Waikereru Baseline Bird Counts

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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).

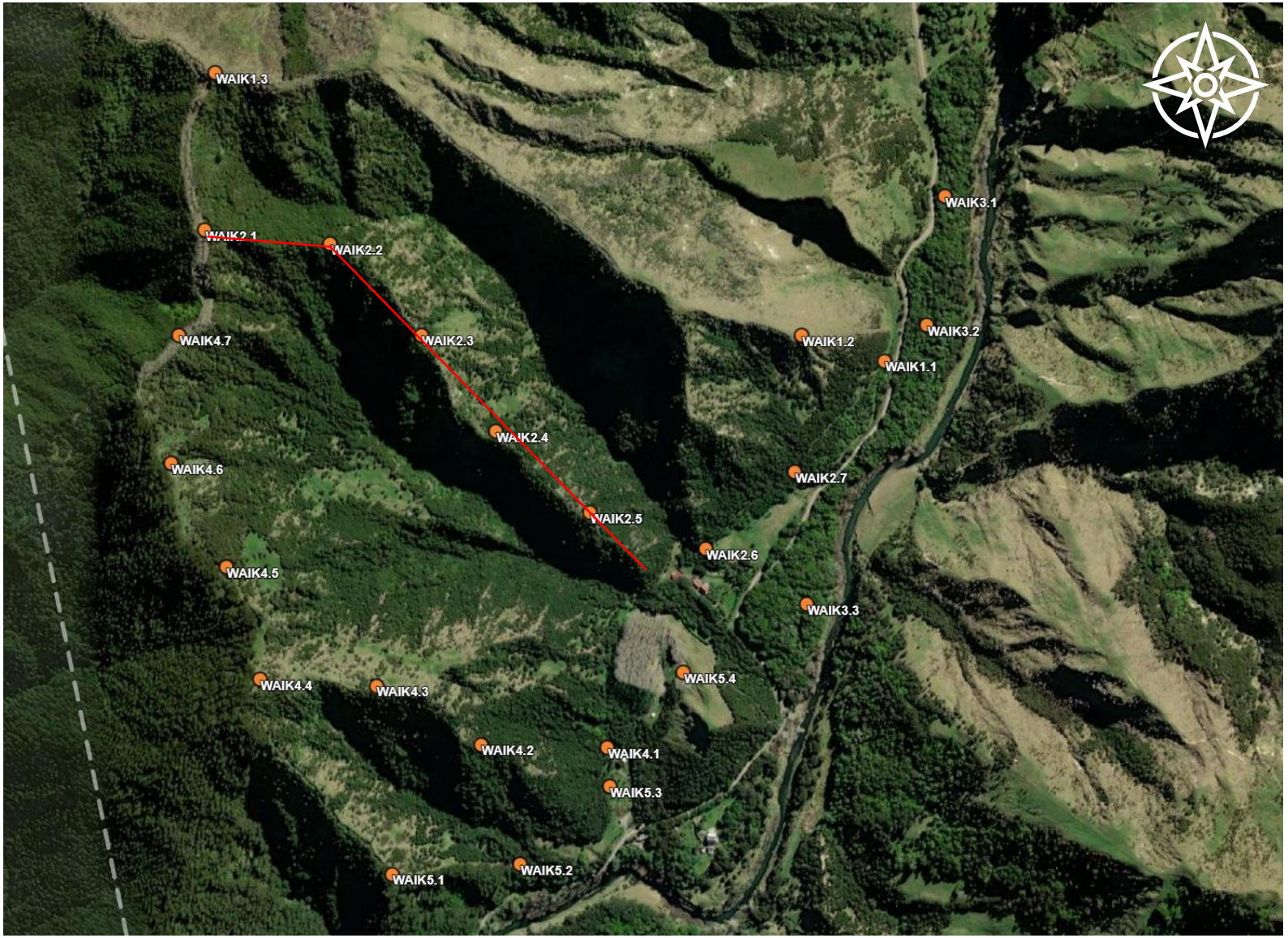

Figure 1. Map showing the locations of the 24 five-minute bird count sites in Waikereru Ecosanctuary and Longbush Reserve.

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).

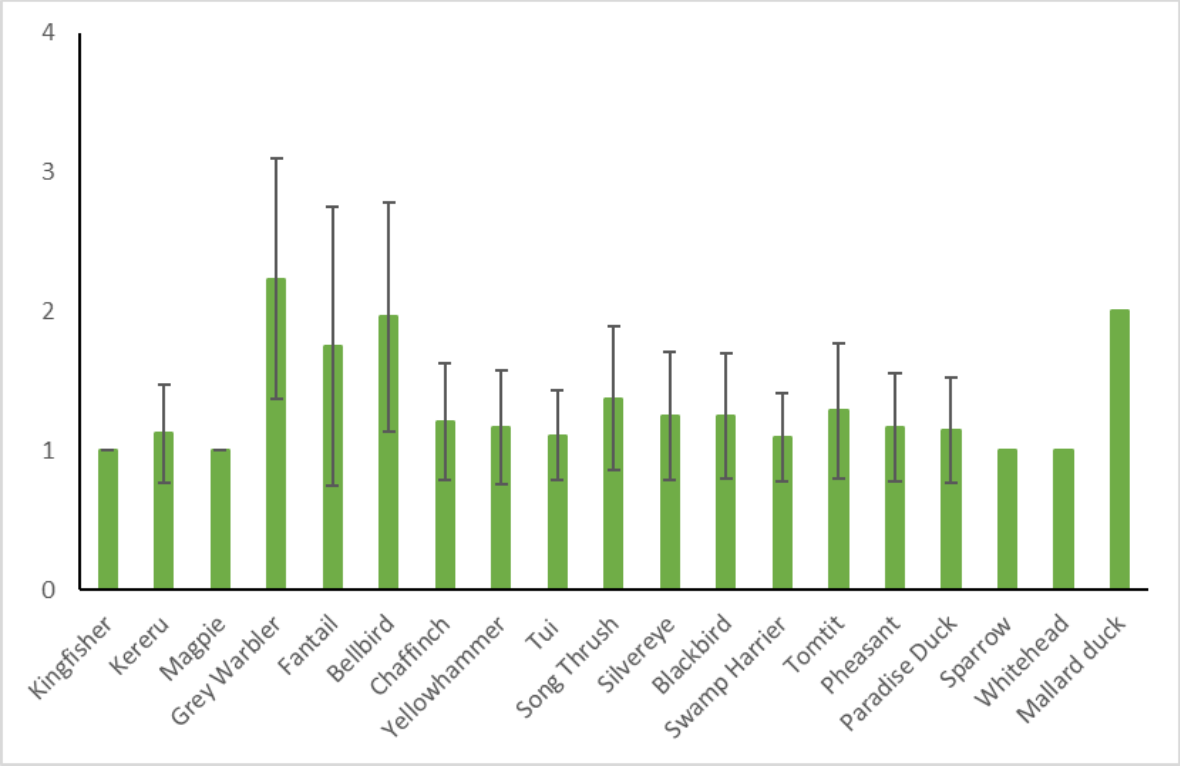

Figure 2. The average number of individuals of a species seen across all sites, with error bars (standard deviation).

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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