**thick-leaved coprosma, mikimiki**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Coprosma propinqua	**mingimingi, mikimiki**	**shrub**	**Not Threatened**	**X**	**P**	**Y**
Coprosma propinqua* × *C. robusta	**mikimiki hybrid**	**shrub**	**-**	**X**	**-**	**Y**
Coriaria arborea	**tree tutu**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Corokia cotoneaster	**korokio**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Hebe salicifolia [2]	**koromiko**	**shrub**	**Not Threatened**	**X**	**P**	**Y**
Hebe strictissima [2]	**Banks Peninsula hebe**	**shrub**	**At Risk-Naturally Uncommon**	**X**	**P**	**Y**
Helichrysum lanceolatum	**niniao**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Heliohebe lavaudiana [2]	**Banks Peninsula sun hebe**	**shrub**	**At Risk-Declining**	**X**	**-**	**Y**
Leptecophylla juniperina* subsp. *juniperina	**prickly mingimingi, mikimiki**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Melicope simplex	**poataniwha**	**shrub**	**Not Threatened**	**X**	**-**	**-**
Melicytus alpinus	**porcupine shrub**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Solanum laciniatum	**poroporo**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Sophora microphylla × *S. prostrata*	kōwhai hybrid	shrub	-	-	-	Y
Sophora prostrata	**dwarf kōwhai, prostrate kōwhai**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Styphelia nesophila	**dwarf heath, pātōtara**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Urtica ferox	**ongaonga, tree nettle**	**shrub**	**Not Threatened**	**X**	**-**	**Y**
Calystegia tuguriorum	**NZ bindweed, pōwhiwhi**	**vine**	**Not Threatened**	**X**	**-**	**Y**
Clematis foetida	**yellow clematis**	**vine**	**Not Threatened**	**X**	**-**	**-**
Fuchsia perscandens	**climbing fuchsia**	**vine**	**Not Threatened**	**X**	**-**	**-**
Muehlenbeckia australis	**large-leaved pōhuehue**	**vine**	**Not Threatened**	**X**	**-**	**Y**
Muehlenbeckia complexa	**scrub pōhuehue, wire vine**	**vine**	**Not Threatened**	**X**	**-**	**Y**
Parsonsia capsularis	native jasmine, akakaikiore	vine	Not Threatened	-	-	Y
Parsonsia heterophylla	**native jasmine, akakaikiore**	**vine**	**Not Threatened**	**X**	**-**	**-**
Rubus schmidelioides	**bush lawyer, tātarāmoa**	**vine**	**Not Threatened**	**X**	**-**	**Y**
Rubus squarrosus	**leafless bush lawyer, tātarāmoa**	**vine**	**Not Threatened**	**X**	**-**	**-**
Acaena anserinifolia	**bidibidi, piripiri**	**dicot herb**	**Not Threatened**	**X**	**-**	**-**
Acaena novae-zelandiae	**red bidibidi**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Aciphylla subflabellata	speargrass, spaniard, kurikuri	dicot herb	At Risk-Declining	-	-	Y
Anaphalioides bellidioides	**everlasting daisy, hells bells**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Brachyglottis lagopus	**groundsel, yellow rock daisy**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Cardamine (dolichostyla?)	**bittercress**	**dicot herb**	**-**	**X**	**-**	**Y?**
Celmisia gracilenta	**slender mountain daisy, pekapeka**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Chenopodium allanii		**dicot herb**	**At Risk-Naturally Uncommon**	**X**	**-**	**Y**
Chenopodium triandrum	pigweed	dicot herb	Not Threatened	-	-	Y

Scientific Name	Common Name(s)	Growth Form	Conservation Status (de *Lange et al.* 2018)	Current survey 2023-2024		Jensen & Shanks 2008
Colobanthus apetalus		dicot herb	Not Threatened	-	-	Y
Colobanthus strictus		**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Convolvulus waitaha	**grass convolvulus**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Cotula australis	**common cotula, soldiers button**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Crassula sieberiana	**a native stonecrop**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Dichondra repens	**dichondra**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Disphyma australe	NZ ice plant	dicot herb	Not Threatened	-	-	Y
Epilobium nummulariifolium	**creeping willow herb**	**dicot herb**	**Not Threatened**	**X**	**-**	**-**
Epilobium pubens	**willow herb**	**dicot herb**	**Not Threatened**	**X**	**-**	**-**
Euchiton audax	**native cudweed**	**dicot herb**	**Not Threatened**	**X**	**-**	**-**
Galium perpusillum	dwarf bedstraw	dicot herb	Not Threatened	-	-	Y
Galium propinquum	**native bedstraw**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Galium trilobum	native bedstraw	dicot herb	Not Threatened	-	-	Y
Geranium* aff. *microphyllum	**native geranium**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Geranium brevicaule	**short-flowered cranesbill**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Gingidia enysii* var. *peninsulare	**Banks Peninsula aniseed**	**dicot herb**	**At Risk-Naturally Uncommon**	**X**	**-**	**Y**
Haloragis erecta	**toatoa**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Hydrocotyle elongata	**pennywort**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Hydrocotyle heteromeria	**pennywort**	**dicot herb**	**Not Threatened**	**X**	**-**	**-**
Hydrocotyle moschata	**pennywort**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Hydrocotyle novae-zeelandiae	**pennywort**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Hypericum involutum	**grassland hypericum**	**dicot herb**	**At Risk-Declining**	**X**	**-**	**-**
Lagenophera pumila	papatāniwhaniwha	dicot herb	Not Threatened	-	-	Y
Leptinella minor	**Banks Peninsula button daisy**	**dicot herb**	**At Risk-Naturally Uncommon**	**X**	**-**	**Y**
Linum monogynum	**NZ linen flax**	**dicot herb**	**At Risk-Declining**	**X**	**-**	**Y**
Myosotis lytteltonensis	**Lyttelton forget-me-not**	**dicot herb**	**Threatened-Nationally Critical**	**X**	**-**	**Y**
Oxalis exilis	**yellow oxalis**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Ranunculus sp.	native buttercup	dicot herb	-	-	-	Y
Raoulia monroi	fan-leaved mat daisy	dicot herb	Threatened-Nationally Vulnerable	-	-	Y
Senecio glomeratus	**native groundsel, fireweed**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Senecio matatini* subsp. *basinudus	**yellow groundsel**	**dicot herb**	**At Risk-Naturally Uncommon**	**X**	**-**	**Y**
Senecio minimus	**native fireweed**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Senecio quadridentatus	**cotton fireweed, pekapeka**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Stellaria parviflora	**native chickweed**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Wahlenbergia rupestris	**NZ harebell**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Wahlenbergia violacea	**NZ harebell**	**dicot herb**	**Not Threatened**	**X**	**-**	**Y**
Arthropodium candidum	**grass lily, repehinapapa**	**monocot herb**	**Not Threatened**	**X**	**-**	**-**

Scientific Name	Common Name(s)	Growth Form	Conservation Status (de *Lange et al.* 2018)	Current survey 2023-2024		Jensen & Shanks 2008
Libertia ixioides	**mikoikoi, native iris**	**monocot herb**	**Not Threatened**	**X**	**-**	**Y**
Phormium tenax	**lowland flax, harakeke**	**monocot herb**	**Not Threatened**	**X**	**P**	**Y**
Earina autumnalis	easter orchid, raupeka	orchid	Not Threatened	-	-	Y
Microtis unifolia	**onion orchid, maikaika**	**orchid**	**Not Threatened**	**X**	**-**	**Y**
Thelymitra longifolia	**white sun orchid**	**orchid**	**Not Threatened**	**X**	**-**	**Y**
Anthosachne solandri	**native wheatgrass, blue wheatgrass**	**grass**	**Not Threatened**	**X**	**-**	**Y**
Dichelachne crinita	**long-hair plume grass**	**grass**	**Not Threatened**	**X**	**-**	**Y**
Festuca actae	**Banks Peninsula blue grass**	**grass**	**At Risk-Naturally Uncommon**	**X**	**-**	**Y**
Festuca novae-zelandiae	**fescue tussock, hard tussock**	**grass**	**Not Threatened**	**X**	**-**	**Y**
Lachnagrostis filiformis	**wind grass**	**grass**	**Not Threatened**	**X**	**-**	**Y**
Microlaena stipoides	**meadow rice grass, pātiti**	**grass**	**Not Threatened**	**X**	**-**	**Y**
Poa cita	**silver tussock, wī**	**grass**	**Not Threatened**	**X**	**-**	**Y**
Poa colensoi	**blue tussock**	**grass**	**Not Threatened**	**X**	**-**	**-**
Poa imbecilla	weak poa	grass	Not Threatened	-	-	Y
Rytidosperma corinum	**danthonia, bristle grass**	**grass**	**Not Threatened**	**X**	**-**	**Y**
Rytidosperma unarede	**danthonia**	**grass**	**Not Threatened**	**X**	**-**	**Y**
Juncus distegus	**wīwī**	**rush**	**At Risk-Naturally Uncommon**	**X**	**-**	**-**
Juncus edgariae	leafless rush, wī	rush	Not Threatened	-	-	Y
Luzula banksiana* var. *orina	**woodrush**	**rush**	**Not Threatened**	**X**	**-**	**Y**
Carex flagellifera	Glen Murray tussock	sedge	Not Threatened	-	-	Y
Carex geminata	cutty grass, rautahi	sedge	Not Threatened	-	-	Y
Carex secta	**pūrei, pūkio**	**sedge**	**Not Threatened**	**X**	**-**	**-**
Carex solandri		**sedge**	**Not Threatened**	**X**	**-**	**Y**
Carex virgata	swamp sedge	sedge	Not Threatened	-	-	Y
Eleocharis gracilis	slender spike sedge	sedge	Not Threatened	-	-	Y
Ficinia nodosa	**club rush, wiwi**	**sedge**	**Not Threatened**	**X**	**-**	**Y**
Adiantum cunninghamii	maidenhair	fern	Not Threatened	-	-	Y
Asplenium appendiculatum	**ground spleenwort**	**fern**	**Not Threatened**	**X**	**-**	**-**
Asplenium flabellifolium	**necklace fern**	**fern**	**Not Threatened**	**X**	**-**	**Y**
Asplenium hookerianum	Hooker's spleenwort	fern	Not Threatened	-	-	Y
Asplenium oblongifolium	**shining spleenwort, huruhuruwhenua**	**fern**	**Not Threatened**	**X**	**-**	**Y**
Blechnum chambersii	lance fern	fern	Not Threatened	-	-	Y
Blechnum fluviatile	**kiwakiwa**	**fern**	**Not Threatened**	**X**	**-**	**Y**
Blechnum minus	swamp kiokio	fern	Not Threatened	-	-	Y
Blechnum novae-zelandiae	kiokio	fern	Not Threatened	-	-	Y
Blechnum penna-marina	**little hard fern**	**fern**	**Not Threatened**	**X**	**-**	**Y**

Scientific Name	Common Name(s)	Growth Form	Conservation Status (de *Lange et al.* 2018)	Current survey 2023-2024		Jensen & Shanks 2008
Blechnum procerum	small kiokio	fern	Not Threatened	-	-	Y
Cheilanthes sieberi	**rock fern**	**fern**	**Not Threatened**	**X**	**-**	**Y**
Ctenopteris heterophylla	**comb fern**	**fern**	**Not Threatened**	**X**	**-**	**Y**
Histiopteris incisa	water fern, mātātā	fern	Not Threatened	-	-	Y
Hypolepis ambigua	**pig fern**	**fern**	**Not Threatened**	**X**	**-**	**Y**
Microsorum pustulatum	**hound's tongue, kōwaowao, paraharaha**	**fern**	**Not Threatened**	**X**	**-**	**Y**
Pellaea calidirupium		fern	Not Threatened	-	-	Y
Pellaea rotundifolia	round-leaved fern, tarawera	fern	Not Threatened	-	-	Y
Polystichum oculatum	**shield fern**	**fern**	**Not Threatened**	**X**	**-**	**Y**
Polystichum vestitum	**prickly shield fern, pūniu**	**fern**	**Not Threatened**	**X**	**-**	**-**
Pteridium esculentum	bracken, rārahu, rauaruhe	fern	Not Threatened	-	-	Y
Non-local indigenous species (i.e. species that do not occur naturally in the Port Hills Ecological District)						
Anemanthele lessoniana	**wind grass**	**grass**	**At Risk-Relict**	**-**	**P**	**-**
Coprosma repens	**taupata**	**tree**	**Not Threatened**	**X**	**-**	**-**
Corynocarpus laevigatus	**karaka**	**tree**	**Not Threatened**	**X**	**P**	**-**
Hoheria angustifolia × H. sextylosa	**hybrid lacebark**	**tree**	**-**	**X**	**-**	**-**
Olearia lineata 'dartonii'		**tree**	**-**	**-**	**P**	**Y**
Pittosporum ralphii	**karo**	**tree**	**Not Threatened**	**X**	**?**	**-**

[1] All members of the Myrtaceae family in New Zealand (including widespread, common species like kānuka and mānuka) were classified as Threatened or At Risk by de Lange *et al.* (2018) because of the potential threat posed by myrtle rust (*Austropuccinia psidii*). More time has now passed since myrtle rust arrived in New Zealand, and some species appear to be less susceptible than initially thought, therefore their threat status is likely to be revised in the upcoming conservation status assessment for vascular plants (due to be published in 2024).

[2] Placed in the genus *Veronica* by some authors.

A1.2 Exotic vascular plant species

Scientific Name	Common Name(s)	Growth Form	Status in Canterbury Regional Pest Management Plan (CRC 2018)	Listed as an Environmental Weed by DOC (Howell 2008)	Current survey 2023-2024		Jensen & Shanks 2008
Acer pseudoplatanus	**sycamore**	**tree**	**Organism of Interest**	**Weed**	**X**	**-**	**Y**
Berberis glaucocarpa	**common barberry**	**tree**	**Organism of Interest**	**Weed**	**X**	**-**	**-**
Crataegus monogyna	**hawthorn**	**tree**	**Organism of Interest**	**Weed**	**X**	**-**	**Y**
Cupressus macrocarpa	macrocarpa, Monterey cypress	tree		Weed	-	-	Y
Euonymus europaeus	**spindle tree**	**tree**		**Weed**	**X**	**-**	**Y**
Laurus nobilis	**bay**	**tree**		**Weed**	**X**	**-**	**-**
Pinus radiata	radiata pine	tree	Progressive Containment Pest	Weed	-	-	Y
Prunus avium	**sweet cherry**	**tree**		**Weed**	**X**	**-**	**Y**
Prunus cerasifera	**cherry plum**	**tree**		**Weed**	**X**	**-**	**-**
Salix cinerea	grey willow	tree		Weed	-	-	Y
Sambucus nigra	**elderberry**	**tree**		**Weed**	**X**	**-**	**Y**
Berberis darwinii	**Darwin's barberry**	**shrub**	**Sustained Control Pest [1]**	**Weed**	**X**	**-**	**Y**
Chrysanthemoides monilifera	**boneseed**	**shrub**	**Sustained Control Pest [1]**	**Weed**	**X**	**-**	**Y**
Cotoneaster coriaceus	**cotoneaster**	**shrub**	**Organism of Interest [1]**	**Weed**	**X**	**-**	**-**
Cotoneaster glaucophyllus	large-leaved cotoneaster	shrub	Organism of Interest [1]	Weed	-	-	Y
Cytisus scoparius	**scotch broom**	**shrub**	**Sustained Control Pest**	**Weed**	**X**	**-**	**Y**
Genista monspessulana	**Montpellier broom**	**shrub**	**Sustained Control Pest**	**Weed**	**X**	**-**	**-**
Lupinus arboreus	tree lupin	shrub	Organism of Interest	Weed	-	-	Y
Lycium ferocissimum	**boxthorn**	**shrub**	**Organism of Interest**	**Weed**	**X**	**-**	**Y**
Ribes uva-crispa	gooseberry	shrub		Weed	-	-	Y
Rosa rubiginosa	**sweet briar, briar rose**	**shrub**	**Organism of Interest**	**Weed**	**X**	**-**	**Y**
***Rubus fruticosus* agg.**	**blackberry**	**shrub**	**Organism of Interest**	**Weed**	**X**	**-**	**Y**
Ulex europaeus	**gorse**	**shrub**	**Sustained Control Pest**	**Weed**	**X**	**-**	**Y**
Clematis vitalba	**old man's beard**	**vine**	**Sustained Control Pest [1]**	**Weed**	**X**	**-**	**Y**
Hedera helix	**ivy**	**vine**		**Weed**	**X**	**-**	**Y**
Solanum dulcamara	bittersweet	vine		Weed	-	-	Y
Acaena agnipila	**Australian sheep's bur**	**dicot herb**	**Organism of Interest**		**X**	**-**	**-**
Achillea millefolium	**yarrow**	**dicot herb**			**X**	**-**	**Y**
Amaranthus deflexus	prostrate amaranth	dicot herb			-	-	Y
Amaranthus powellii	redroot	dicot herb			-	-	Y
Anthriscus caucalis	**beaked parsley**	**dicot herb**			**X**	**-**	**Y**
Aphanes arvensis	**parsley piert**	**dicot herb**			**X**	**-**	**Y**
Arctotheca calendula	Cape weed	dicot herb			-	-	Y
Arenaria serpyllifolia	**sandwort**	**dicot herb**			**X**	**-**	**-**

Scientific Name	Common Name(s)	Growth Form	Status in Canterbury Regional Pest Management Plan (CRC 2018)	Listed as an Environmental Weed by DOC (Howell 2008)	Current survey 2023-2024		Jensen & Shanks 2008
Bellis perennis	**daisy**	**dicot herb**			**X**	**-**	**-**
Capsella bursa-pastoris	**shepherds purse**	**dicot herb**			**X**	**-**	**Y**
Cardamine flexuosa	**wavy bitter cress**	**dicot herb**			**X**	**-**	**-**
Cardamine hirsuta	**bitter cress**	**dicot herb**			**X**	**-**	**Y**
Carduus pycnocephalus	**slender winged thistle**	**dicot herb**			**X**	**-**	**-**
Carduus tenuiflorus	winged thistle	dicot herb			-	-	Y
Centranthus ruber	**spur valerian, red valerian**	**dicot herb**	**Organism of Interest**		**X**	**-**	**Y**
Cerastium fontanum	**mouse-ear chickweed**	**dicot herb**			**X**	**-**	**Y**
Cerastium glomeratum	**annual mouse-ear chickweed**	**dicot herb**			**X**	**-**	**Y**
Cirsium arvense	**Californian thistle**	**dicot herb**		**Weed**	**X**	**-**	**Y**
Cirsium vulgare	**Scotch thistle**	**dicot herb**		**Weed**	**X**	**-**	**Y**
Claytonia perfoliata	**miners lettuce**	**dicot herb**			**X**	**-**	**Y**
Conium maculatum	**hemlock**	**dicot herb**	**Organism of Interest**		**X**	**-**	**Y**
Crepis capillaris	**hawksbeard**	**dicot herb**			**X**	**-**	**-**
Digitalis purpurea	**foxglove**	**dicot herb**			**X**	**-**	**Y**
Erigeron sumatrensis	**broad-leaved fleabane**	**dicot herb**			**X**	**-**	**Y**
Erodium cicutarium	**storksbill**	**dicot herb**			**X**	**-**	**Y**
Foeniculum vulgare	**fennel**	**dicot herb**			**X**	**-**	**Y**
Galium aparine	**cleavers**	**dicot herb**			**X**	**-**	**Y**
Geranium molle	**dovesfoot cranesbill**	**dicot herb**			**X**	**-**	**Y**
Hieracium lepidulum	tussock hawkweed	dicot herb	Organism of Interest [1]	Weed	-	-	Y
Hypochaeris glabra	smooth catsear	dicot herb			-	-	Y
Hypochaeris radicata	**catsear**	**dicot herb**			**X**	**-**	**Y**
Leontodon taraxacoides	hawkbit	dicot herb			-	-	Y
Lepidium africanum	**peppercress**	**dicot herb**			**X**	**-**	**Y**
Malva neglecta	dwarf mallow	dicot herb			-	-	Y
Marrubium vulgare	horehound	dicot herb	Organism of Interest		-	-	Y
Mentha suaveolens	**apple mint**	**dicot herb**			**X**	**-**	**-**
Montia fontana* subsp. *minor	**blinks, dwarf montia**	**dicot herb**			**X**	**-**	**-**
Mycelis muralis	**wall lettuce**	**dicot herb**			**X**	**-**	**-**
Myosotis sylvatica	**garden forget-me-not**	**dicot herb**			**X**	**-**	**-**
Petroselinum crispum	**wild parsley**	**dicot herb**			**X**	**-**	**-**
Pilosella officinarum	**mouse-ear hawkweed**	**dicot herb**	**Organism of Interest [1]**	**Weed**	**X**	**-**	**-**
Plantago lanceolata	**narrow-leaved plantain**	**dicot herb**			**X**	**-**	**Y**
Plantago major	**broad-leaved plantain**	**dicot herb**			**X**	**-**	**Y**
Polycarpon tetraphyllum	**allseed**	**dicot herb**			**X**	**-**	**Y**

Scientific Name	Common Name(s)	Growth Form	Status in Canterbury Regional Pest Management Plan (CRC 2018)	Listed as an Environmental Weed by DOC (Howell 2008)	Current survey 2023-2024		Jensen & Shanks 2008
Pseudognaphalium luteoalbum	**jersey cudweed**	**dicot herb**			**X**	**-**	**Y**
Ranunculus parviflorus	**small-flower buttercup**	**dicot herb**			**X**	**-**	**-**
Rumex acetosella	**sheeps sorrel**	**dicot herb**			**X**	**-**	**Y**
Rumex obtusifolius	broad-leaved dock	dicot herb			-	-	Y
Sagina procumbens	**procumbent pearlwort**	**dicot herb**			**X**	**-**	**Y**
Sedum acre	**stonecrop**	**dicot herb**		**Weed**	**X**	**-**	**Y**
Sedum album	**white stonecrop**	**dicot herb**			**X**	**-**	**-**
Senecio vulgaris	**common groundsel**	**dicot herb**			**X**	**-**	**-**
Silene gallica	**catchfly**	**dicot herb**			**X**	**-**	**Y**
Silybum marianum	**variegated thistle**	**dicot herb**	**Organism of Interest**		**X**	**-**	**Y**
Sisymbrium officinale	**hedge mustard**	**dicot herb**			**X**	**-**	**Y**
Solanum chenopodioides	**velvety nightshade**	**dicot herb**			**X**	**-**	**-**
Solanum nigrum	black nightshade	dicot herb			-	-	Y
Sonchus oleraceus	**pūhā, smooth sow thistle**	**dicot herb**			**X**	**-**	**Y**
Spergularia rubra	sand spurrey	dicot herb			-	-	Y
Stellaria media	**chickweed**	**dicot herb**			**X**	**-**	**Y**
Stuartina muelleri	**spoon-leaved cudweed**	**dicot herb**			**X**	**-**	**-**
Taraxacum officinale	**dandelion**	**dicot herb**			**X**	**-**	**Y**
Trifolium glomeratum	**clustered clover**	**dicot herb**			**X**	**-**	**Y**
Trifolium pratense	red clover	dicot herb			-	-	Y
Trifolium repens	**white clover**	**dicot herb**			**X**	**-**	**Y**
Trifolium subterraneum	subterranean clover	dicot herb			-	-	Y
Urtica urens	nettle	dicot herb			-	-	Y
Verbascum thapsus	**woolly mullein**	**dicot herb**			**X**	**-**	**Y**
Veronica persica	**scrambling speedwell**	**dicot herb**			**X**	**-**	**-**
Vicia hirsuta	**hairy vetch**	**dicot herb**			**X**	**-**	**-**
Vicia sativa	**vetch**	**dicot herb**			**X**	**-**	**Y**
Vittadinia gracilis	**purple fuzzweed**	**dicot herb**			**X**	**-**	**Y**
Allium triquetrum	**3-cornered garlic**	**monocot herb**		**Weed**	**X**	**-**	**-**
Hemerocallis fulva	**orange day lily**	**monocot herb**			**X**	**-**	**-**
Agrostis capillaris	**brown top**	**grass**		**Weed**	**X**	**-**	**Y**
Agrostis stolonifera	creeping bent	grass			-	-	Y
Aira caryophyllea	**silvery hair grass**	**grass**			**X**	**-**	**Y**
Anthosachne scabra	**blue wheatgrass**	**grass**			**X**	**-**	**Y**
Anthoxanthum odoratum	**sweet vernal**	**grass**			**X**	**-**	**Y**
Arrhenatherum elatius	**tall oat grass**	**grass**			**X**	**-**	**Y**

Scientific Name	Common Name(s)	Growth Form	Status in Canterbury Regional Pest Management Plan (CRC 2018)	Listed as an Environmental Weed by DOC (Howell 2008)	Current survey 2023-2024		Jensen & Shanks 2008
Austrostipa nodosa	**needle grass**	**grass**			**X**	**-**	**Y**
Bromus catharticus	**prairie grass**	**grass**		**Weed**	**X**	**-**	**Y**
Bromus diandrus	**ripgut brome**	**grass**			**X**	**-**	**Y**
Bromus hordeaceus	**soft brome**	**grass**			**X**	**-**	**Y**
Critesion murinum	barley grass	grass			-	-	Y
Cynosurus cristatus	**crested dogstail**	**grass**			**X**	**-**	**Y**
Cynosurus echinatus	rough dogstail	grass			-	-	Y
Dactylis glomerata	**cocksfoot**	**grass**		**Weed**	**X**	**-**	**Y**
Festuca bromoides	**vulpia hair grass, squirrel-tailed fescue**	**grass**			**X**	**-**	**Y**
Holcus lanatus	**Yorkshire fog**	**grass**		**Weed**	**X**	**-**	**Y**
Lolium perenne	**ryegrass**	**grass**		**Weed**	**X**	**-**	**Y**
Phalaris minor	**lesser canary grass**	**grass**			**X**	**-**	**-**
Poa infirma	**early meadow grass**	**grass**			**X**	**-**	**-**
Rytidosperma caespitosum	**danthonia, bristle grass**	**grass**			**X**	**-**	**Y**
Rytidosperma racemosum	danthonia	grass			-	-	Y
Juncus bufonius	**toad rush**	**rush**			**X**	**-**	**-**
Dryopteris filix-mas	**male fern**	**fern**		**Weed**	**X**	**-**	**Y**
Polypodium vulgare	**common polypody**	**fern**	**Organism of Interest [1]**		**X**	**-**	**Y**

[1] Classified as an 'Unwanted Organism' by the Ministry of Primary Industries.

References

Canterbury Regional Council 2018: *Canterbury Regional Pest Management Plan 2018-2028*. Canterbury Regional Council, Christchurch. 129 pp.

de Lange P.J., Rolfe J.R., Barkla J.W., Courtney S.P., Champion P.D., Perrie L.R., Beadel S.M., Ford K.A., Breitwieser I., Schönberger I., Hindmarsh-Walls R., Heenan P.B. and Ladley K. 2018: Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series 22*. Department of Conservation, Wellington. 82 pp.

Howell C. 2008: Consolidated list of environmental weeds in New Zealand. *DOC Research & Development Series 292*. Department of Conservation, Wellington. 42 pp.

Jensen C. and Shanks A. 2008: *Whakaraupō Reserve. A Botanical Study. May 2007-June 2008*. Prepared for Christchurch City Council. 25 pp.

Appendix 3 – Bryophyte and lichen species in Whakaraupō Reserve

Bryophyte (liverwort and moss) and lichen species recorded in Whakaraupō Reserve by Melissa Hutchison on 13 September 2023, 8 December 2023, and 10 January 2024.

A2.1 Indigenous bryophyte species

Scientific Name	Common Name(s)	Life Form	Conservation Status (de Lange *et al.* 2020) (Rolfe *et al.* 2016)
Lophocolea (semiteres?)		liverwort	-
Plagiochasma rupestre	cliff waxwort	liverwort	Not Threatened
Targionia hypophylla	orobus-seed liverwort	liverwort	At Risk Declining
Acrocladium chlamydophyllum		moss	Not Threatened
Breutelia affinis		moss	Not Threatened
Campylopus clavatus		moss	Not Threatened
Grimmia sp.		moss	-
Hedwigia ciliata		moss	Not Threatened
Hypnum cupressiforme	cypress-leaved plait moss	moss	Not Threatened
Lembophyllum sp.		moss	-
Philonotis scabrifolia		moss	Not Threatened
Polytrichum juniperinum	juniper haircap moss	moss	Not Threatened
Triquetrella papillata		moss	Not Threatened

A2.2 Indigenous lichen species

Scientific Name	Common Name(s)	Conservation Status (de Lange *et al.* 2018b)
Buellia sp.		-
Candelariella sp.		-
Chrysothrix sp.	gold dust lichen	-
Cladia gorgonea		Not Threatened
Cladonia (enantia?)	pixie cup lichen	-
Cladonia corniculata	pixie cup lichen	Not Threatened
Cladonia (chlorophaea?)	pixie cup lichen	-
Cladonia sp.	pixie cup lichen	-
Coccocarpia palmicola	salted shell lichen	Not Threatened
Diploschistes (scruposus?)		-
Flavoparmelia haysomii		Not Threatened
Hyperphyscia adglutinata		Not Threatened
Lecanora (farinacea?)		-
Lecidea sp.		-
Lecidella elaeochroma		Not Threatened
Lepraria sp.		-
Leptogium sp.		-
Lobothallia radiosa		Not Threatened
Menegazzia subpertusa		Not Threatened
Notoparmelia sp.		-
Ochrolechia parella	crawfish lichen	Not Threatened
Pannaria athroophylla		Not Threatened
Parmotrema perlatum	black stone flower	Not Threatened
Pertusaria sp.		-
Physcia caesia	blue-grey rosette lichen	Not Threatened
Physcia jackii		Not Threatened
Placopsis rhodophthalma	bullseye lichen	Not Threatened
Podostictina pickeringii		Not Threatened
Porpidia sp.		-
Pseudocyphellaria episticta		Not Threatened
Pseudocyphellaria glabra		Not Threatened
Pseudocyphellaria neglecta		Not Threatened

Scientific Name	Common Name(s)	Conservation Status (de Lange *et al.* 2018b)
Psoroma melanizum		Not Threatened
Punctelia subrudecta		Not Threatened
Ramalina celastri	cartilage lichen	Not Threatened
Rhizocarpon geographicum	map lichen	Not Threatened
Rinodina thiomela		Not Threatened
Stereocaulon corticatulum		Not Threatened
Stereocaulon ramulosum		Not Threatened
Teloschistes velifer		Not Threatened
Tephromela atra		Not Threatened
Usnea sp.	old man's beard lichen	-
Xanthoparmelia scabrosa	sexy pavement lichen	Not Threatened
Xanthoparmelia sp. *(grey)*	rockshield lichen	-
Xanthoparmelia sp. *(brown)*	rockshield lichen	-
Xanthoria parietina	common sunburst lichen	Not Threatened
Xanthoria parietina	common sunburst lichen	Not Threatened

A2.3 Exotic bryophyte species

Scientific Name	Common Name(s)	Life Form	Conservation Status (de Lange *et al.* 2020) (Rolfe *et al.* 2016)
Lunularia cruciata	crescent-cup liverwort	liverwort	-
Kindbergia praelonga	common feather-moss	moss	-

References

de Lange P., Blanchon D., Knight A., Elix J., Lücking R., Frogley K., Harris A., Cooper J. and Rolfe J. 2018: Conservation status of New Zealand indigenous lichens and lichenicolous fungi, 2018. *New Zealand Threat Classification Series 27*. Department of Conservation, Wellington. 64 pp.

de Lange P.J., Glenny D., Frogley K., Renner M.A.M., von Konrat M., Engel J.J., Reeb C. and Rolfe J.R. 2020: Conservation status of New Zealand hornworts and liverworts, 2020. *New Zealand Threat Classification Series 31*. Department of Conservation, Wellington. 30 pp.

Rolfe J.R., Fife A.J., Beever J.E., Brownsey P.J. and Hitchmough R.A. 2016: Conservation status of New Zealand mosses, 2014. *New Zealand Threat Classification Series 13*. Department of Conservation, Wellington. 16 pp.