Waikereru Ecosanctuary Pest Mammal Monitoring

November 2022

Header photos: *Examples of chew cards at Waikereru Ecosanctuary.*

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On the 22nd of November 2022, 30 chew cards were deployed within Waikereru Ecosanctuary to index the density of introduced mammalian predators within the sanctuary. Introduced mammals are incredibly detrimental to the health of the New Zealand environment and the survival of indigenous species. Waikereru Ecosanctuary and the adjoining Longbush Reserve have been extensively trapped for over 20 years, in conjunction with shooting of ungulates and management of pest plants. The chew card index (CCI) is a method commonly used to assess the abundance of target pest species in an area. Chew cards typically target rats (*Rattus* spp.), mouse (*Mus musculus*), hedgehog (*Erinaceus europaeus*) and the brushtail possum (*Trichosurus vulpecula*).

Methods

The chew cards are made of plastic corflute, allowing a lure – in this case peanut butter – to be pressed into the gaps of the corflute. This means that, to access the lure, an animal must chew on or through the plastic. They leave behind bite marks which allow identification of the animal. This information can then be used to create an index of density by looking at the frequency of the species biting the chew cards across the area where they are deployed.

Three lines of chew cards were created within Waikereru, one focussed around the Seed Island project on the northern side, one up Big Ridge, and one up Petrel Ridges. Ridges were selected for two lines are they are frequently used by animals, and they provide safer access for people to travel up. The chew cards were placed approximately 50m – 75m apart depending on the suitability of the area. For example, if there was something nearby to attach the card to, or how similar the habitat of adjacent cards was; in which case the same individual may chew multiple cards. Cards were predominantly attached to the trunks of kānuka trees as these are widespread throughout the ecosanctuary, fence posts were also commonly used to attach cards to as old fences follow the ridgelines. Chew cards were collected for analysis after three nights.

Figure 1. Locations of chew cards around the Seed Islands (1 – 10) and along Big Ridge (pink line; 11 – 20).

Figure 2. Locations of chew cards on Petrel Ridge (yellow line; 21 – 30).

Table 1. Summary of chew card information including unique descriptors and the result found on the card upon collection. The site description details what the card was attached to, and the habitat type the card was in (kānuka canopy, grassland, ridge, gully, or face), along with any other relevant details.

Line	Card ID	Location	Site Description	Result
Seed Island	1	-38.60579, 178.06302	Flats, sheltered grassland	No chew marks
	2	-38.60617, 178.06262	Kānuka canopy	No chew marks
	3	-38.60617, 178.06217	Kānuka canopy	Possum
	4	-38.60596, 178.06184	Exposed grassland	No chew marks
	5	-38.60626, 178.06172	Grassland, sparse vegetation	No chew marks
	6	-38.60644, 178.06200	Peg, amongst seed island	No chew marks
	7	-38.60669, 178.06171	Kānuka, edge of grassland/kānuka canopy	No chew marks
	8	-38.60699, 178.06184	-	Not retrieved
	9	-38.60722, 178.06178	Grass strip below forest	No chew marks
	10	-38.60721, 178.06124	Kānuka canopy	Possum
Big Ridge	11	-38.60865, 178.05718	Edge kānuka forest/grassland	No chew marks
	12	-38.60844, 178.05686	Kānuka, ridge	Possum
	13	-38.60819, 178.05649	Dead kānuka, southern face	No chew marks
	14	-38.60788, 178.05608	Kānuka, ridge	No chew marks
	15	-38.60755, 178.05573	Kānuka, southern face	No chew marks
	16	-38.60733, 178.05530	Fence post, ridge, south facing	No chew marks
	17	-38.60707, 178.05476	Kānuka, grassland	No chew marks
	18	-38.60690, 178.05445	Kānuka, grassland	No chew marks
	19	-38.60653, 178.05426	Fencepost, ridge	No chew marks
	20	-38.60601, 178.05396	Kānuka, ridge	Possum
Petrel Ridge	21	-38.61115, 178.05249	Kānuka, ridge	No chew marks
	22	-38.61127, 178.05310	Fencepost, ridge, exposed grassland	No chew marks
	23	-38.61107, 178.05361	Kānuka, ridge, windy	No chew marks
	24	-38.61091, 178.05403	Kānuka, grassland	No chew marks
	25	-38.61067, 178.05472	Kānuka, grassland, sparse vegetation	No chew marks

	26	-38.61050, 178.05526	Peg, card had been pulled off	Possum
	27	-38.61037, 178.05580	Old fence post, top of petrel enclosure, sheltered	No chew marks
	28	-38.61027, 178.05619	Kānuka, edge of canopy	No chew marks
	29	-38.61022, 178.05665	-	Not retrieved
	30	-38.61038, 178.05698	Kānuka, grassland	Possum

Results

28 of the 30 chew cards were able to be retrieved. Six of the retrieved cards had been chewed to varying degrees by possums (Table 1). No bite marks from other species were recorded on the cards. The chewed cards consisted of two cards from each of the three lines. This gives a Relative Abundance Index (RAI) of 0.215 or 21.5%.

The occurrence of possum bite marks on chew cards appears random, aside from sites having trends in the elevation they are at (Table 2); card numbers 3, 10 and 30 can be joined almost perfectly with a line across the lower part of the sanctuary, as can cards 12 and 26 (Fig. 3). No one similarity across all sites is apparent.

Table 2. Elevation data for chewed cards.

Card ID	Metres above sea level
3	68
10	70
12	126
20	258
26	176
30	94

Figure 3. Similarities in elevation between sites with chewed cards, across the monitored lines.

Figure 4. Examples of where the bitten chew cards were placed.

Discussion

Introduced mammals are highly detrimental to the indigenous environment of New Zealand which had not evolved with the pressure of terrestrial mammalian predators. Fortunately, the results of the present survey indicate that Waikereru Ecosanctuary is gradually returning to a state subject to a reduced level of damage by such introduced mammals. The brushtail possum was the only mammal which interacted with the chew cards deployed and this interaction was at a relatively low rate. This is the first time indexing for introduced mammals has been conducted at Waikereru Ecosanctuary. Historic trap-catch data indicates that possum abundance within the Waikereru area tends to fluctuate over time, however, there has been a downwards trend in possum catches overall (Fig. 5). This corroborates the relatively low abundance of possum indicated by the results of the present chew card survey.

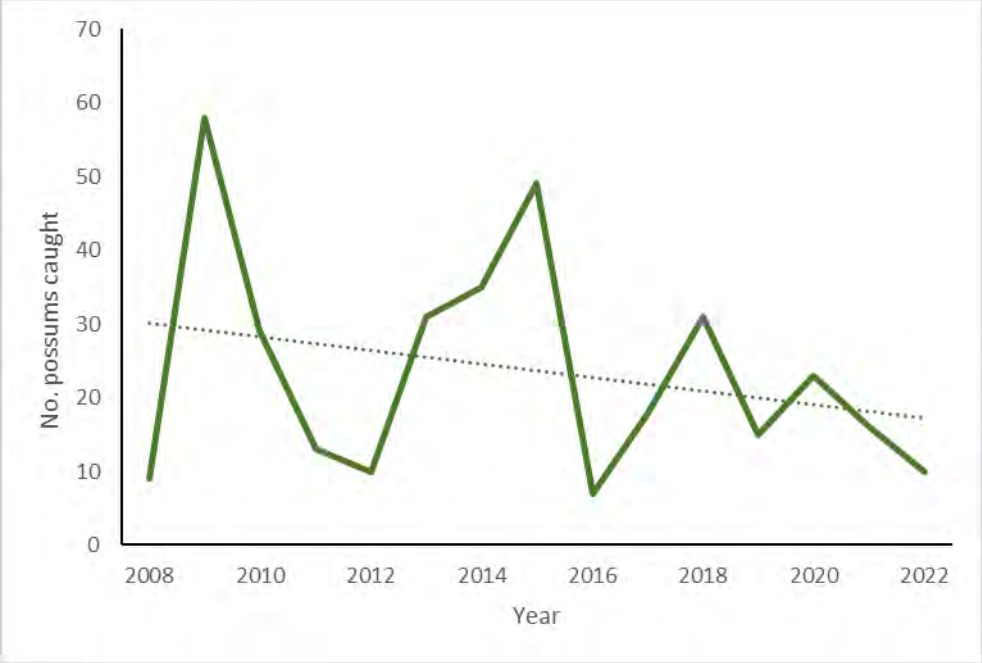

Figure 5. Possum catch data from the Waikereru area from the past 15 years (2008 – present).

Conversely, rat and mouse trap catch data shows an upward trend, though numbers caught in traps has fluctuated dramatically over time (Fig. 6). It is possible that factors such as the height of the card, weather, or alternative food availability influenced the interaction rate of rats and mice with the cards. This illustrates why it is useful to have multiple sources of data to compare and reinforce conclusions.

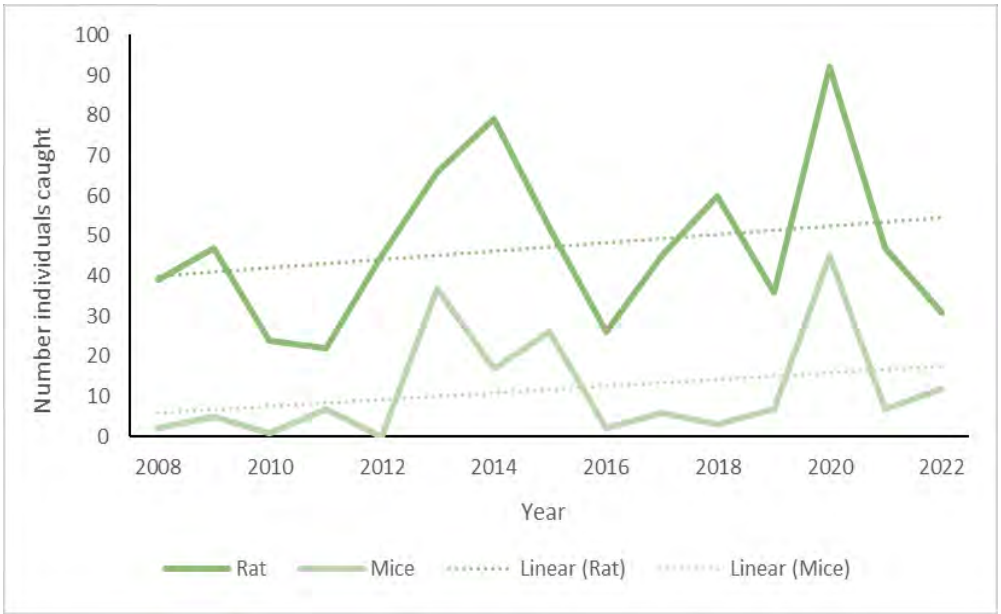

Figure 6. Trap catch data for rats and mice in the Waikereru area over the past 15 years (2008 – present).

The Seed Island area is not extensively trapped. In comparison, Big Ridge and Petrel Ridge both contain robust traplines, though possum-targeted traps tend to be in the more accessible lowland areas, where the vegetation density is greater. Whether the area is trapped or not does not appear to influence the occurrence of possums. This may indicate that the trapping measures across Waikereru have generally suppressed possum numbers in the wider area.

As reinvasion is not restricted (e.g., by a predator-proof fence), continued trapping is going to be the main method of maintaining this downward trend in possum numbers. The present survey provides a baseline from which future surveys can be compared to, to provide supplementary data for trends in trap catches. Along with other monitoring, such as camera trapping and five-minute bird counts, this data helps to assess the progress of ecosystem restoration within Waikereru Ecosanctuary.

If you have any further questions regarding this survey, please contact Steve Sawyer on 027 209 6049 or Steve@ecoworks.co.nz.

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For

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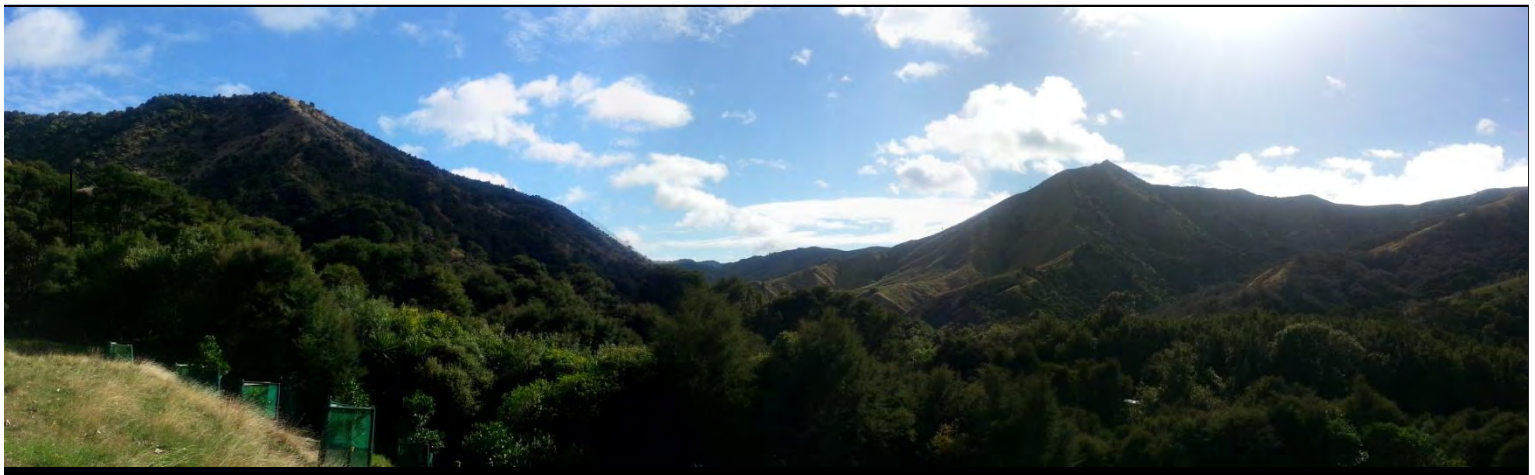

Waikereru Seed Island Project Update

August 2022

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Between June and August 2022, eleven camera traps were deployed throughout the lower and mid Waikereru Ecosanctuary. These traps were deployed to monitor the relative abundance of pest species within Waikereru. Pests known to occur within Waikereru include feral goat (*Capra hircus*), red and fallow deer (*Cercus* spp.), brush-tail possum (*Trichosurus vulpecula*), ship and Norway rat (*Rattus* spp.) and mice (*Mus musculus*), feral cat (*Felis catus*), rabbit and European hare and mustelids (*Mustela* spp.). It is crucial to monitor these species in ecosanctuaries such as Waikereru as they are highly destructive to native flora and fauna. Waikereru is home to several vulnerable bird species, such as North Island tomtit/miromiro (*Petroica macrocephala*), kererū (*Hemiphaga novaeseelandiae*), tūī (*Prosthemadera novaeseelandiae*), bellbird/korimako (*Anthornis melanura*), and New Zealand falcon/karearea (*Falco novaeseelandiae*). The significant reduction in numbers of herbivorous and omnivorous pests allows native forest to regenerate properly, with successional stages and different stories. The cumulative result of protecting both wildlife and plants is a healthy, functioning ecosystem, hence it is important to monitor the progress of pest control projects.

Through this study we gathered baseline information on pest presence in Waikereru, which allows more specific targeting of future pest control. These camera trap sites will be re-used annually, with replication of time of year and length of deployment, to track the progress of pest abundance reduction.

Methods

Six trail cameras (cameras #1 - #6) were deployed from the 20th of June until the 26th of July. A further five cameras (cameras #7 - #11) were subsequently deployed from the 26th of July until the 17th of August. All cameras were placed at different sites (Map 1; Table 1) and remained onsite for between 22 and 36 days. Each camera was active for 24 hours of each day it was deployed. The camera trap sites were selected based on their suitability for vertebrate pests, for example being relatively open sites, ridgelines, and worn animal paths. These characteristics give the highest chance of capturing any vertebrate pests that are present to gain an accurate picture of their abundance within Waikereru.

Once the cameras had been collected in, the photos were analysed to create a log of observations for each camera. From this log, a pass rate was able to be calculated. This pass

rate can be used as an index for the density of each species caught on a camera, within the sanctuary. A pass rate per 100 trap hours was used.

Figure 1. Aerial photo showing the location of each of the eleven trail cameras deployed throughout Waikereru.

Results

Overall, a total of 7814 hours, or 326 days, of camera trap monitoring was completed over the period of this study (Table 1). Cameras 2, 3, 7, 10, and 11 had no animals captured on them over the study period. Across the other six cameras, just seven species were identified, with only two species that are classified as vertebrate pests (Table 2).

Table 1. Camera Trap Summary Data for Waikereru June 20th to August 17th, 2022.

Camera Trap ID	Location (NZTM)	Dates Deployed	Days Deployed	Hours Deployed
#1	E2040857.996 N5714786.001	20/06/22 – 26/07/22	36	866.5
#2	E2040820.973 N5714744.011	20/06/22 – 26/07/22	36	866.5
#3	E2040895.300 N5714765.057	20/06/22 – 26/07/22	36	866.5
#4	E2040930.944 N5714790.012	20/06/22 – 26/07/22	36	866.5
#5	E2040614.972 N5714466.013	20/06/22 – 26/07/22	36	866.5
#6	E2040543.929 N5714661.008	20/06/22 – 26/07/22	36	866.5
#7	E2040345.551 N5713973.128	26/07/22 – 17/08/22	22	523
#8	E2040246.011 N5714027.148	26/07/22 – 17/08/22	22	523
#9	E2040305.743 N5714105.372	26/07/22 – 17/08/22	22	523
#10	E2040348.911 N5714217.606	26/07/22 – 17/08/22	22	523
#11	E2040442.938 N5714191.905	26/07/22 – 17/08/22	22	523
Total			**326**	**7814**

Table 2. Observations from cameras placed near seed island sites at Waikereru.

Species		Camera #											Total	Encounter Rate/100 Hours
		1	2	3	4	5	6	7	8	9	10	11		
Goat	*Capra hircus*						3						3	0.0384
Brushtail possum	*Trichosurus vulpecula*					2			3				5	0.0640
Pheasant	*Phasianus colchicus*	1				1							2	0.0256
Song Thrush	*Turdus philomelos*					2							2	0.0256
Blackbird	*Turdus merula*					5							5	0.0640
Kōtare	*Todiramphus sanctus*				1								1	0.0128
Piwakawaka	*Rhipidura fuliginosa*									1			1	0.0128
Unidentified bird					1	1	2						4	0.0384

Feral Goat

Goats were detected three times by camera 6 over the survey period, giving an encounter rate of 0.0384 per 100 camera trap hours (Table 2). This indicates a relatively low density of goats within the Waikereru, likely helped by the exclusionary fence surrounding the sanctuary. Goats are generalist herbivores, as such they can cause huge damage to regenerating plants. Regular culling of goats around Waikereru is also conducted to ensure numbers remain supressed.

Photo 1. Feral goat (*Capra hircus*) at camera 6 in Waikereru Ecosanctuary.

Brushtail Possum

Photo 2. Brushtail possum (*Trichosurus vulpecula*) at camera 8 in Waikereru Ecosanctuary.

Brushtail possums, introduced from Australia, are generalist omnivores and can threaten both plants and birds. They consume a lot of plant material, often competing with bird species such as kererū for palatable berries and shoots. Additionally, they will opportunistically steal eggs from bird nests. Possums were observed on cameras 2 and 3 a total of five times, giving an encounter rate of 0.0640 per 100 camera trap hours. This is a low pass rate, though possums were one of the most frequently observed species over this study, matched only by the blackbird.

Introduced bird species

Photo 3. Common pheasant (*Phasianus colchicus*) at camera 5 within Waikereru Ecosanctuary.

At least three species of introduced bird were captured by the camera traps. These included pheasants (n = 2), song thrushes (n = 2), and blackbirds (n = 5). These species are less impacted by vertebrate pests due to their more generalist lifestyle; they are able to tolerate a variety of circumstances and ecosystems. They may produce competition with native bird species, though not enough to be concerned by their presence in Waikereru. The blackbird had the highest camera pass rate of these three species, at 0.0640 encounters/100 camera trap hours. While pheasants and song thrushes were seen in equal abundance, with an encounter rate of 0.0256 passes/100 hours each.

Native bird species

Two native bird species, the sacred kingfisher/kōtare (n = 1) and the fantail/piwakawaka (n = 1) were observed, at site 4 and site 9, respectively. Neither of these species are especially

impacted by introduced predators, however their presence at camera sites indicates that they are likely to be present in relatively high densities – and that the threat from predators is low even at sites selected specifically to identify pest presence. The encounter rate of both bird species was 0.0128 passes/100 camera trap hours.

Summary

Camera trapping is an effective method for measuring the density of large vertebrate pests in New Zealand. From the observations a camera makes, encounter rates can be calculated and used as an index for density of target species. In this study, we used encounters per 100 camera trap hours as an index for the density of pest species within an Waikereru Ecosanctuary. Seven species were caught on the trail cameras, and all had very low encounter rates, correlating to a low expected density of these species. Of the seven species captured, two are considered vertebrate pests – feral goats and brushtail possums. Their low density indicates that control methods used so far at Waikereru, which includes shooting and trapping, and an exclusionary fence for goats and deer, have been successful in reducing their numbers within the sanctuary.

To maintain this low density of pest species, all current traps and bait boxes are going to be replaced as they have been deployed for around 13 years. Additional automatic traps (self-resetting) for rats and possums are going to be added to current trap lines to increase the level of protection of the sanctuary, and to reduce the amount of maintenance the trapline requires over time. Culling of goats and deer in the area will also continue.

To further our baseline understanding of Waikereru, ongoing five-minute bird counts will be conducted throughout Waikereru and Long Bush. Five-minute bird counts allow an assessment of which species are present, which areas of the sanctuary they are using – and if they have preferences – as well as in what abundances each species is present.

In addition, chew cards are being deployed, covering a large area of Long Bush and Waikereru. Chew cards, like camera traps, provide an index for the density of vertebrate pests on a landscape scale, however they are better at detecting smaller mammals such as rats, mice, and hedgehogs (*Erinaceus europaeus*) than camera traps.

This regular monitoring allows us to form a picture of what is happening in the Waikereru area. From this, we can determine the most effective approach for continuing to restore the ecosystem within Waikereru Ecosanctuary.

For any further information regarding this project, please contact Steve Sawyer on Steve@ecoworks.co.nz or 027 209 6049.

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For Steve Sawyer

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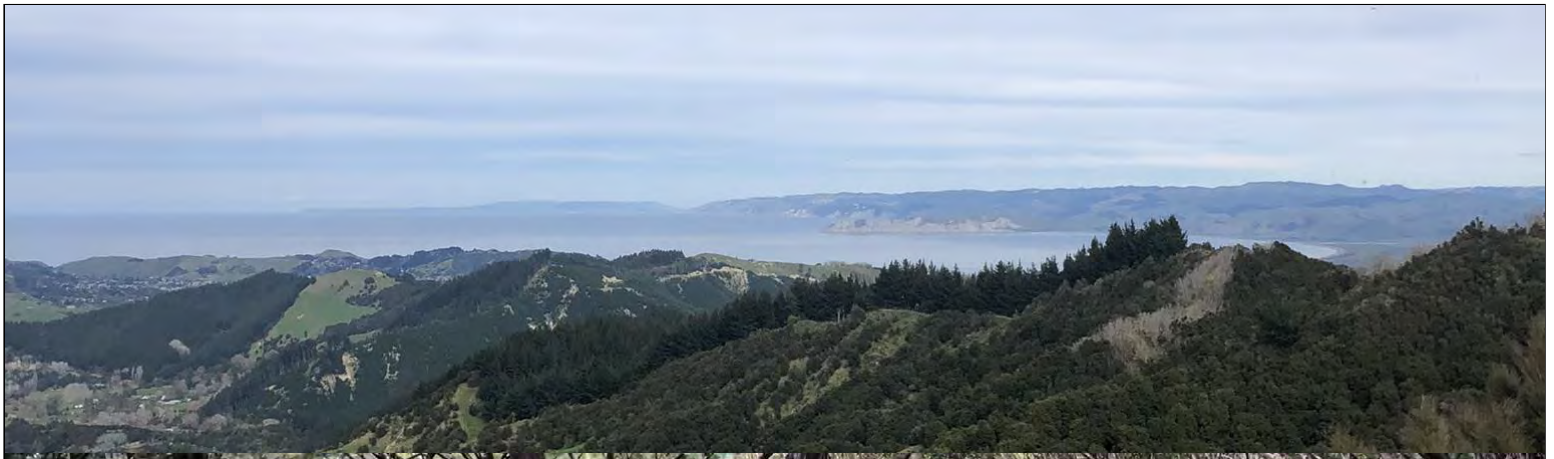

Waikereru Baseline Bird Counts

September 2022

Prepared by Ecoworks NZ Ltd.

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During August and September 2022, five-minute bird counts were undertaken at Waikereru Eco-sanctuary to collect baseline data regarding the forest bird species present within the ecosanctuary. This data supports the long-term goal of restoring the Waikereru ecosystem: to sustain the conservation of biodiversity in and around the Waimatā Catchment.

Waikereru Ecosanctuary is being restored by deploying several different trap designs targeting introduced predators (especially rats, feral cat, stoat, and possum) which prey on all native birds, insects, and reptile species. Additionally, the planting of native vegetation and controlling the numbers of ungulate pests (goat and deer) within the sanctuary has had significant benefit. Browsing by ungulates and possums significantly reduces forest cover. This leads to several negative impacts on native species. For example, browsers often change the species composition of forests as they reduce numbers of palatable species, allowing unpalatable species such as kawakawa (*Piper excelsum*) to dominate. Reduced forest cover is another consequence of browsing, frequently resulting in the creation of areas that are impacted by "edge effects". Edge effects can include changes in the level of exposure to weather, changes to microclimate, and changes to the species composition of a system correlated with these changes to the habitat (Murcia, 1995; Willmer *et al*., 2022). The ecosystem could switch to an alternate state, which may not be optimal for indigenous biodiversity.

Waikereru and Long Bush areas have been protected for over 20 years now and the results of this hard work are beginning to be seen with fewer vertebrate pest species recorded, and more rare native species being encountered. Gathering this baseline data is part of the 10-year plan for Waikereru, created in 2017.

Methods

Twenty-four five-minute bird data points were completed over three monitoring sessions between the 25th of August and the 9th of September 2022 (Figure 1). These were conducted using standard five-minute bird count protocols (Hartley & Greene, 2012) including having at least 200m spacing between each count site, recording if a species was heard or seen, and ensuring records within a site were independent (i.e., the same bird was not observed as two separate individuals, or vice-versa).

Above: Nicola Carter and Guido Haag from Ecoworks NZ at Waikereru Ecosanctuary.

Sites were primarily on ridgelines and boundaries of the sanctuary for accessibility, and safety of the observer, as the gullies are extremely steep. This placement of sites also meant the observer was at high points within the sanctuary, giving a good outlook over the gullies. These surveys are intended to be repeated, so they need to be reliably accessible. Counts were conducted in conditions that were optimal for collecting representative samples, for

example when it is raining, forest bird vocalisations are biased as some species such as NI tomtit will generally not call.

This data was subsequently collated and analysed to assess which species are most abundant; in total and relative to the other species observed (relative abundance: (no. individual species ÷ total no. individuals) x 100). Additionally, we were interested in differences between sites, and if there are correlated differences in the type of habitat present at those data points. Sites have been grouped as Northern Waikereru (north side of Big Ridge), Longbush Reserve, and Southern Waikereru (south side of Big Ridge).

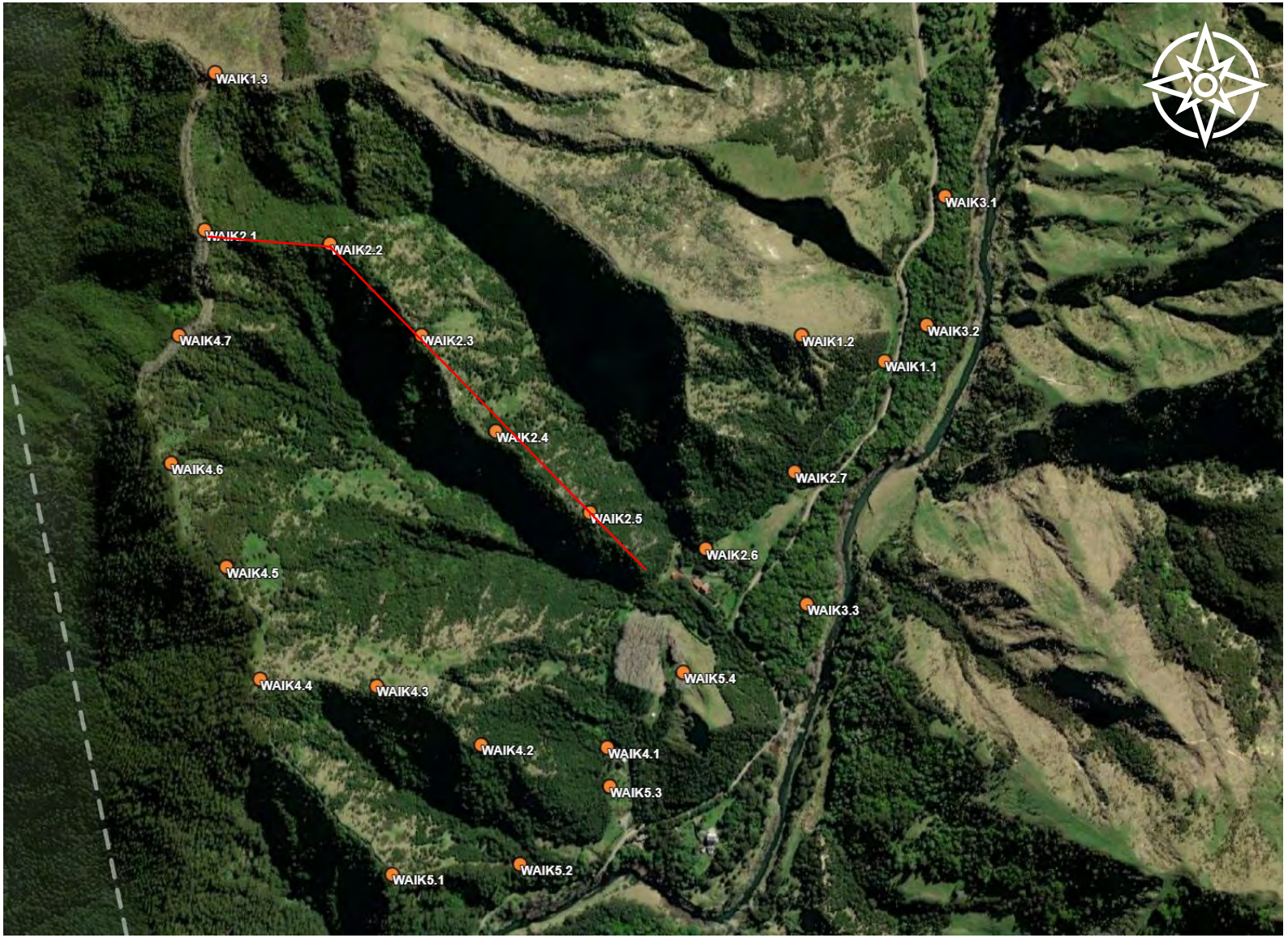

Figure 1. Map showing the locations of the 24 five-minute bird count sites in Waikereru Ecosanctuary and Longbush Reserve.

Results

Nineteen species were recorded across the twenty-four bird count sites. Eleven of these were species native or endemic to New Zealand. A total of 314 observations were made (Table 1); however, it is possible that individuals that are wide-ranging or highly vocal were recorded at multiple sites (e.g., bellbird or swamp harrier), an issue which spacing sites by 200m cannot always account for.

Table 1. Summary data from five-minute bird counts at Waikereru Ecosanctuary.

Species		Total recorded	Average number per site	Relative abundance	Frequency
Common name	Specific name				
Native/Endemic Species					
Sacred Kingfisher	*Todiramphus sanctus*	3	1.00	0.96	2
Kererū	*Hemiphaga novaeseelandiae*	9	1.13 (± 0.354)	2.87	6
Grey Warbler	*Gerygone igata*	58	2.23 (± 0.863)	18.47	24
Fantail	*Rhipidura fuliginosa*	49	1.75 (± 1.005)	15.61	20
Bellbird	*Anthornis melanura*	51	1.96 (± 0.824)	16.24	23
Tūī	*Prosthemadera novaeseelandiae*	20	1.11 (± 0.323)	6.37	14
Silvereye	*Zosterops lateralis*	10	1.25 (± 0.463)	3.18	7
Swamp Harrier	*Circa approximans*	11	1.10 (± 0.316)	3.50	9
Tomtit	*Petroica macrocephala*	9	1.29 (± 0.488)	2.87	6
Whitehead	*Mohoua albicilla*	1	1.00	0.32	1
Paradise Shelduck	*Tadorna variegata*	8	1.14 (± 0.378)	2.55	7
Introduced Species					
Magpie	*Gymnorhina tibicen*	12	1.00	3.82	12
Chaffinch	*Fringilla coelebs*	23	1.21 (± 0.419)	7.32	17
Yellowhammer	*Emberiza citrinella*	7	1.17 (± 0.408)	2.23	6
Song Thrush	*Turdus philomelos*	11	1.38 (± 0.518)	3.50	7
Blackbird	*Turdus merula*	15	1.25 (± 0.452)	4.78	12
Pheasant	*Phasianus colchicus*	14	1.17 (± 0.389)	4.46	12
House Sparrow	*Passer domesticus*	1	1.00	0.32	1
Mallard Duck	*Anas platyrhynchos*	2	2.00	0.64	1
Total	**19**	**314**		**100**	

The species in highest abundance across all sites were grey warbler, bellbird, and fantail, respectively (Table 1; Figure 2). These three species were also the most frequently observed, i.e., noted at the highest proportion of sites. This is significant as these are all endemic species,

indicating that the ecosystem restoration in Waikereru Ecosanctuary is progressing well. Many introduced species, such as sparrows and blackbirds, are found in more disturbed and developed areas due to their generalist lifestyle which allows them to survive in many different environments. Bellbirds are widespread throughout New Zealand, from the Waikato southwards though they typically reach notably higher densities when pest presence is reduced or eradicated (Sagar, 2013). Grey warbler and fantail are also relatively common nationwide, as they spend less time on the ground than other species, meaning they are often less susceptible to predation. In addition, kererū appeared to be present here in relatively high numbers with nine individuals observed on the 25th of August 2022.

An exciting observation was the distribution of North Island tomtits (*Petroica macrocephala toitoi*). In initial surveys of Waikereru, in 2009, North Island tomtits were not recorded. Since this time, intensive predator control has been carried out. All tomtit species are highly susceptible to predation due to their small size, curious nature, and spending a relatively large amount of their time on or near the ground, reducing mammal predation is expected in allow substantial increases in their abundance (Walker *et al*., 2021). The abundance of tomtits is therefore a significant indicator of the effectiveness of pest control measures. At least seven of the tomtit sightings are likely to be independent birds due to the distance between sites or multiple birds being observed at one site (e.g., a pair). However, the size of tomtit territories is unknown, thus it is likely that observations at neighbouring sites were the same bird. In addition, one pair of tomtits was seen along the boundary of the sanctuary, between sites 1.2 and 1.3 (Figure 1).

Above: A male tomtit checking out the observers at one bird count site along Big Ridge.

Whitehead, sparrow, and mallard duck were the three least common species across the bird count sites, only being observed at one site each and in low densities (Table 1). Sparrow and mallard duck are better suited to more open habitats. Whitehead have been recorded within Longbush, and we expect their density within Waikereru to increase as the hardwood-broad-leaved forest habitat expands. The bird count sites were primarily in edge habitat and manuka scrub, where the whitehead prefers more dense forest with taller trees (Leuschner, 2013).

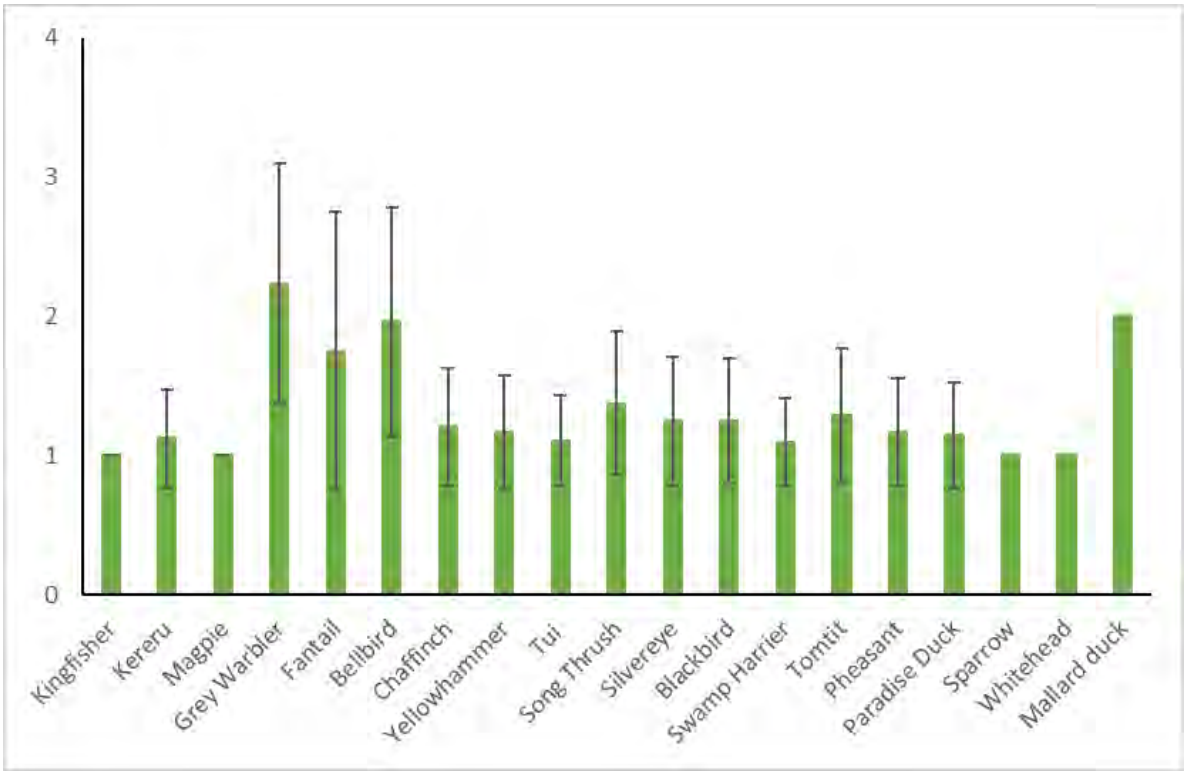

Figure 2. The average number of individuals of a species seen across all sites, with error bars (standard deviation).

Sites 1.1, 4.1, and 5.4 scored the highest in species richness. Ten species were recorded at each of these sites (Table 2). These sites are all located in flat terrain within lower Waikereru (Figure 1). A greater number of introduced species were present at theses sites. Introduced species tend to prefer forest, edge, and open habitat near to human activity. This tendency possibly explains the increased prevalence of introduced species in the lower Waikereru.

The three count sites within Longbush Reserve (WAIK3.1, 3.2 and 3.3) had a slightly lower species richness with six species recorded, on average. Sites on both the northern and southern sides of the sanctuary had a higher average of 8 species per site. Longbush Reserve is a long, skinny section of Waikereru, though it contains older, remnant forest. Longbush therefore has competing forces influencing biodiversity, as it is likely subjected to stronger edge effects but has the advantage of mature hardwood-broad-leaved trees which provide habitat for a multitude of species. The total (N=11) bird species composition for this area was equally split between introduced (n=5) and native (n=6) species. As previously mentioned, introduced species tend to prefer more disturbed or open areas and edges. They may therefore be in higher abundance in Longbush and be displacing or competing with the native birds. Longbush, additionally, borders the Waimatā river therefore introducing another habitat type.

Table 2. Summary of species richness (number of different species present) data for each of the 24 bird count sites in Waikereru Ecosanctuary and Longbush Reserve.			
Site	**Species Richness**	**Native/Endemic**	**Introduced/ Vagrant**
Northern Waikereru			
WAIK1.1	10	6	4
WAIK1.2	9	6	3
WAIK1.3	8	5	3
WAIK2.1	8	6	2
WAIK2.2	9	5	4
WAIK2.3	9	5	4
WAIK2.4	8	5	3
WAIK2.5	6	4	2
WAIK2.6	5	5	0
WAIK2.7	9	6	3
Longbush Reserve			
WAIK3.1	6	3	3
WAIK3.2	6	4	2
WAIK3.3	6	4	2
Southern Waikereru			
WAIK4.1	10	4	6
WAIK4.2	9	6	4
WAIK4.3	8	4	4
WAIK4.4	7	5	2
WAIK4.5	6	3	3
WAIK4.6	6	5	1
WAIK4.7	8	6	2
WAIK5.1	8	6	2
WAIK5.2	7	5	2
WAIK5.3	9	6	3
WAIK5.4	10	4	6
Average per site	**7.79**	**4.92**	**2.92**

The Next Phase

Traplines throughout Waikereru and Longbush are currently being upgraded, thanks to the Seed Island Project funding. Some traps are being replaced and an assessment of where traps could be added to increase the level of control on introduced predators is being conducted. The Trap.nz application and website are being trialled as a method to monitor these traplines. Mustelids (stoat, weasel, and ferret), ship rat, possum, and feral cat are the main target species of this pest control. Mammalian pests have a large home range and can rapidly reinvade the sanctuary.

Trap.nz is additionally being trialled as a data recording application for five-minute bird counts. The main advantage of using this platform is that all the data points from five-minute bird counts can be stored in one place. This will then help to compare records across different monitoring periods, streamlining our ability to visualise and assess changes in biodiversity over time.

As discussed earlier, bird counts allow us to gather baseline data to index the progress of biodiversity and ecosystem restoration within Waikereru Ecosanctuary in relation to forest bird reproductive success as a measure of vertebrate pest control. As the area of hardwood-broad-leaved forest continues to increase, we expect to see corollary increases in the density and diversity of sensitive species, such as North Island tomtit. This data set provides the first forest bird indices within Waikereru. Though Waikereru Ecosanctuary is a small area and allows only a limited spread of count sites and data points, we believe that this data will provide a valuable baseline for future forest bird population monitoring efforts in the area.

If you have any further questions regarding this survey or report, please contact Steve Sawyer on Steve@ecoworks.co.nz or 027 209 6049.

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