Waikereru Seed Islands Progress Report

October 2024

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Contents

Introduction

The Seed Island project has already been highly successful in providing a learning opportunity in a real-world environment.

Most plants in most of the plots have had excellent growth rates. Pest plant and animal incursions have been dealt with in a timely manner due to regular monitoring and as a result any damage has been minimal. The plots are easy to monitor and maintain due to their location. The area was deliberately chosen for its proximity to a track making planting, monitoring and maintenance easier and more cost effective. Additionally, the soil at the base of the slope naturally has higher nutrient and moisture levels which boost the plant growth rates.

The plots should begin to provide seed material within a short time frame based on current growth rates.

During October, the third Seed Island assessment for 2024 was conducted by Ecoworks NZ. This update provides information which helps us to understand both the short and long-term progress and outcomes of this experimental planting regime.

Results

Generally, the plants have been doing well since planting in 2022 and 2023. The Tairāwhiti region has experienced consecutively wet seasons which has impacted on plant growth. While this has been beneficial for most plants, it has also been advantageous for undesirable species, and we are witnessing that now with exceptional growth in rank grass and other invasive plants. This extra foliage has also allowed a high number of browsing animals to thrive. In addition to the Seed Island monitoring and maintenance, Waikereru Ecosanctuary has an established trapping network and has regular visits from professional cullers to manage pest animals.

Table 1 includes a brief summary of each plot including which plants are thriving and which are struggling, as well as any other field observations. These observations are useful for determining which species to plant in future regeneration plantings at Waikereru and further afield in Tairāwhiti.

Table 1. Progress notes for Seed Islands 1-31, inspection date: October 2024.

Island number	Notes

1	Pūriri are doing exceptionally well, one tree is over 3 meters tall. Tōtara are putting on new growth, but the main trunk is still flimsy, this causes them to bend over and then get smothered by the grass. Makomako are consistently struggling with browse and insect damage.
2	Pūriri and houhere over 2 meters tall. Ngaio, beech and rewarewa over 1 meter. Five-finger has been heavily browsed but is putting on fresh growth.
3	Plot is very dry. Plants are doing ok, one makomako and one kowhai have perished.
4	Kowhai and houhere are thriving. Makomako, beech and karamu have all perished.
5	All tree species are growing consistently.
6	Pūriri growing much taller than other species with each tree being over 1.5 meters tall. Beech trees have died. Five-finger has been heavily browsed but is putting on lots of new growth. Interestingly there is a self-seeded five-finger 1 meter outside this plot that hasn't been browsed. This demonstrates the opportunistic nature of the path browsing animals walk.
7	Pūriri, houhere and ngaio all over 1.5 meters tall. One very healthy beech tree present.
8	In this plot the kohekohe, karamu and makomako are all doing well which is notable as these species are generally struggling across the other plots. Houhere and pūriri are also doing well here. Rewarewa has not put on as much growth as in the other plots and the leaves are blotchy with damage from thrips.
9	One kowhai is 1.5 meters tall and one pūriri is 1 meter tall, these two trees stand out from the rest of the plot, but all other trees are growing well.
10	The tallest pūriri, over 3 meters tall, has been ringbarked by deer rubbing on the trunk. The next tallest tree in this plot, a ngaio, has been snapped in half and the bark on its trunk scraped but it is regrowing from the base, indicating the damage is old. Other species are growing well.
11	Pūriri over 2 meters tall. Makomako is putting on lots of new growth after being heavily browsed. The beech trees have all died. All other trees growing well.
12	The ngaio and pūriri are thriving in this plot, with both species now standing over 2 meters tall.

13	Kawakawa, mahoe and various fern species are all naturally regenerating this plot. Plants are healthy but slow growing. The kanuka has dropped its branches and smothered some plants. There are several dead trees in the top half of this plot, the ground is very dry.
14	The trees have all put on good growth apart from the few that are being covered by pōhuehue.
15	Significant naturally occurring regeneration of native species in this plot. Most species growing well, including makomako. One dead rewarewa and more dead beech trees.
16	Pūriri and ngaio are notably larger than the other species in this plot. The rātā and five-finger have both put on considerable growth in this plot which is significant as they are struggling in most other plots.
17	Pūriri and ngaio are larger than the other species in this plot. The rātā has put on significant new growth this spring.
18	Dead/dry branches dropping from the kanuka and covering the trees is an issue in this plot. A consideration for all plots not in the open.
19	Kanuka branches dropping on trees an issue in this plot also. Moss and ferns growing around base of trees when grass removed, good to see the ecosystem starting to regenerate naturally.
20	All plants have put on new growth, despite the moderate grass cover. During this survey, a chaffinch was observed landing in the lower branches of one of the planted ngaio to reach the grass seed at the same height.
21	One kowhai is 1.6 meters tall, notable for a sometimes-vulnerable species.
22	One pūriri that was 1.2 meters tall has been snapped in half by a dead kanuka branch falling on it. A disadvantage to being in a partially shaded plot.
23	Karaka has been browsed to the ground but is regrowing. All other plants growing well.
24	All pūriri are thriving in comparison with other species. The beech trees are dead or struggling.
25	The largest tree in this plot, a pūriri, has been snapped in half. Possible cause of breakage is a browsing animal. Ngaio and rātā leaves both have insect damage. Kahikatea is thriving, likely due to the damp nature of this plot.
26	Pūriri and kowhai are tall and healthy. Karaka, makomako, tītoki and five-finger have all been browsed but are slowly regrowing, browsing is old.

27	This is the largest plot with 88 plants planted initially. All plants have battled against the thick rank grass growth this spring. Conversely, some seem to have benefited from the grass cover. All species have put on new growth, and the few that were browsed are regrowing.
28	All species growing well, only one plant has died at the top of the plot due to being covered in fallen kanuka branches. Most trees have reached 1 meter in height except for rātā which is shorter but still has lots of new growth.
29	Putaputaweta and mahoe are regenerating naturally in this plot. This plot is very dry, a likely cause of the six plants that have died.
30	Six plants have died in this plot, they seem to be kahikatea and kowhai. Perhaps the plot is too dry for these species. Substantial amount of natural regeneration is occurring.
31	New growth on most of the plants in this plot. The karaka has all been browsed but are regrowing well.

Dead kanuka branches that have dropped on a rewarewa.

Incursion of weeds

Following discussions with Michael Bergin (Trees That Count, Technical Advisor) in September 2023, Ecoworks staff hand cleared, and release sprayed around the trees as required. It was decided that grass control around the plants would only occur for the first two years after planting as this is a realistic commitment for other regenerative plantings and therefore aiding the results of this study in a practical way.

It was interesting to see that although the rank grass throughout the grass-covered plots had grown abundantly this spring, when hand releasing around the trees, the base remained free from grass growth where it had been sprayed previously. Additionally, moss and small ferns were starting to grow around the base of most of the trees.

Weed control throughout the seed island project has been successful. Follow up is required in some areas, especially where the larger patches of blackberry were sprayed in 2023.

Various fern and moss species growing around the base of a totara that was release sprayed in 2023.

Table 2. Island-specific notes on any issues with weeds or smothering at the Seed Islands, notes taken during the assessment in October 2024.

Island number	Status
1	Rank grass is thick and tall, but all the trees are now taller than the grass and thus unaffected. Trees were hand released from encroaching grass and it was noted that the base of the trees remained free from grass, presumably because of the previous spray release. Small patches of blackberry and inkweed have sprouted above the plot where the big patch was controlled last year. Some Mexican daisy is growing just outside the plot, this will be controlled on the next visit to prevent an incursion on the plot.
2	Rank grass has grown significantly this spring, but all the trees are tall enough that it isn't affecting them.
3	Ground covered in Mexican daisy, but plants are not affected.
4	No issues.
5	Minimal grass cover in lower half of plot.
6	Moderate grass cover but tree bases clear when hand releasing undertaken, and the grass is not affecting tree growth.
7	Minimal grass and moderate Mexican daisy covering the ground, this is only affecting for the rātā and the kahikatea now as the rest of the trees are taller than these problematic species.
8	Minimal Mexican daisy and no other issues.
9	Mexican daisy is covering 50% of the plot, will control during next visit.
10	Minimal grass and Mexican daisy growing, no issues as a result.
11	No issues.
12	A small area of encroaching blackberry was controlled during site visit. No other issues.
13	Pōhuehue starting to encroach from the edges.
14	Minimal grass cover having no impact due to the size of the trees. Pōhuehue is smothering several of the trees. Do we interfere for the sake of the study or let nature take its course?
15	Minor grass cover, not posing any issues.
16	The lower branches of the kahikatea are being smothered by Mexican daisy. No other issues.

17	Some Mexican daisy affecting kahikatea, no other issues.
18	No issues at this site, there is no grass growing at all due to the dryness of this plot.
19	Minimal grass growth in this plot but again, not affecting the trees.
20	Moderate grass cover, hand released during sight visit. Fennell controlled nearby to prevent spread.
21	No issues.
22	No issues.
23	Minimal grass and no other issues.
24	Some Mexican daisy starting to encroach, needs controlling before it spreads.
25	All plants were being smothered by the spring growth of rank grass. They were all hand and spray released. The large alder just uphill of this plot was controlled and the nearby pampas was sprayed.
26	Thin grass cover, not affecting plant growth.
27	All plants swamped by rank grass. All were hand released and then the grass sprayed. Blackberry is encroaching from the large patch uphill that had an initial spray in 2023 but requires a follow up.
28	Blackberry, scotch thistle, inkweed, fox glove and fireweed all hand-pulled during survey.
29	Some smothering from dead kanuka branches, no other issues.
30	No issues.
31	Small blackberry plants were controlled during the site visit. No other issues.

Discussion

Pūriri and ngaio are notably putting on the most growth and resisting insect damage and ungulate browsing compared to the other species. It is notable that these species were some of the larger sized plants that came from the nursery. While this has shown a significant increase in growth rate, they were more cumbersome to transport up to the plots.

Left: Pūriri have consistently been the fastest growing tree across all the plots.

Right: The trunk of a pūriri that was planted in 2022.

One of the maintenance directives outlined in the *Seed Island Work Plan* was to cut back any encroaching canopy cover to maintain the planted gap. During Michael Bergin's site visit in 2023 the decision was made to not undertake this work as it is not likely to be replicated in large scale regeneration plantings and therefore not a useful addition to the trial project. Using the same rationale, the decision has been made to leave the native pōhuehue which is growing in a few of the plots. Further discussion will be had on this when Michael Bergin visits the site in November 2024.

Native pōhuehue smothering a five-finger. Do we interfere or let nature decide?

Waikereru is entirely stock fenced, and the majority is deer fenced on top of this, yet ungulate browsing continues to be an issue. This highlights the importance of ongoing monitoring of the site, especially during the first years as plants are getting established. Any incursions have been, and continue to be dealt with promptly and there is plans to continue the deer fencing around the whole site.

A damaged pūriri tree in Seed Island 1. Monitoring and control of browsers within and around the Seed Islands remains important as these young trees are still vulnerable.

Weed Management Plan

In July 2024, Marley Ford completed a Weed Management Plan (*Appendix 1)* for Waikereru Ecosanctuary. The aim of the plan is to provide a practical and economical plan that works with natural systems towards the sustainable maintenance of the biodiversity at Waikereru.

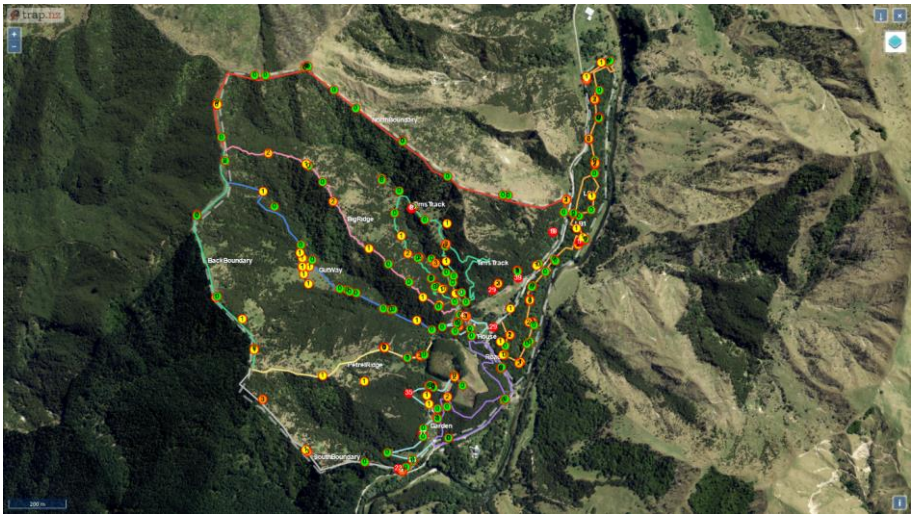
Although this management plan is for the wider Waikereru Ecosanctuary, it will benefit the Seed Island project by preventing the spread of the invasive plant species into the plots.

Pest Control Summary

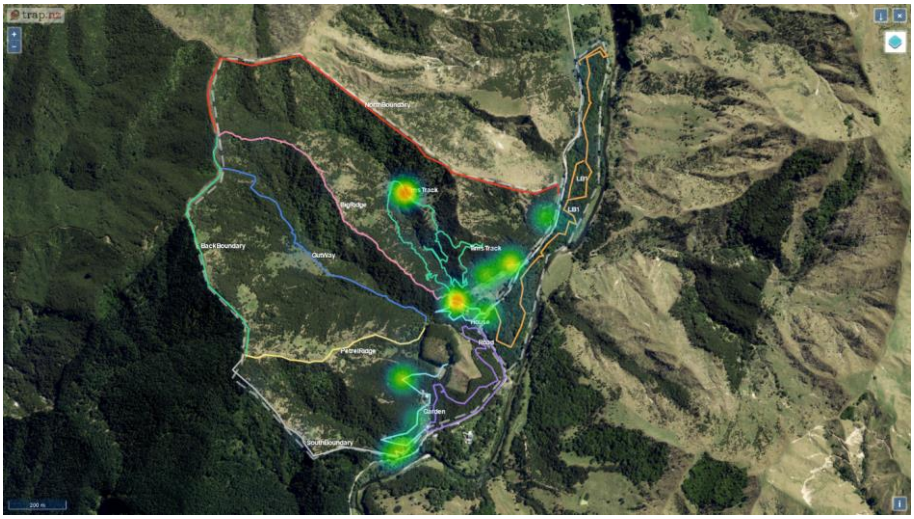
Two hundred and thirteen traps and sixty-seven bait stations are spread over approximately 124 hectares. Traps are installed and baited according to industry best practice and serviced approximately every 30 days. Bait stations are monitored every 60 to 90 days or as required.

Trap results are shown below in a series of images generated from the Trap.NZ website. Records are generated in the field, at time of check, using a smartphone app and then uploaded to the website at the end of the day's work.

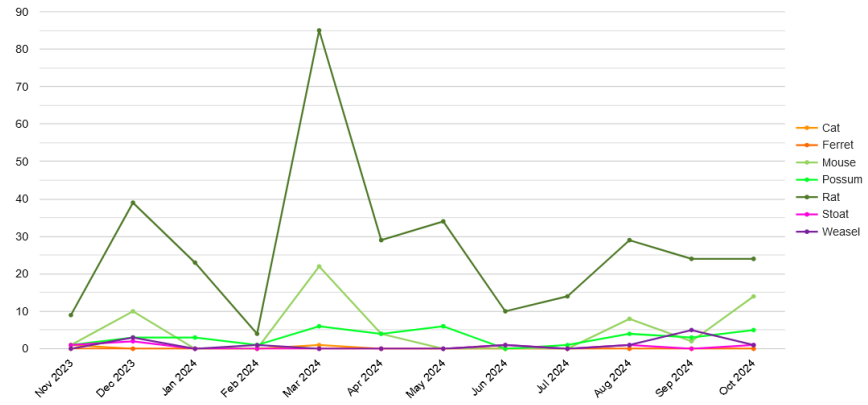
Data includes kills from a selection of traditional mustelid and rat traps, as well as more modern automatic traps that can account for up to 90 kills between servicing. The automatic traps give an indication of possum or rat/mouse kills which are read off the device using an app (rat/mouse tallies generated by the traps are recorded as ship rats unless mouse carcases are seen in/around the traps at time of data download).



Preceding year trap catches Oct 25th 2023 to 2024



Preceding year trap catches Oct 25th 2023 to 2024 as a heatmap



Monthly chart of trap catches Oct 25th 2023 to 2024

Conclusion

The ongoing success and learnings from the Seed Islands so far are already helping to inform larger scale regeneration plantings, both in Tairāwhiti and across Aotearoa, and it's only just the beginning. This success has been achieved despite the additional pressures put on the project by extreme weather events and relentless invasion by pest plants and animals. These factors are testament to this being an on-the-ground, real-life example of what is possible.

If you require further information regarding this survey, please contact Nicola Carter on 021 567 653 or nicola@ecoworks.co.nz.

Kind regards,

Nicola Carter

For

Steve Sawyer

Ecoworks NZ Ltd.

Appendix 1

Waikereru Weed Management Plan

Marley Ford, Field Survey, Report Author

Nicola Carter, Field Survey

July 2024

Report prepared for Waikereru Ecosanctuary

Aspirations

This weed management plan works towards the sustainable maintenance of biodiversity at Waikereru Ecosanctuary. It aims to work with natural systems to provide a practical and economical plan to control the invasive species present at the sanctuary in conjunction with the long-term management aspirations of the Waikereru Ecosanctuary – enhancing and maintaining the local biodiversity in a cost-efficient way. The goal of this plan is to create a self-managing, functioning ecosystem that provides ecosystem benefits with minimal inputs, e.g., little weed control, by working with the regeneration already occurring at the sanctuary. Rather than focusing on the complete eradication of invasive species, which would be pointless in a catchment with many nearby infestations providing seed sources, the focus should be on protecting the ecological integrity of the natural regeneration occurring on slopes. This would be done by keeping invasive species at low densities rather than their complete eradication. Infestations will need to be monitored, and some controlled over time rather than all at once.

Introduction

Waikereru Ecosanctuary is a 110 ha reserve located in Waimatā valley 6.5 km north of Gisborne. The ecosanctuary has a range of biodiversity values, including functioning ecosystems and threatened species, outlined in Ford et al. (2022). Due to past long-term weed control the sanctuary has smaller weed infestation than surrounding properties. However, there are weed infestations such as old man's beard (*Clematis vitalba*) that risk the integrity of the kānuka (*Kunzea robusta*) regeneration on the slopes of the reserve that are providing erosion mitigation and providing ecological benefits. This report summarises field work undertaken over the period of the 2nd to 5th of April 2024. This plan identifies and priorities weed species and infestations for management.

Methods

The site was traversed by foot and has been separated into management units based on Figure 1. These are the alluvium catchment (A) Long Bush running along the west side of the Waimata river, which is separated from the three other hillside catchments (B-D) by the Riverside Road. All invasive species were way pointed with notes taken on their abundance and threat. The way points were loaded onto the app trap.nz so the weed control team are aware of the weed's locations.

All pink ragwort (*Senecio glastifolius*) encountered were pulled. All small *Pinus radiata* were either pulled or cut and pasted, and trees too large for removal by these methods were GPSed. Most plants of Jerusalem cherry (*Solanum pseudocapsicum*) and inkweed (*Phytolacca octandra*) encountered were pulled unless the infestations were too large, in which case they were controlled. One large vine of old man's beard was cut and pasted during the survey.

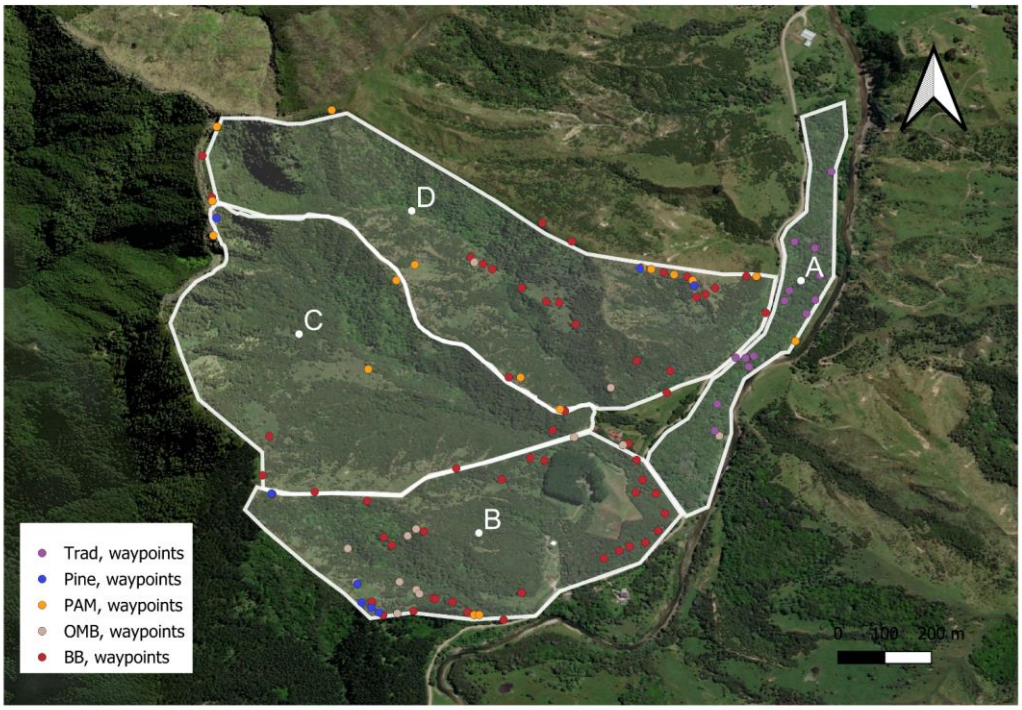


Figure 1. Vegetation map of Waikereru Ecosanctuary. with the alluvium (A) Long bush running along the west side of the Waimata River and separated from the three other hillside catchments (B-D) by Waimata Road. Trad = wandering willie (*Tradescantia fluminensis*). Pine = pine (*Pinus radiata*), PAM = Pampas grass (*Cortaderia selloana*), OMB = Old man's beard (*Clematis vitalba*) and BB = black berry (*Rubus fruiticosus* agg.) (QGIS).

Recommendations

Two main strategies are recommended for the management of weeds at Waikereru Ecosanctuary, control and surveillance. Control involves prioritizing the control of smaller infestations before they spread and systematically controlling larger infestations. Surveillance involves checking for future infestations and potential new weed species. Table 1 outlines 27 weeds recommended for control, ranked by priority, with their location based on Figure 1. This ranking is based on the size of infestations, the threat the species pose to the local biodiversity and the ease of control. Invasive species are discussed in further detail below. It is identified that weed spreading by two made methods, vegetatively or by seed.

Table 1. List of invasive weeds by priority of control with locations and occurrence notes.

Weeds species (27)	**Location based on Figure 1 (A-D)**	**Notes**
old man's beard (*Clematis vitalba*)	B, C, D	Localised infestations
wandering willie (*Tradescantia fluminensis*)	A	Localised infestations
periwinkle (*Vinca major*)	A	Localised infestations
moth plant (*Araujia hortorum*)	Salmond homestead and roadside	Localised infestations – one plant seen and removed
Japanese honeysuckle (*Lonicera japonica*)	D	Local - rare
German ivy (*Delairea odorata*)	A	Local
pampas grass (*Cortaderia selloana*)	A, B, C, D	Localised infestations
radiata pine (*Pinus radiata*)	B, C, D	Localised infestations
cotoneaster (*Cotoneaster glaucophyllus*).	D	Rare
barberry (*Berberis glaucocarpa*)	D	Rare
black alder (*Alnus glutinosa*)	A	Localised infestations
white poplar (*Populus alba*)	A	Localised infestations
willow (*Salix* sp.)	A	Localised infestations
poplar (*Populus* sp.)	A	Localised infestations
Himalayan honeysuckle (*Leycesteria formosa*)	Roadside	Rare
woolly nightshade (*Solanum mauritianum*)	B	Rare
sweet briar (*Rosa rubiginosa*)	B, D	Local
pink ragwort (*Senecio glastifolius*)	A, B, C, D	Widespread - scattered
Jerusalem cherry (*Solanum pseudocapsicum*)	A, B	Widespread - scattered
inkweed (*Phytolacca octandra*)	A, B, C, D	Localised infestations
blackberry (*Rubus fruiticosus* agg.)	A, B, C, D	Localised infestations
grey sedge (*Carex divulsa*)	A, B, C, D	Localised infestations
Cretan brake (*Pteris cretica*)	D	Rare
montbretia (*Crocosmia* x *crocosmiiflora*)	A	Local
mouse-ear-hawkweed (*Pilosella officinarum*)	B, C, D	Local
field horsetail (*Equisetum arvense*)	A	Locally abundant
Mexican daisy (*Erigeron karvinskianus*)	A, B, C, D	Widespread

Long bush A

There are a number of weeds species present in the fertile alluvial forest of Longbush (Figure 1). This area including the roadside had the greatest variety of weeds in the Ecosanctuary. The largest threat is shade-tolerant species invading the forest understorey and preventing natural regeneration of the forest. This includes wandering willie (*Tradescantia fluminensis*), periwinkle (*Vinca major*), grey sedge (*Carex divulsa*) and Jerusalem cherry (*Solanum pseudocapsicum*).

On the margins of the Waimata River a range of weedy riparian are present in the flood zone including sycamore (*Acer pseudoplatanus*), black alder (*Alnus glutinosa*), white poplar (*Populus alba*), poplar (*Populus* sp.), willow (*Salix* sp.). Field horsetail (*Equisetum arvense*) is also locally common on the rivers edge.

Slopes B – D

The slopes are mainly dominated by regenerating kānuka forest but have localised weed infestations, the most serious being old man's beard. There are also large patches of black berry (*Rubus fruiticosus* agg.) and Mexican daisy (*Erigeron karvinskianus*) is common on the dry slopes.

Salmond's homestead garden and the 1769 garden

A few localised weeds are present around the Waikereru gardens. It is recommended that the weed control team, work with the gardeners to identify and control local weed infestations.

Seed Islands

Targeting maintenance should be undertaken at the research 'seed islands'. Especially of species not widely controlled such as blackberry.

Weed species management

Old man's beard (*Clematis vitalba*)

Mature vines of old man's beard are scattered throughout the slopes (B – D) of the sanctuary (Figure's 1-4). Many of these vines were mature in the kānuka canopy, easily visible at the time of surveying because of their large fluffy seedheads. This plant is deciduous, losing its leaves in winter. The control of this species is high priority because of the risk it poses to the integrity of the regenerating forest on the slopes of the reserve. Once controlled populations will require repeat visits to ensure they do not persist. Old man's beard is similar to the native clematis species present, *Clematis cunninghamii* and *Clematis paniculata*, but native species can be distinguished by the smaller size of the vine, the three leaflets (five leaflets in *C. vitalba*) and the evergreen habitat. It could also be mistaken for the native pohuehue (*Muehlenbeckia australis*), or native jasmine (*Parsonsia capsularis*) and care should be undertaken to identify plants before controlling them. The seed source is most likely from the neighbouring properties so surveillance should be done to ensure new populations are not establishing. An effective way to survey for this species would be to use a drone when this species is flowering or fruiting.

Wandering willie (*Tradescantia fluminensis*)

Patches of wandering willie are present in the alluvial forest of Longbush and there has been a long history of control here (Figure's 1 & 5). This species is common throughout the Waimata River catchment and has a high risk of re invasion along the river. Because of its rampant growth and risk to the native understorey, control is important. Priority should be given to controlling this species in the forest understorey pushing patches to the margins. It is recommended that the recently introduced biocontrols for this species are taken to this site to help reduce its impact on the native biodiversity.

Periwinkle (*Vinca major*)

Patches of periwinkle are present on the stream banks of and forest margin and understorey of Longbush. These are recommended for control before they spread further with a focus of patches under the forest understorey pushing these back towards the river.

Moth plant (*Araujia hortorum)*

One plant of moth plant was found in the Salmond homestead garden and removed; previously one had been found nearby. A second plant was seen along the roadside and removed. Further surveillance will be needed to ensure this vine species does not spread into the natural forests.

Japanese honeysuckle (*Lonicera japonica*)

A few small patches of Japanese honeysuckle are present on the northern slopes of the Ecosanctuary (Figure 6). They are recommended as high priority for control before while infestations are still small. Surveillance of this species is needed throughout the reserve as birds spread the seed.

German ivy (*Delairea odorata*)

Localised infestations of German ivy are found in Longbush and have historically been controlled. Further control and surveillance are recommended.

Commented [MF1]: Is this true?

Pampas grass (*Cortaderia selloana*)

Pampas is scattered in low numbers across the reserve (Figure 1) on the slopes of Waikereru (Figure 7) aswell as on the margin of Longbush (Figure 9). Pampas hinders natural regeneration on dry slopes but will ultimately be outcompeted by native vegetation. Since its density is so low and to ensure quicker regeneration on the slopes this species is priority for control.

Pine (*Pinus radiata*)

Pines are scattered across the slopes of Waikereru (Figure 1). All seedlings and saplings encountered were removed during this survey. Seedlings were common on the southern boundary of polygon B on the margin of a pine plantation (Figure 8). Large trees were way-pointed and should be priority for control. This included some large trees on the upper slopes of polygon D.

Barberry (*Berberis glaucocarpa*), Large-leaved cotoneaster (*Cotoneaster glaucophyllus*).

These species were rare on the slopes of the northern polygon (D) and were controlled. They should be a priority for control when found and are easily removed. Cotoneaster is common near to the reserve on the roadside so poses a re invasion risk.

Sycamore (*Acer pseudoplatanus*)

Scattered plants are present on the riparian margins of Longbush as well as on the slopes of Waikereru. All plants seen were controlled except for one inaccessible plant found in a thicket of blackberry in polygon B. This species should be easily eradicated from the Ecosanctuary but on-going surveillance of new populations should also be undertaken.

Black alder (*Alnus glutinosa*), White poplar (*Populus alba*), Willow (*Salix* sp.), Poplar (*Populus* sp.)

Localised patches of these tree species are present along the riverbanks of the Waimata River bordering Longbush (Figures 9 & 10). These species have a high risk of re invasion from nearby populations along the river. Seedlings of black alder, white poplar and willow are seen in the native riparian plantings, the result of disturbance from the recent large flooding events. These seedlings should be priority for control before they outcompete the plantings.

Himalayan honeysuckle (*Leycesteria formosa*)

One plant was found and controlled on the southern roadside of the Ecosanctuary, and infestations are present on Riverside Road at the Southern end of the sanctuary. Surveillance of this species is recommended.

Woolly nightshade (*Solanum mauritianum*)

One plant of woolly nightshade was found in the lower slopes of Waikereru. This species should be under surveillance for new occurrence and is locally abundant south of Waikereru along Riverside Road.

Sweet briar (*Rosa rubiginosa*)

This shrub was found in multiple areas on the slopes of Waikereru and all plants found were controlled. This species is easily controlled and should be easily eradicated from the Ecosanctuary.

Pink ragwort (*Senecio glastifolius*)

This species was scattered across the reserve and all plants seen were removed (Figure 11). It is easily pulled and should be when come across, preferably before the plant produces seen. It is present throughout the catchment, the wind born seeds have high risk of re invasion.

Jerusalem cherry (*Solanum pseudocapsicum*)

This species is common in Longbush and on the lower slopes of Waikereru. Smaller infestations were removed, and larger ones were way pointed. Thes species should be controlled and is easily hand pulled.

Inkweed (*Phytolacca octandra*)

Inkweed was local throughout the reserve as was controlled when come across. Because it is easily controlled and not widespread it is recommended for control.

Black berry (*Rubus fruiticosus* agg.)

Black berry is scattered across Waikereru (Figure 1) with large patches present on the slopes (Figure 12). These patches prevent the regeneration of native species such as kānuka. Patches also persist for some time on the margins in shaded forests as shown in Figure 13. To encourage quicker regeneration of slopes larger patches of black berry could be sprayed by helicopter then planted. Otherwise over time these slopes will eventually regenerate into native forest.

Grey sedge (*Carex divulsa*)

This species is found throughout the Ecosanctuary. It poses a significant threat to the native understorey at Longbush by outcompeting native *Carex* species. It should be controlled in the shaded understorey of Longbush's alluvial forest where it is dominant. The dark tussock from and separated seed heads along the spikelet distinguish this species from native members of the genus (Figures's 14 and 15).

Cretan brake (*Pteris cretica*)

One plant of the exotic fern *Pteris cretica* was found and removed from catchment D (Figure 16). Previous plants found of this species have been removed (M. Rutherford personal, communication). Further surveillance should be undertaken, and all plants found controlled.

Montbretia (C*rocosmia* x *crocosmiiflora*)

Patches of monbretia are present in Longbush on the river margin and in forest lights wells. However, control of this species is not a high priority because of the high risk of re invasion from croms. Patches in the forest out of the flood zone should be controlled.

Mouse-ear-hawkweed (*Pilosella officinarum*)

Small patches of mouse-ear-hawkweed were found on the dry slopes of Waikereru. These small patches would be easy to control before they spread further but as the slopes will eventually regenerate into forest this species is not a priority for control.

Field Horsetail (*Equisetum arvense*)

This species was locally abundant on the riverbanks of Longbush (Figure 17). It is notoriously difficult to control and has a high risk of re invasion from disturbance events either side of the river so is ranked low in priority.

Mexican daisy (*Erigeron karvinskianus*)

Mexican daisy is common on the dry open slopes of the reserve. This species is identified as a threat in Ford et al. (2022) to the At Risk – Declining *Jovellana sinclairii*, which is locally common at Waikereru. It is recommended the daisy is monitored and if this species persists on dry bluffs that are not regenerating or is obviously outcompeted rare native species it is recommended for control.

Further surveillance and recommendations

Further surveillance is recommended on the edge of the Ecosanctuary as there are many weed infestations either side of the reserve along Riverside Road and upstream of the Longbush Reserve including willow, poplar, black alder sycamore, blackberry, black locust (*Robinia pseudoacacia*) and large-leaved cotoneaster (*Cotoneaster glaucophyllus*). During flood events material can be brought down from further up the catchment so the risk of re invasion is high. The same is the case for many of the weedy species with bird dispersed fruit so regular surveys are needed to find new weed infestations.

Invasive species that are not present at Waikereru but found on the neighbouring properties include agapanthus (*Agapanthus orientalis*), elephant's ears (*Alocasia brisbanensis*) and English ivy (*Hedera helix* subsp. *helix*). There is future scope for weed control along roads and working with neighbours to eradication weed species in the catchment.

No plants of gorse (*Ulex europaeus*) were seen during this or pervious (Ford et al., 2022) surveys. If an infestation is found it is recommended plants are removed before they spread further. This is recommended for all new weed species infestations at small scales.

Figure 2. Old man's beard (*Clematis vitalba***)** growing on rank pasture of slopes.

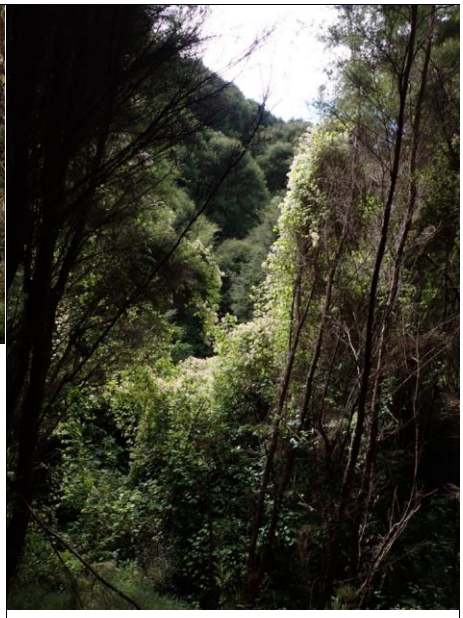


Figure 3. Old man's beard on the kānuka canopy.

Figure 4. Old man's beard vines in the kānuka understorey.

Figure 5. Wandering willie (*Tradescantia fluminensis*) in the understorey of alluvial forest of Longbush.

Figure 6. Patch of Japanese honeysuckle *(Lonicera japonica)* on ridge under kānuka.

Figure 7. A tussock of Pampas (*Cortaderia selloana*) on the slopes of Waikereru on the margin of the regenerating pasture.

Figure 8. Pine (*Pinus radiata*) saplings on the southern margin of polygon B.

Figure 9. Weedy margin of Waimata River with pampas.

Figure 10. Thicket of exotic riparian trees.

Figure 11. Large plant of pink ragwort (*Senecio glastifolius*) on dry slope.

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Figure 12. Large patch of blackberry (*Rubus fruiticosus* agg.) on dry ridge.

Figure 13. Patch of blackberry on shaded forest margin.

Figure 14. Tussock of grey sedge (*Carex divulsa*) in shaded forest.

Figure 15. Seed head of grey sedge.

Figure 16. A frond of the weedy Cretan brake (*Pteris cretica*).

Figure 17. Thick patch of field horsetail (*Equisetum arvense*) on Waimata River margin.

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References

Ford, M., Smale, M., & Gilbride, K. (2022). *A biodiversity survey of Waikereru Ecosanctuary, Waimatā, Gisborne. Auckland Botanical Society Journal 77* (2): 100–117.