

State and trends in the diversity, abundance and distribution of birds in Upper Hutt City

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Executive Summary

Five-minute bird counts have been carried out at 45 bird count stations situated in native forest habitat in six selected Upper Hutt City parks and reserves each year between 2011 and 2021. The aim of these surveys is to monitor trends in the diversity, abundance and distribution of native forest birds in Upper Hutt City's reserve network in order to provide a measure of local biodiversity management outcomes and to contribute towards achieving the outcomes in Upper Hutt City's Open Space Strategy and Greater Wellington Regional Council's Key Native Ecosystem programme.

Thirty-nine bird species have been recorded during these five-minute bird counts, including 15 native forest bird species. One additional native forest bird species (kākā) has been detected by citizen scientists in Upper Hutt City but has not yet been detected during these five-minute bird counts. On average, more than twice as many native forest birds than introduced birds are recorded during each five-minute bird count, indicating that the bird communities in Upper Hutt's parks and reserves are dominated by native species.

Mean annual counts of native birds have increased by 19% since 2011, driven largely by a 1,370% increase in the mean annual counts of pīwakawaka / NZ fantails since 2011. This spectacular increase in pīwakawaka / NZ fantail numbers almost certainly represents a rapid population recovery following mass mortality events that occurred during two unusually severe snowfall events that occurred in July and August 2011. Mean annual counts of riroriro / grey warblers, tauhou / silvereyes and pīpīwharau / shining cuckoo have declined by 86%, 76% and 94% respectively since 2011. All three species have relatively strong dispersal abilities and are well-adapted to persist in the presence of mammalian predators, so these declines are unlikely to be a consequence of threats occurring locally within Upper Hutt's reserves network. Instead, these declines may reflect factors that are influencing the population trends or habitat use of these species at regional, national or international scales.

Keith George Memorial Park and Wi Tako Ngātata Reserve both continue to support populations of almost all of the native forest bird species detected during these five-minute bird counts. Both reserves should continue to be considered high priorities for biodiversity management within the Upper Hutt City parks and reserves network, as they both provide Upper Hutt City ratepayers with the opportunity to encounter the full range of native forest bird species that currently exists in the Upper Hutt parks and reserves network. A number of the native forest bird species present in Upper Hutt City show a preference for suburbs with greater mature tree cover, indicating that efforts to increase tree cover in suburban Upper Hutt would improve habitat quality for native birds in suburban areas, complementing current efforts to reduce populations of mammalian predators throughout the city.

This report recommends several additional management and monitoring actions for Upper Hutt City Council to consider, with the aim of further enhancing habitat quality and native bird values within the city's parks and reserves network and contributing towards the implementation of Upper Hutt City's Open Space Strategy.

Keywords: bird abundance, citizen science, eBird, five-minute bird count, generalised linear mixed-effect models, iNaturalist, Keith George Memorial Park, Upper Hutt City, Wi Tako Ngātata Reserve.

Upper Hutt City forest bird health check

Low Concern
Large, stable or increasing populations.
Low to moderate predator risk.

Tūī, Riroriro / Grey Warbler, Tauhou / Silvereye, Pīwakawaka / NZ Fantail, Pōpokotea / Whitehead, Kōtare / NZ Kingfisher



Moderate Concern
Small, localised, sparse or declining populations.
Moderate predator risk.

Korimako / Bellbird, Miromiro / Tomtit, Kererū, Pīpīwharau / Shining Cuckoo, Kārearea / NZ Falcon



High Concern
Tiny populations.
High predator risk.

Tītīpounamu / Rifleman



Data Deficient
Population size and trends poorly known.

Ruru / Morepork



Photo credits: New Zealand Birds Online (<http://nzbirdsonline.org.nz/>)

1. Introduction

Upper Hutt City Council's Open Space Strategy provides a strategic direction for the management and development of public parks and open spaces in Upper Hutt City from 2018 to 2028 (UHCC 2018). This document includes a set of five strategic goals designed to ensure that:

Upper Hutt has an open space network of great spaces and places that are valued for their role in contributing to the health and wellbeing of the people and the environment of our city.

Goal four of the Open Space Strategy is to ensure that:

Upper Hutt's open spaces are enhanced to provide benefits for the environment and recreational experience.

To achieve this goal, Upper Hutt City Council has developed a series of objectives, including working collaboratively with key partners and the community to achieve better environmental outcomes and to enhance biodiversity habitats, and ensuring that biodiversity values are protected and enhanced by maintaining and developing environmental corridors. To measure whether Upper Hutt City Council is succeeding in achieving these goals and objectives, the Council has also committed to carrying out bird counts within Upper Hutt City's open spaces, in collaboration with key stakeholders and the community (UHCC 2018).

Upper Hutt City Council has been collaborating with Greater Wellington Regional Council for the past 15 years to monitor trends in the diversity, abundance and distribution of native birds in selected Upper Hutt City parks and reserves. This bird monitoring programme commenced in 2005 when five-minute bird count stations were established in Keith George Memorial Park as part of Greater Wellington Regional Council's Key Native Ecosystem programme (Stephens *et al.* 2007). In 2006 and 2007, bird count stations were installed in a further six parks and reserves around Upper Hutt to provide a more detailed picture of city-wide trends in bird distribution and abundance (Figure 1.1). Native forest habitats within three of these parks (Keith George Memorial Park, Wi Tako Ngātata Reserve and Trentham Memorial Park) are currently managed as part of Greater Wellington's Key Native Ecosystem programme (GWRC 2018; GWRC 2020), and all seven parks and reserves have been identified as Significant Natural Areas as part of Upper Hutt City Council's Tiaki Taiao – Significant Natural Areas and Landscapes programme (Wildlands Consultants Ltd 2018).

The results of the bird counts that were carried out between 2005 and 2010 have been reported in Stephens *et al.* (2007), Fea & Moylan (2008) and Govella *et al.* (2011). These authors reported that native bird diversity and abundance tended to be greater in those reserves with larger tracts of mature native forest and with better habitat connectivity to nearby areas of native or exotic forest habitat. Pīwakawaka / fantail (*Rhipidura fuliginosa*), tūi (*Prosthemadera novaeseelandiae*), riroriro / grey warbler (*Gerygone igata*) and tauhou / silvereye (*Zosterops lateralis*) were the most frequently encountered native bird species. Keith George Memorial Park emerged as a particularly important site for native birds in Upper Hutt because it was the only reserve sampled that supported large populations of both pōpokotea / whiteheads (*Mohoua albicilla*) and miromiro / tomtits (*Petroica macrocephala*).

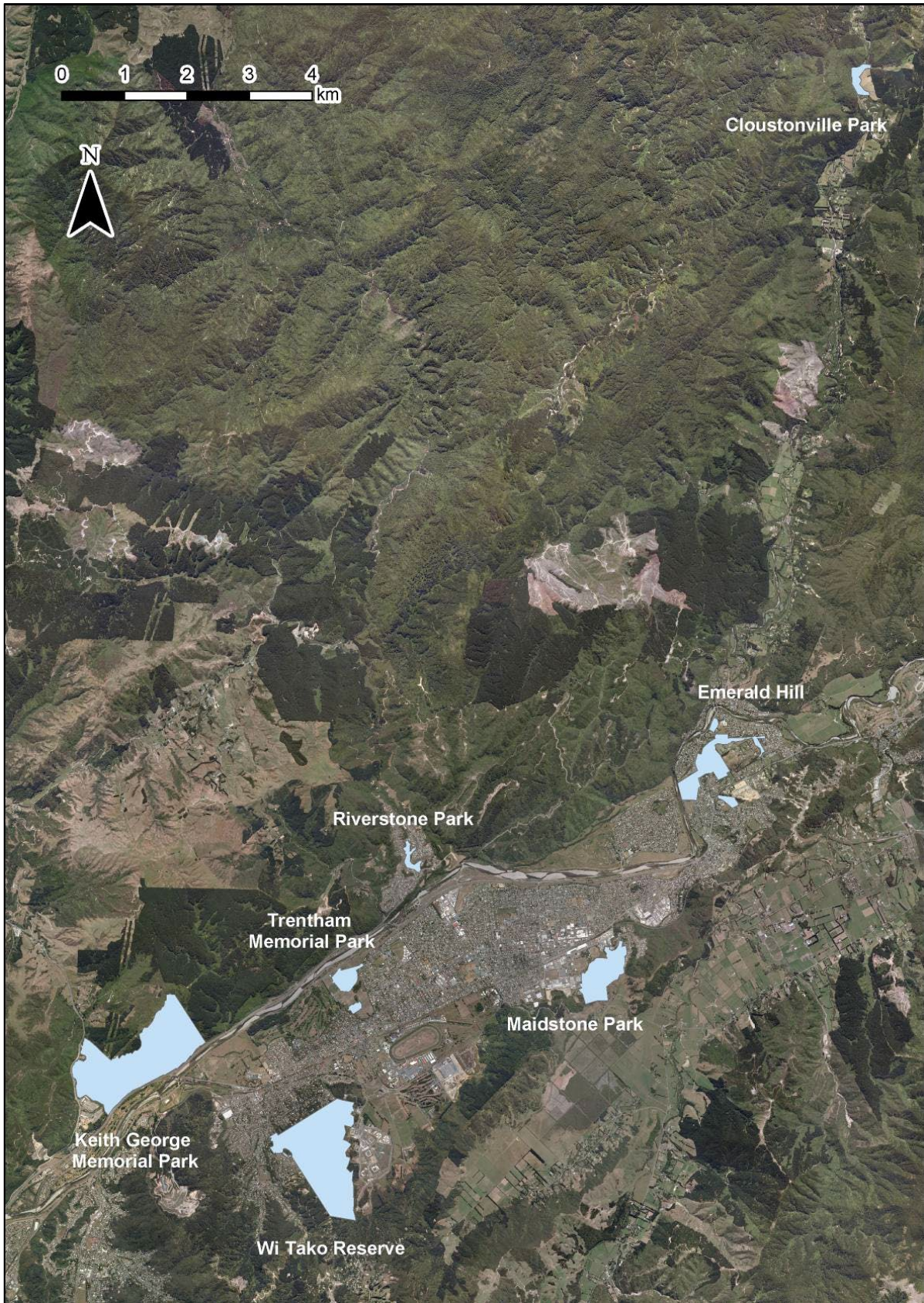


Figure 1.1: Location of parks and reserves sampled as part of the Upper Hutt bird monitoring programme between 2007 and 2021.

In 2011, this bird monitoring programme was replaced with a new survey designed to monitor trends in the diversity, abundance and distribution of native forest birds across the entire network of selected reserves, rather than to attempt to compare indices of abundance between individual reserves (McArthur *et al.* 2012). The tūi was chosen as a key focal species for this new survey design due to its conspicuousness and popularity with the general public. Based on a power analysis of the pre-2011 data, a sample size of 90 five-minute bird counts was selected to ensure sufficient statistical power to detect a 25% or more change in the relative abundance of tūi from one year to the next.

These counts have now been carried out each year since 2011 and have shown that the bird communities in these parks are dominated by native species, although mean counts of native species may have declined slowly between 2011 and 2020 (McArthur & Walter 2021). Tūi, riroriro / grey warbler and tauhou / silveryeye were the most frequently encountered native bird species recorded in Upper Hutt reserves each year since 2011, although the abundance of both riroriro / grey warblers and tauhou / silveryeyes appear to have declined over the past decade (McArthur & Walter 2021). Pīwakawaka / fantail encounter rates were exceptionally low in 2011, probably as a result of heavy mortality suffered during two unusually heavy snowfall events that occurred during the winter of 2011. Since 2011 however, fantail encounter rates have undergone a spectacular increase, suggesting that local fantail populations have recovered quickly from these severe weather events (McArthur & Walter 2021). Kākāriki / red-crowned parakeets, (*Cyanoramphus novaezelandiae*), korimako / bellbirds (*Anthornis melanura*) and tītītipounamu / riflemen (*Acanthisitta chloris*) were all detected in Wi Tako Ngātata Reserve for the first time in 2011, but this may have been a consequence of the improved search effort and coverage that was built into the new survey design, rather than evidence that recent re-colonisation events had occurred (McArthur *et al.* 2012). Riflemen were also recorded in Keith George Memorial Park for the first time in 2016, representing possibly the first record for this species at this location in over 90 years (McArthur *et al.* 2019). That said, these surveys also show that both kākāriki / red-crowned parakeets and tītītipounamu / riflemen are detected only occasionally during these surveys, so are unlikely to be present in sufficient numbers to maintain viable populations in the long term (McArthur & Walter 2021). Larger and better-connected reserves such as Wi Tako Ngātata Reserve and Keith George Memorial Park have been found to support the greatest diversity of native forest bird species among the Upper Hutt City reserves (McArthur & Walter 2021).

The improved level of survey effort in both Keith George Memorial Park and Wi Tako Ngātata Reserve has also revealed spatial patterns in bird distribution that had not previously been detected. Both the north-eastern portion of Keith George Memorial Park and the southern portion of Wi Tako Ngātata reserve support higher numbers of miromiro / tomtits, pīwakawaka / fantails, pōpokotea / whiteheads and korimako / bellbirds than the remaining portions of both reserves. This suggests that the north-east and southern portions of these two reserves provide particularly high-quality habitat for these native species, likely due to the presence of mature stands of both black beech (*Fuscospora solandri*) and hard beech (*F. truncata*) (McArthur & Walter 2021).

The incorporation of citizen science data into this bird monitoring programme from 2015 onwards has provided additional insights into the distribution and habitat use of native forest birds in Upper Hutt City. Based on the spatial distribution of citizen science observations, Upper Hutt's native forest bird species can be divided into two broad categories: those species that are largely restricted to native forest habitats (e.g., pōpokotea / whitehead and miromiro / tomtit), and those species which regularly occur in both native forest and suburban habitats (e.g., tūi, kererū, riroriro / grey warbler and pīwakawaka / NZ fantail). In 2019, local citizen scientists also reported the presence of kākā in the Upper Hutt suburb of Pinehaven, representing possibly the first record for this species in suburban Upper Hutt in over 100 years (McArthur *et al.* 2019).

Further changes to Upper Hutt’s bird community are likely to occur in the coming years. In 2018, the Upper Hutt branch of Forest & Bird, Greater Wellington Regional Council, Upper Hutt City Council and the Department of Conservation joined forces to launch the Pest Free Upper Hutt project, with the aim of intensifying and expanding the trapping of rats, mustelids and possums throughout suburban Upper Hutt and its local parks and reserves¹. This report provides an update on trends in the diversity, abundance and distribution of birds in Upper Hutt City parks and reserves between 2011 and 2021, providing a comprehensive baseline against which future changes in the city’s birdlife can be measured.

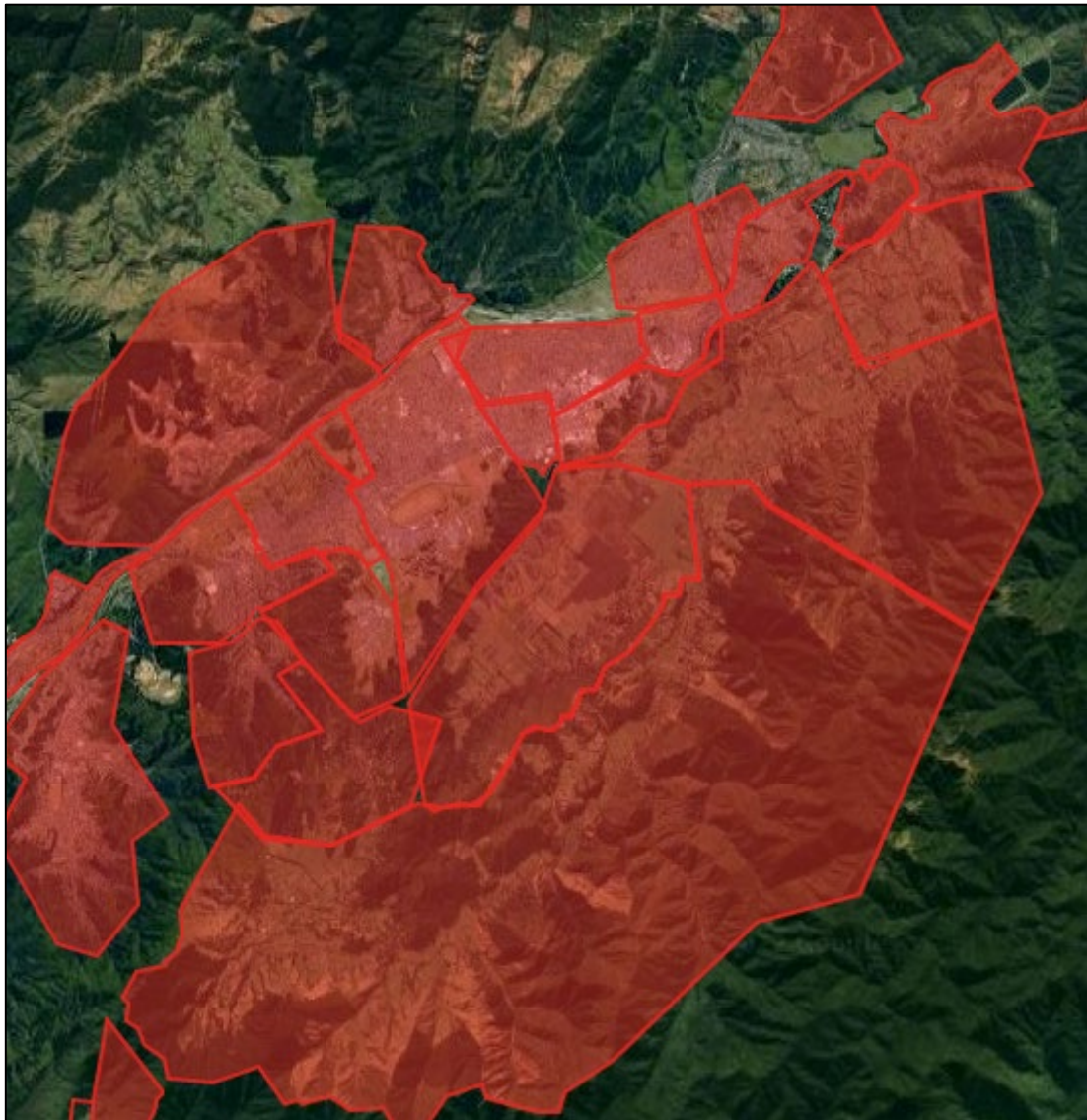


Figure 1.2: Map of Upper Hutt City showing the boundaries of community-led ‘pest free’ suburb projects. Image reproduced from <https://www.pfhv.org.nz/predator-free-groups/boundary-map/>; accessed 30/05/2022.

¹ https://www.pfhv.org.nz/site/assets/files/1064/predatorfreeuh_flyer_2018.pdf; accessed 30/05/2022.

2. Methods

2.1 Five-minute bird count data collection

Forty-five bird count stations were established at randomly selected locations in six of seven selected Upper Hutt City parks and reserves in November 2011 and have been surveyed each summer between 2011 and 2021 (Figure 2.1). Bird count stations were established at a minimum distance of 200 metres from one another and each station was marked with a blue triangle affixed to a living tree. Due to the random placement of count stations, no station fell within the boundary of Riverstone Park, the smallest of the seven reserves selected for sampling. For this reason, no abundance data is collected at this site. Instead, a 20-minute walk-through survey has been carried out each year to collect species richness and distribution data in this park.

Two five-minute bird counts were carried out at each station each year, with each of the two counts at each station being carried out on a different day. All counts were carried out in November or early December each year and counts were made only on fine, calm days between 1.5 hours after sunrise and 1.5 hours before sunset (approximately 7.30 am to 6.30 pm). At each station, an observer spent five minutes recording the number of individuals of all species seen or heard from the count station (i.e., an unbounded count as per Dawson & Bull (1975) and Hartley & Greene (2012)). Care was taken to avoid recording the same bird twice during a count. Two experienced observers were employed to conduct the counts each year between 2011 and 2020, with each observer surveying each bird count station once. In 2021, all counts were carried out by a single observer.

Bird conspicuousness can vary in response to environmental factors such as time of year, weather conditions and time of day (Bibby *et al.* 2000). Because of this, every effort has been made to standardise or sample the range of variation in each of these factors to ensure that as much as possible any changes in the mean number of birds counted per station from one year to the next is more likely to reflect changes in bird abundance rather than conspicuousness. Precautions taken include carrying out these counts during the same months each year and in similar weather conditions. Counts were carried out throughout the day, so sampled any variation in bird conspicuousness that occurred during the day.

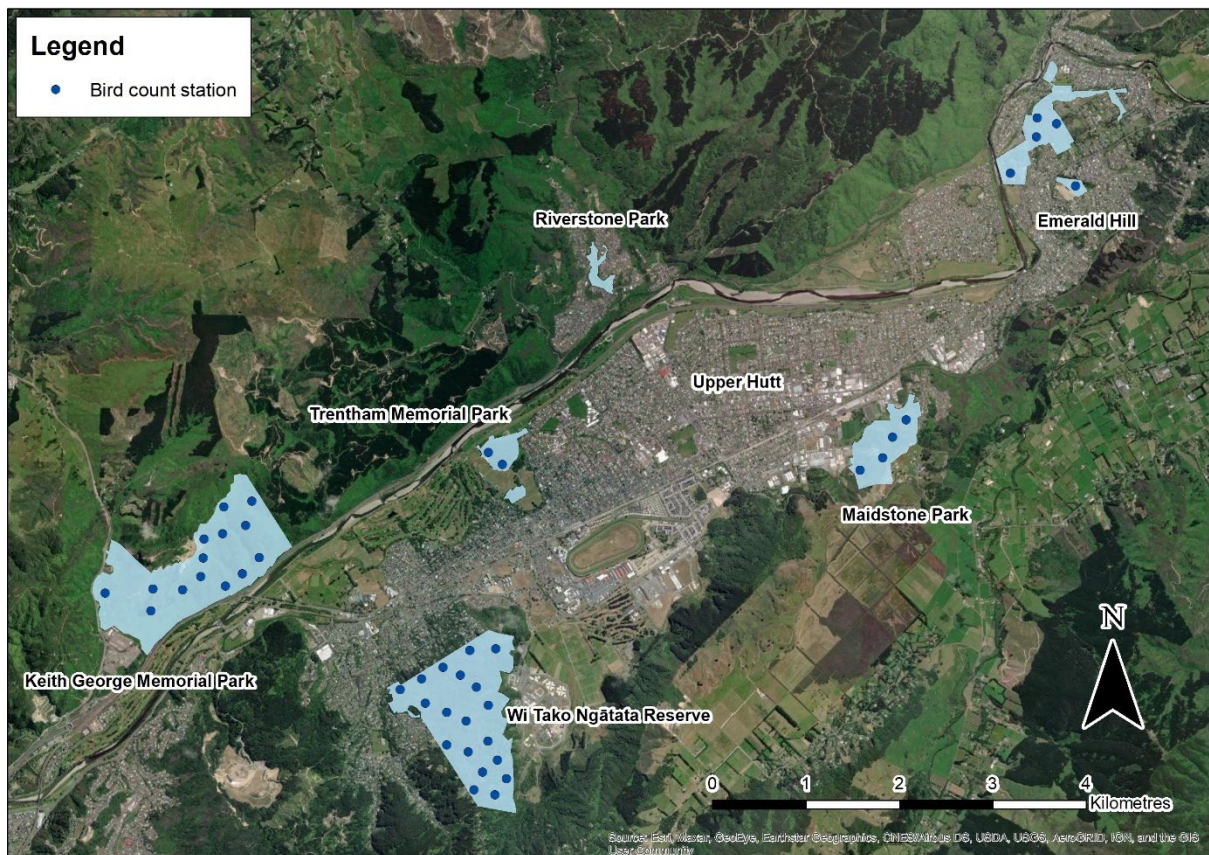


Figure 2.1: Locations of five-minute bird count stations surveyed annually in Upper Hutt City parks and reserves between 2011 and 2021 (Note: the single bird count station in Cloustonville Park is not shown).

2.2 Five-minute bird count data analysis

The Upper Hutt City five-minute bird count data were first entered into a Microsoft Excel spreadsheet and then imported into the statistical package R (R Core Team 2021) for statistical analysis. Two separate analyses were carried out, the first of which examined overall trends in indigenous dominance by modelling trends in the encounter rates of native and introduced birds over time. The second analysis examined changes in the abundance of individual bird species by modelling trends in the encounter rates of any native forest bird species that was detected during at least 4.5% of counts (i.e., there were at least 45 individual detections during counts carried out between 2011 and 2021).

For both analyses, generalised linear mixed-effects models with a Poisson error were used to investigate trends in bird encounter rates over time. For each analysis, we compared models from a candidate set to determine which of the plausible relationships between the number of birds encountered and time best explained the data. The model that fitted the data best was selected using Akaike's Information Criterion corrected for small sample size (AICc; Burnham and Anderson 2002), with the model with the lowest AICc value providing the best fit to the data using the lowest number of model parameters. We then used the selected models to assess whether trends in bird encounter rates were increasing or decreasing over time by calculating estimates of slope, and 95% confidence intervals (CIs) around estimates. Positive estimates of slope indicated increases in bird encounter

rates, while negative estimates of slope indicated decreases in bird encounter rates. We used the 'lme4' package (Bates *et al.* 2015) in the statistical package R (R Core Team 2021) for both analyses.

2.2.1 Trends in the encounter rates of native versus introduced species

To analyse overall trends in the encounter rates of native versus introduced birds over time, three plausible models were considered:

1. **No change:** Bird encounter rates have not changed between 2011 and 2021 but encounter rates of native and introduced species have differed. This model included the count of all species detected at a station in a given year as a response variable, and the status of each species (native or introduced) as a predictor variable.
2. **Same population trend for both native and introduced species:** Bird encounter rates have changed between 2011 and 2021, but at the same rate for both native and introduced species. This model consisted of the same response variable as the “no change” model above but included both species status and year as predictor variables.
3. **Different population trends for native versus introduced species:** Bird encounter rates have changed between 2011 and 2021, but at different rates for native versus introduced species. This model consisted of the same response and predictor variables as the “same population trend” model above but included an additional interaction term between the status and year predictor variables to allow for the slope of the relationship with time to vary between native and introduced species.

For each of these three models, a random intercept term was included for each station to account for the repeated-measures design. A second random intercept term was also included for each observer, to account for potential observer bias.

2.2.2 Trends in the encounter rates of individual native forest bird species

To analyse trends in the encounter rates of individual bird species over time, two plausible models were considered:

1. **No trend:** Bird encounter rates have not changed between 2011 and 2021.
2. **Trend over time:** Bird encounter rates have either increased or decreased between 2011 and 2021.

Both models included the count of each species detected at a station in a given year as a response variable, and an intercept term. Bird count station and observer were included in both models as random intercept terms to account for the repeated-measures design and for potential observer bias. The “trend over time” model also included year as a predictor variable. Where it was necessary, an observation-level random effect was also included to account for overdispersion, i.e., a higher error variance than assumed by the Poisson error distribution for these models (Harrison 2014).

2.2.3 Spatial patterns in the distribution and encounter rates of native forest birds

Patterns in the distribution of native birds among Upper Hutt City reserves were examined by mapping the relative frequency at which each native forest bird species was detected at each bird count station using ArcMap version 10.8.2. Although this technique does not explicitly take into account relative differences in abundance (less common species present within sight or earshot of a bird count station are less likely to be detected) or variation in detection probabilities between species (less conspicuous species will also be less likely to be detected), it should be sufficient to detect relatively conspicuous patterns in species' distributions and habitat use (Mackenzie *et al.* 2006).

2.3 Citizen science data analysis

As a result of the increasing popularity of citizen science, there is a steadily growing pool of bird observation data collected by citizen scientists which is available online and can be combined with these more systematic five-minute bird count data to help detect changes in bird distribution in Upper Hutt City over time. To date, residents and visitors to Upper Hutt City have contributed over 8,000 bird observations to online databases and citizen science projects such as New Zealand eBird, the New Zealand Bird Atlas, iNaturalist and the Great Kererū Count.

The New Zealand eBird database (<http://ebird.org/content/newzealand/>), which in turn hosts the New Zealand Bird Atlas dataset, is run by the Cornell Lab of Ornithology in partnership with Birds New Zealand (formerly the Ornithological Society of New Zealand). It provides a facility for recreational birdwatchers and professional ornithologists to permanently record their bird observations in a standard format and in one centralised location and makes these observations available to researchers, conservation managers and environmental policy makers (Scofield *et al.* 2012). Globally, the eBird database is now the largest and fastest growing biodiversity database in the world, with over 723,000 unique users having so far contributed over 1.1 billion bird records describing the distribution of 98% of the world's bird species (Sullivan *et al.* 2014; <https://ebird.org/news/2021-year-in-review>, accessed 21/04/2022).

Within the eBird database, automated data filters and an expert review process ensure that these data are of high quality and accuracy (Sullivan *et al.* 2014). We used eBird's "download data" tool to access the March 2022 release of the eBird Basic Dataset (EBD) and to build custom datasets containing citizen science records of all native forest bird species recorded in Upper Hutt City between 2011 and 2022. We formatted these datasets using Microsoft Excel, including removing any extraneous data fields and converting latitude/longitude coordinates into New Zealand Transverse Mercator coordinates. We then saved these files as .csv files so that they could be imported into ArcMap version 10.8.2 and converted into shapefiles. Once imported into ArcMap, we visually inspected these eBird records to locate and remove 'absence' records and any records containing obvious location errors (e.g., records placed offshore, or for which location descriptions did not match the coordinates provided) before adding these records to the distribution maps created from the five-minute bird count data. A total of 7,553 records of native forest birds observed in Upper Hutt City was retrieved from eBird using this process, representing 92% of the citizen science bird observations included in this report.

The iNaturalist database is the second-largest online source of citizen science bird data for Upper Hutt City. iNaturalist is a database that allows citizen scientists to submit, share and store natural history observations online, and unlike eBird it is designed to accept records for almost any taxon of plant or animal rather than just birds. iNaturalist (<https://inaturalist.nz/>) is run by a charitable trust called the New Zealand Bio-recording Network Trust and was established using funding from the New Zealand Government's Terrestrial Freshwater Biodiversity Information System Fund.

Within the iNaturalist database, a community peer-review process is used to validate records, with records tagged as either "research grade" or "casual grade" depending on whether or not the original species identifications have been verified by another iNaturalist user. We used the search tool on the iNaturalist NZ website (<https://inaturalist.nz/>) to create and download a custom dataset of all bird observations recorded on Miramar Peninsula between 2017 and 2022. We formatted this dataset using Microsoft Excel, including extracting records of all native forest bird species recorded in Upper Hutt City, then saved the resulting file as a .csv file so that it could be imported into ArcMap and converted to a shapefile. We then displayed the data on a map and visually inspected them and removed records with obvious location errors, before adding these records to the distribution maps created from the five-minute bird count data. A total of 517 records of native forest birds observed in Upper Hutt City was retrieved from iNaturalist using this process, representing 6% of all of the citizen science bird observations included in this report.

Kererū Discovery's Great Kererū Count dataset is the third-largest source of citizen science bird data available for Upper Hutt City. The Great Kererū Count was a nationwide kererū survey that took place each year between 2014 and 2021 (Hartley 2021). Observers from around the country were encouraged to record the presence or absence of kererū at locations of their choosing over a 10-day period each September. In 2021, 12,002 reports were received nationwide, with a total of 24,562 kererū counted (<https://kererudiscovery.org.nz/the-great-kereru-count/>; accessed 21/04/2022). We made a request for access to the Great Kererū Count data from Kererū Discovery and received a .csv file containing 177 observations reported from Upper Hutt City. We imported this .csv file into ArcMap and visually inspected the records to locate and remove any records containing obvious location errors before adding these records to the distribution maps created from the five-minute bird count data. The 177 kererū observations sourced from the Great Kererū Count dataset represent 2% of all of the citizen science bird observations included in this report.

A key difference between these citizen science datasets and the five-minute bird count data is that the temporal and spatial distribution of search effort spent by citizen scientists varies unpredictably from year to year, whereas this search effort is standardised during these five-minute bird counts. Nonetheless, accurate bird observations submitted by citizen scientists have the potential to complement distribution data derived from our five-minute bird count dataset by providing information describing the presence of native forest birds at locations and in habitats not sampled by these five-minute bird counts. By collecting bird observation data all year round, local citizen scientists are also better placed to record local colonisation events, prior to the colonising species being detected during these five-minute bird counts.

3 Results

3.1 Species diversity and trends in indigenous dominance

Thirty-nine bird species have been detected during five-minute bird counts carried out in Upper Hutt City parks and reserves between 2011 and 2021. Fifteen of these are native bird species that are typically found in forest habitats, and it is these species for which trends in relative abundance and distribution are reported below. The remaining 24 species are either introduced and naturalised or are native species that are more typically found in wetland or grassland habitats and are therefore not included in any further analyses. Complete lists of all the bird species detected in each of the seven reserves being sampled can be found in the Appendix of this report.

Among the 15 native forest bird species detected during these counts, one is ranked as Nationally Vulnerable, one is ranked as Nationally Increasing, one is ranked as At Risk Declining, one is ranked as At Risk Relict and eleven are ranked as Not Threatened under the New Zealand Threat Classification Scheme (Appendix; Robertson *et al.* 2021).

The best model to describe the overall trends in encounter rates of native versus introduced birds in Upper Hutt City parks and reserves over time was the model that assumed that population trends would differ between native versus introduced species. This model had a lower AICc value compared to the next closest model considered ($\Delta\text{AICc} = 2.66$). According to this model, forest bird communities in Upper Hutt City parks and reserves are dominated by native species, with approximately twice as many native birds detected each year compared to introduced birds (Figure 3.1.1). Between 2011 and 2021, there has been a shallow increase in the number of native forest birds counted over time, with a coefficient of year on log abundance of 0.015 (95% CI 0.003 – 0.029). A mean of 9.5 (± 0.39 SE) native birds were counted per bird count in 2011 compared to 11.4 (± 0.6 SE) birds in 2021, representing a 19% increase in the mean number of native birds counted per five-minute bird count over eleven years. Much of this observed increase occurred between the 2020 and 2021 counts however, indicating that the 2021 counts may be a bit of an outlier. In contrast, there has been a shallow decrease in the number of introduced birds counted over time, with a coefficient of year on log abundance of -0.014 (95% CI -0.025 – -0.003). A mean of 4.3 (± 0.34 SE) introduced birds were counted per bird count in 2011 compared to 5.2 (± 0.8 SE) birds in 2021, representing a 21% increase in the mean number of introduced birds counted per five-minute bird count over eleven years. Much of this observed increase occurred between the 2020 and 2021 counts however, indicating that the 2021 counts may be a bit of an outlier in contrast to the slow decline in mean counts observed over the preceding 10 years.

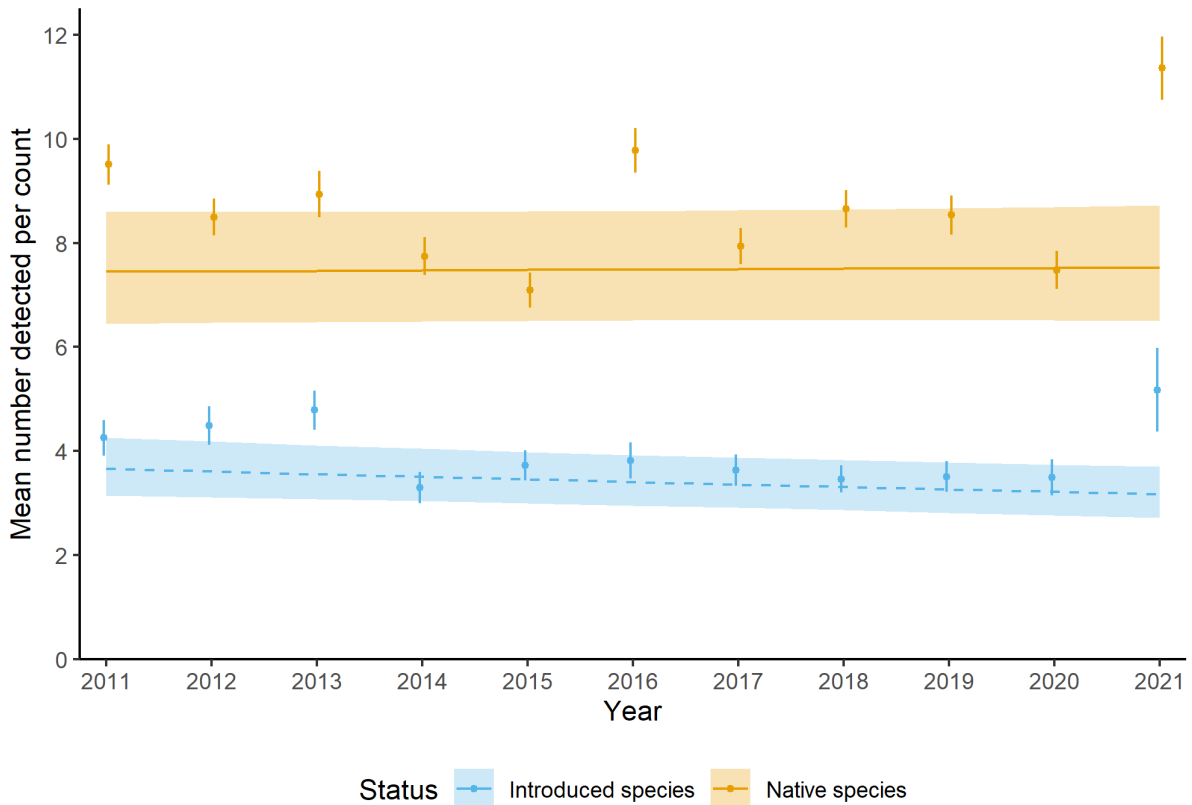


Figure 3.1.1: Trends in the mean number of native and introduced birds encountered per bird count in Upper Hutt City parks and reserves between 2011 and 2021. Individual data points (\pm standard error) represent the mean total number of native and introduced birds detected per count each year. Solid orange and dashed blue lines (\pm 95% Confidence Intervals) represent the modelled trend in the number of native and introduced bird species recorded per count each year.

3.2 Abundance and distribution of native forest bird species

Of the 16 native forest bird species that have been recorded in Upper Hutt City since 2011 (comprising 15 species recorded during these five-minute bird counts and one further species reported by citizen scientists), 10 species were encountered on at least 45 occasions (i.e., during at least 4.5% of all counts). Based on the lowest AICc values of the two candidate models, four of these 10 species showed trends over time, whereas the remaining six species showed no trend. For species that showed a trend in mean encounter rates, coefficient estimates of slope greater than zero indicate an increase in encounter rates over time, with greater coefficient estimates indicating faster rates of increase. Conversely, a negative coefficient estimate indicates a decrease in encounter rates over time. Based on the coefficient estimates for the four native forest bird species that show trends over time, one of these species (pīwakawaka / fantail) showed an increase in mean encounter rates over time, and three species (riroriro / grey warbler, tauhou / silvereye and pīpīwharau / shining cuckoo) showed a decrease in encounter rates over time (Table 3.2.1).

Table 3.2.1: Summary of models of population change in 10 native forest bird species detected on at least 45 occasions in Upper Hutt City parks and reserves since 2011, and trend if detected. The ‘selected model’ column indicates which model was selected for each species. The ‘trend’ column indicates if the change in abundance was increasing, decreasing, or if no trend was detected (‘-’) based on estimates of slope.

| Species | AICc model 1 | AICc model 2 | Δ AICc | Selected model | Trend | Coefficient estimate (95% CIs) |
|------------------------------|--------------|--------------|--------|----------------------------------|------------|--------------------------------|
| Pīwakawaka NZ fantail | 1925.25 | 1897.35 | 27.90 | Model 2 (Trend over time) | Increasing | 0.127 (0.096 – 0.161) |
| Tūi | 3307.01 | 3307.28 | 0.27 | Model 1 (No change over time) | - | - |
| Pōpokotea Whitehead | 1850.90 | 1852.23 | 1.33 | Model 1 (No change over time) | - | - |
| Miromiro Tomtit | 1548.33 | 1550.15 | 1.82 | Model 1 (No change over time) | - | - |
| Korimako Bellbird | 1267.10 | 1267.95 | 0.85 | Model 1 (No change over time) | - | - |
| Kōtare NZ kingfisher | 979.85 | 980.29 | 0.43 | Model 1 (No change over time) | - | - |
| Kererū | 902.02 | 903.62 | 1.61 | Model 1 (No change over time) | - | - |
| Riroriro Grey warbler | 3047.79 | 2994.74 | 53.05 | Model 2 (Trend over time) | Decreasing | -0.041 (-0.058 - -0.025) |
| Tauhō Silvereye | 3413.39 | 3375.08 | 38.31 | Model 2 (Trend over time) | Decreasing | -0.053 (-0.072 - -0.036) |
| Pīpīwharau Shining cuckoo | 954.81 | 929.53 | 25.28 | Model 2 (Trend over time) | Decreasing | -0.159 (-0.235 - -0.07) |

The following individual species accounts are listed in decreasing order of their current or recent abundance in Upper Hutt City parks and reserves. Species that are most frequently encountered during the five-minute bird counts are covered first, and the species that are less frequently encountered are treated last. Every species of native forest bird that has been observed in Upper Hutt City since 2011 is included in this section of the report.

3.2.1 Tūī (*Prothemadera novaeseelandiae*)

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The tūī was the native forest bird species that was most frequently encountered during these five-minute bird counts, with a total of 1,962 individuals detected during 838 of the 990 bird counts (85%) conducted since 2011. Although mean annual tūī encounter rates varied between 1.2 (± 0.14 SE) and 2.5 (± 0.17 SE) tūī detected per bird count, there has been no overall increase or decrease in tūī encounter rates between 2011 and 2021 (Table 3.2.1; Figure 3.2.1). The tūī is the native forest bird that is most frequently reported by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 1,646 encounters with tūī, demonstrating that this species is common and widespread in native forest, parkland and suburban habitats throughout the city (Figure 3.2.2).



Image courtesy of Tony Whitehead/NZ Birds Online

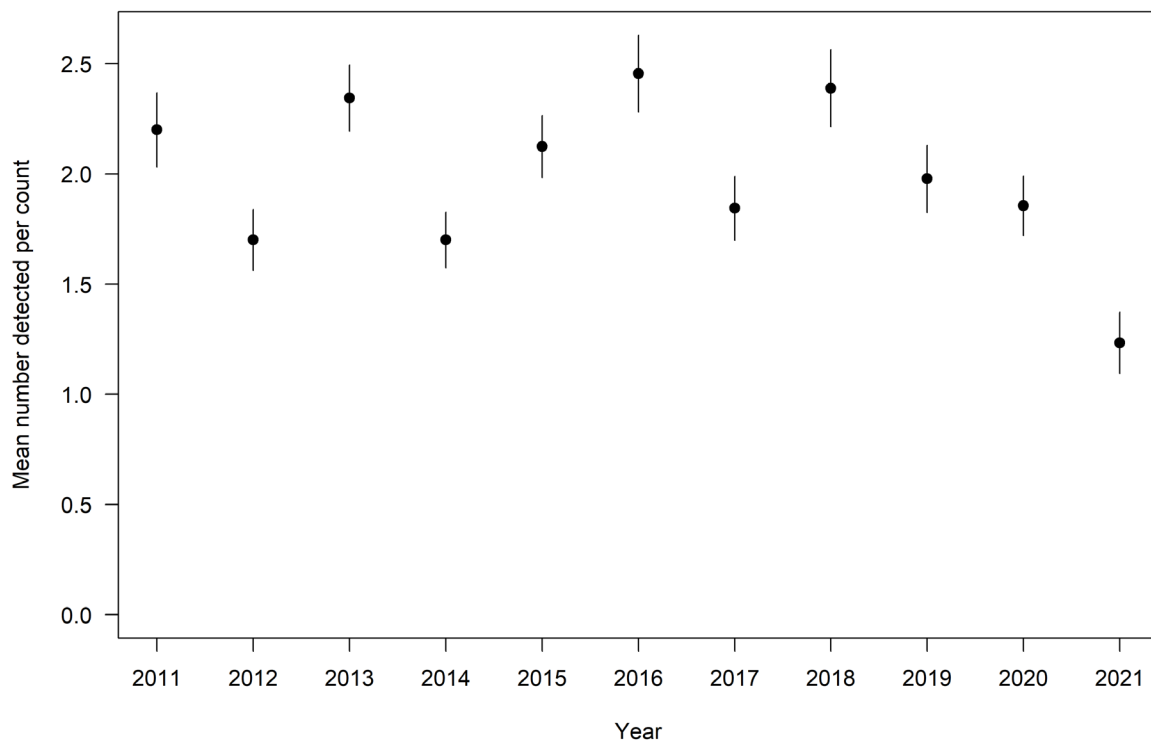


Figure 3.2.1: Mean (\pm SE) number of tūī recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

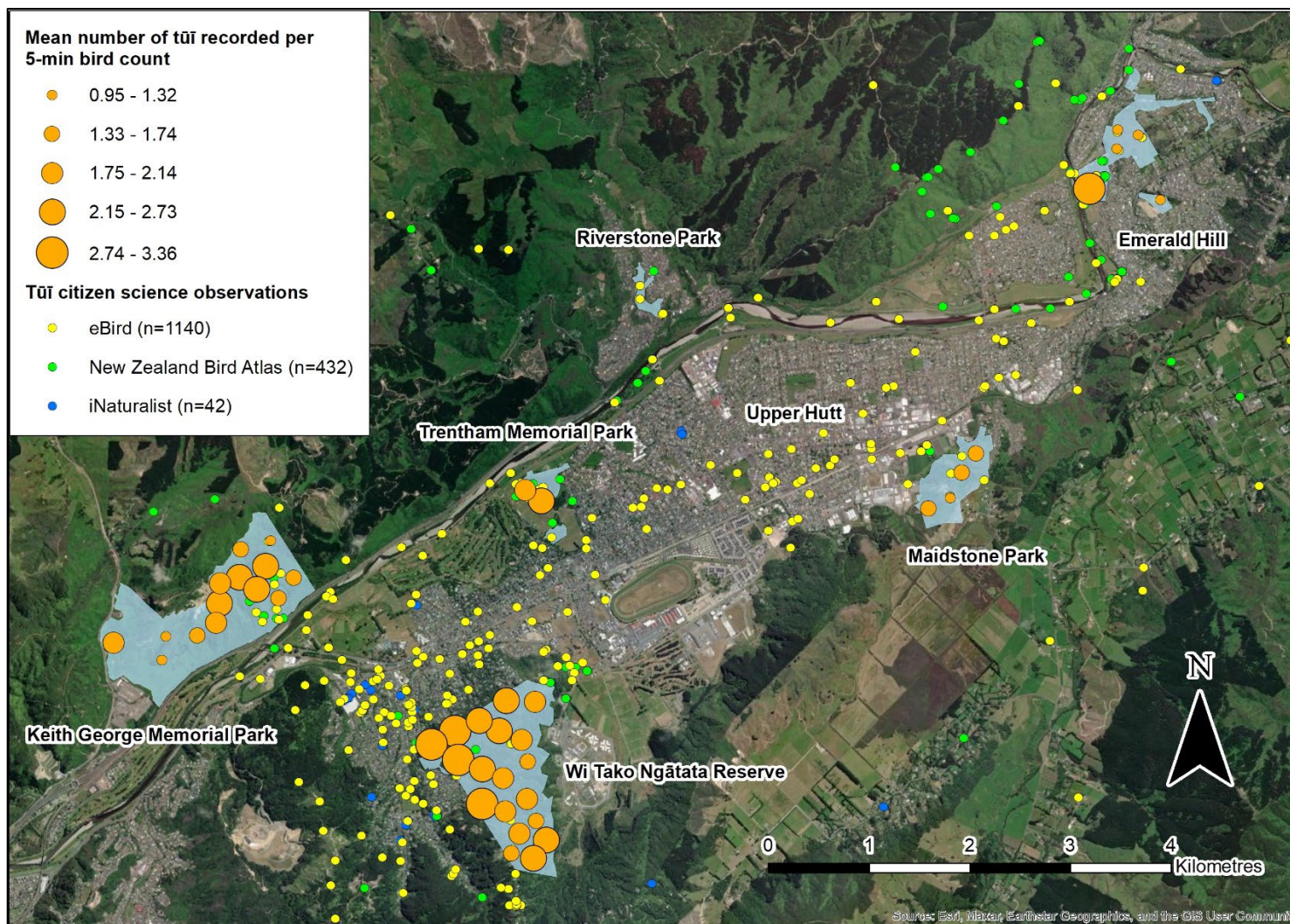


Figure 3.2.2: Distribution of tūi in Upper Hutt City between 2011 and 2022. Orange circles represent tūi detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of tūi detected per station between 2011 and 2021. Yellow, green and blue circles represent tūi observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

3.2.2 Riroriro / Grey warbler (*Gerygone igata*)



Image courtesy of Bartek Wypych/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The riroriro / grey warbler was the second most frequently encountered native forest bird species during these five-minute bird counts, with a total of 1,779 individuals detected during 854 of 990 bird counts (86%) carried out since 2011. Riroriro / grey warbler encounter rates have declined by 65% between 2011 and 2021, from a mean of 2.3 (± 0.14 SE) birds recorded per five-minute bird count in 2011 to 0.8 (± 0.07 SE) birds recorded per count in 2021 (the coefficient of year on log abundance was -0.062 ; 95%

CI -0.076 - -0.048 ; Table 3.2.1; Figure 3.2.3). The riroriro / grey warbler is the third most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 1,291 encounters with riroriro / grey warblers, demonstrating that this species is widespread in native forest and parkland but is more sparsely distributed in suburban habitats in Upper Hutt City (Figure 3.2.4).

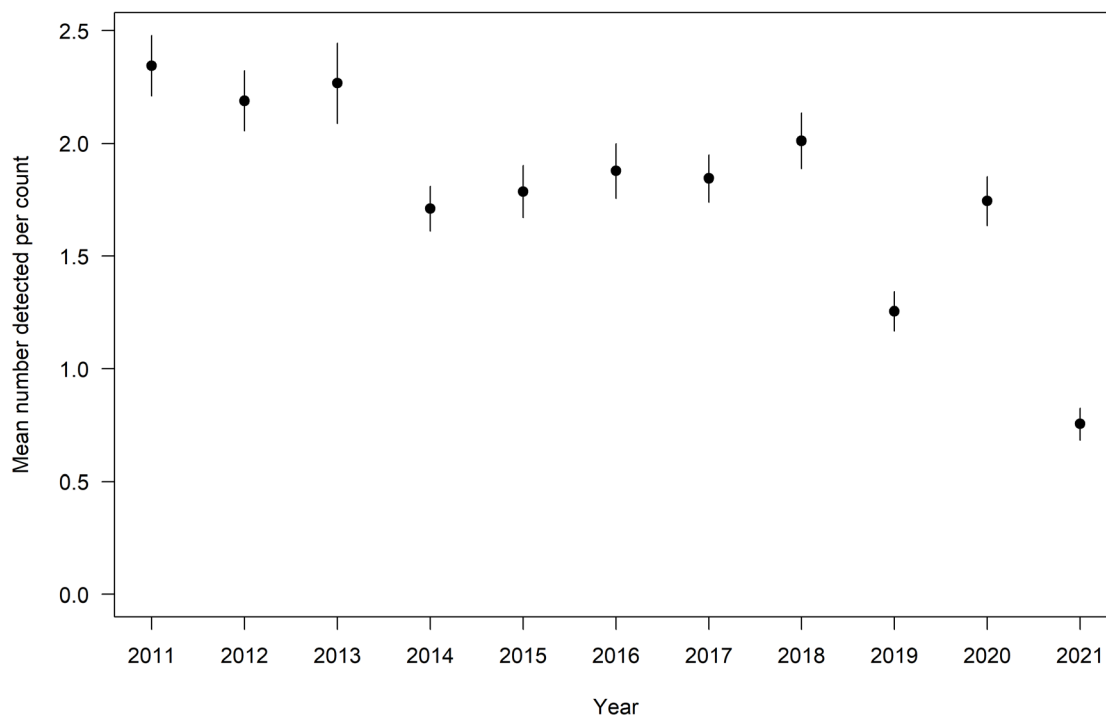


Figure 3.2.3: Mean (\pm SE) number of riroriro / grey warblers recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

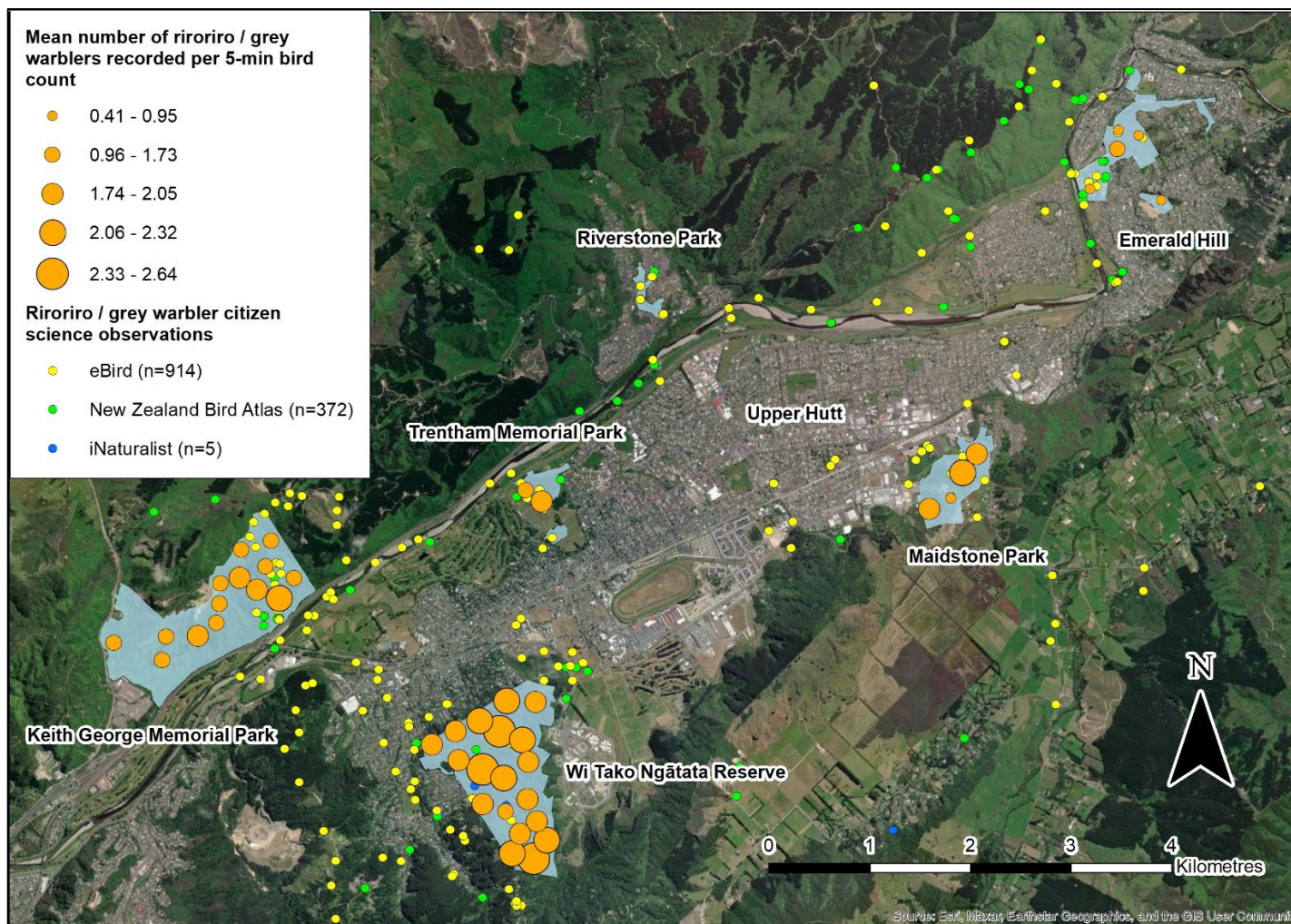


Figure 3.2.4: Distribution of riroriro / grey warblers in Upper Hutt City between 2011 and 2022. Orange circles represent riroriro / grey warbler detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of riroriro / grey warblers detected per station between 2011 and 2021. Yellow, green and blue circles represent riroriro / grey warbler observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

3.2.3 Tauhou / Silvereeye (*Zosterops lateralis*)

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The tauhou / silvereeye was the third most frequently encountered native forest bird species during these five-minute bird counts, with a total of 1,761 individuals detected during 753 of 990 bird counts (76%) carried out since 2011. Tauhou / silvereeye encounter rates have declined by 50% between 2011 and 2021, from a mean of 3.0 (± 0.19 SE) birds recorded per five-minute bird count in 2011 to 1.5 (± 0.12 SE) birds recorded per count in 2021 (the coefficient of year on log abundance was -0.049; 95% CI -0.065 - -0.033; Table 3.2.1; Figure 3.2.5), with substantial year-to-year fluctuations. The tauhou / silvereeye is the second most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 1,373 encounters with tauhou / silvereeyes, demonstrating that this species is widespread in native forest, parkland and suburban habitats throughout Upper Hutt (Figure 3.2.6).



Image courtesy of Ormond Torr/NZ Birds Online

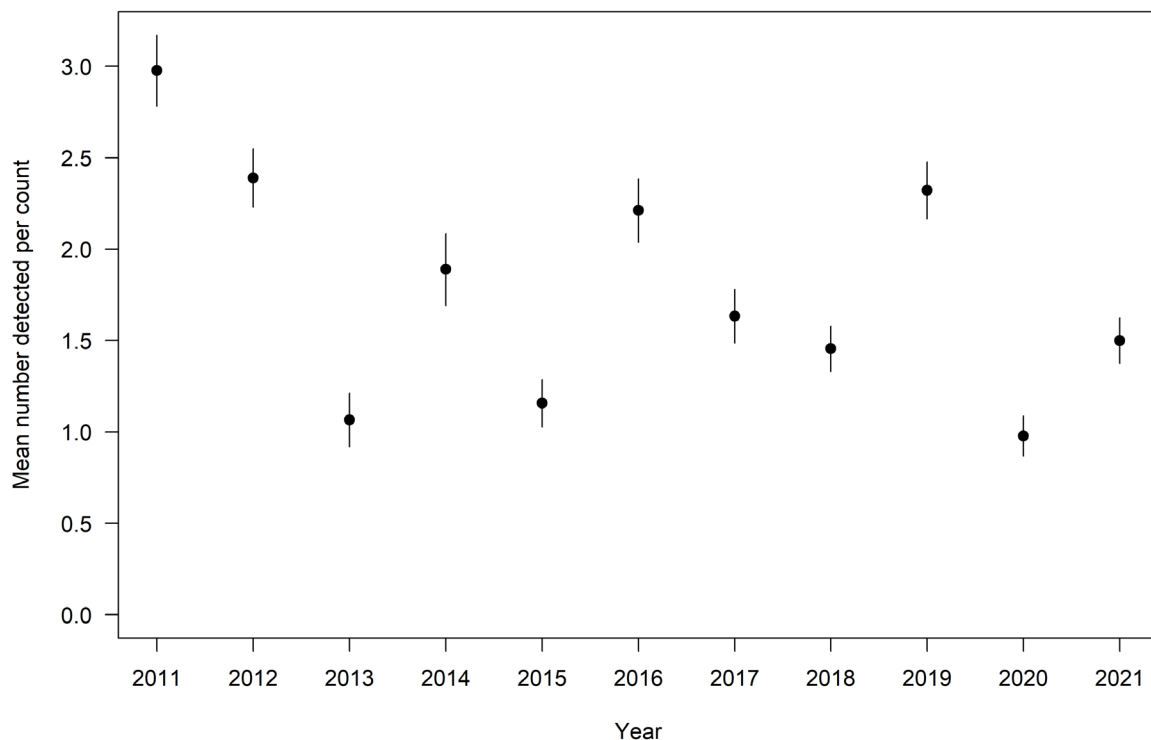


Figure 3.2.5: Mean (\pm SE) number of tauhou / silvereeyes recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

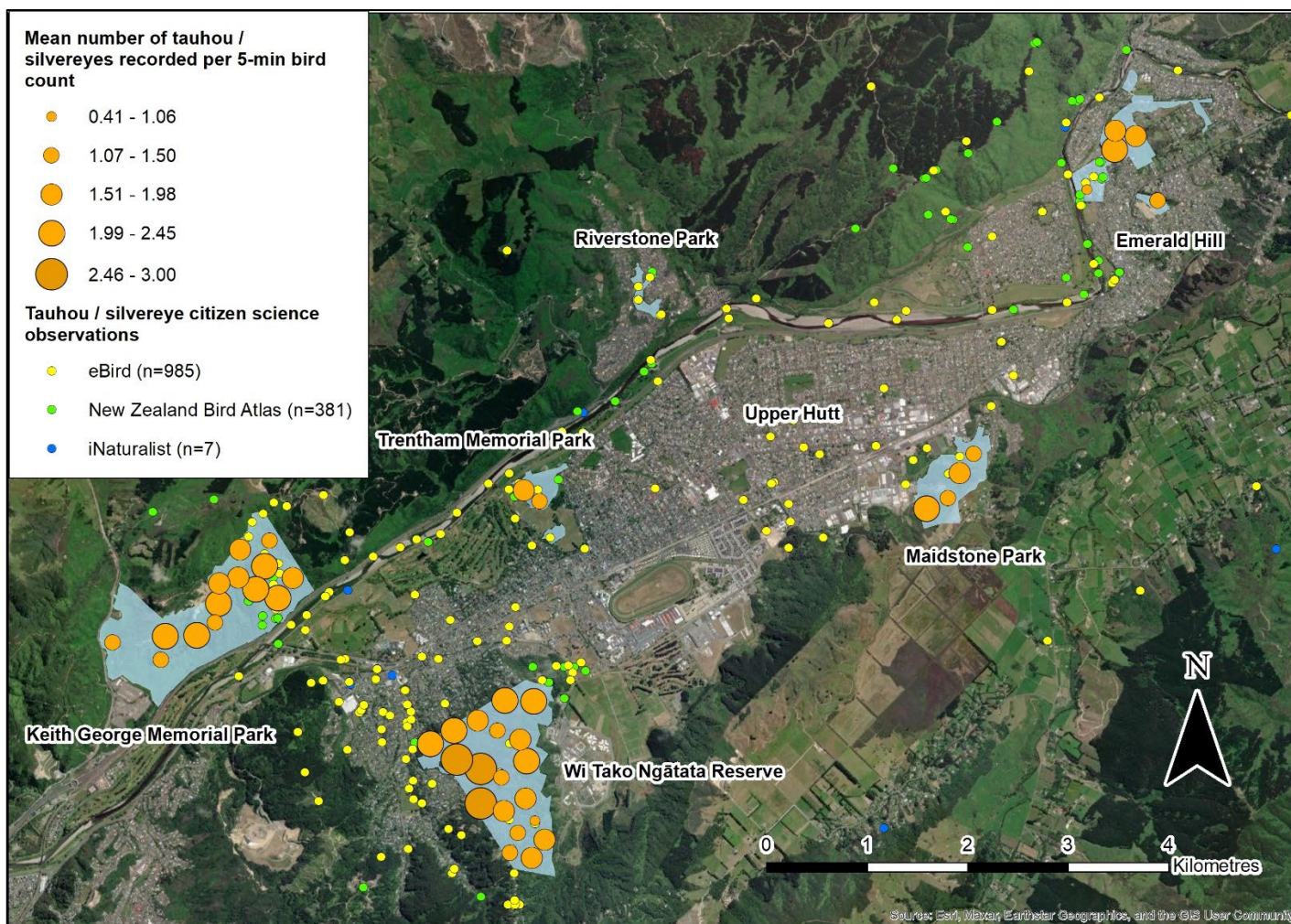


Figure 3.2.6: Distribution of tauhou / silvereyes in Upper Hutt City between 2011 and 2022. Orange circles represent tauhou / silvereye detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of tauhou / silvereyes detected per station between 2011 and 2021. Yellow, green and blue circles represent tauhou / silvereye observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

3.2.4 Pōpokotea / Whitehead (*Mohoua albicilla*)



Image courtesy of Tony Whitehead/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The pōpokotea / whitehead was the fourth most frequently encountered native forest bird species during these five-minute bird counts, with a total of 821 individuals detected during 323 of 990 bird counts (33%) carried out since 2011. Although mean annual pōpokotea / whitehead encounter rates varied between 0.3 (± 0.07 SE) and 1.2 (± 0.20 SE) birds detected per bird count, there has been no overall increase or

decrease in pōpokotea / whitehead encounter rates between 2011 and 2021 (Table 3.2.1; Figure 3.2.1). The pōpokotea / whitehead is the seventh most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 395 encounters with pōpokotea / whiteheads, demonstrating that this species is largely restricted to larger tracts of native forest habitat in reserves including Keith George Memorial Park, Wi Tako Ngātata Reserve and the Akatarawa Forest. Pōpokotea / whiteheads have also been detected in Trentham Memorial Park, Maidstone Park and Harcourt Park, three smaller suburban reserves with lower levels of habitat connectivity to adjacent tracts of native forest, but they are otherwise largely absent from parkland and suburban habitats in Upper Hutt City (Figure 3.2.8).

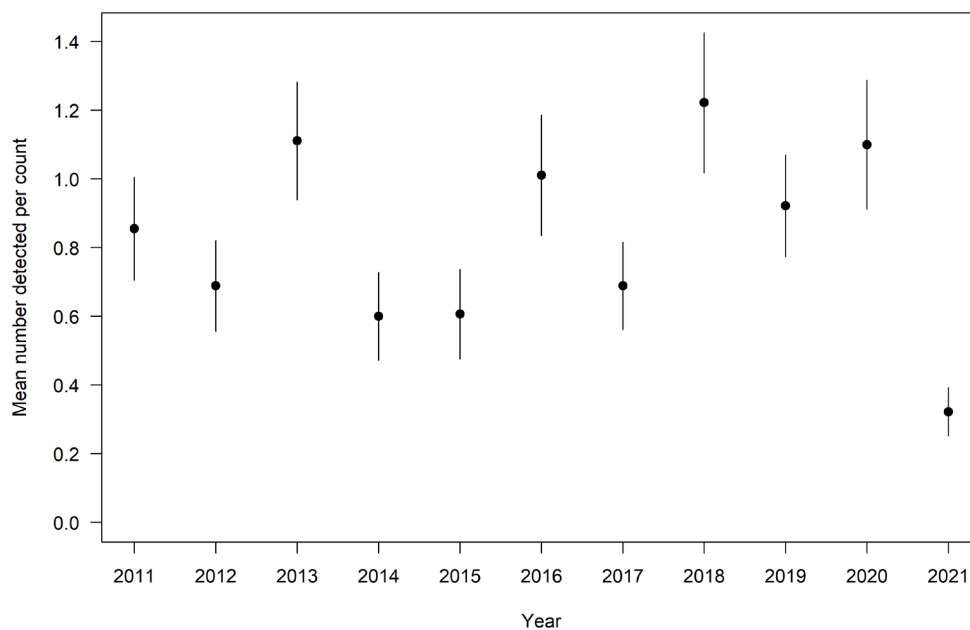


Figure 3.2.7: Mean (\pm SE) number of pōpokotea / whiteheads recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

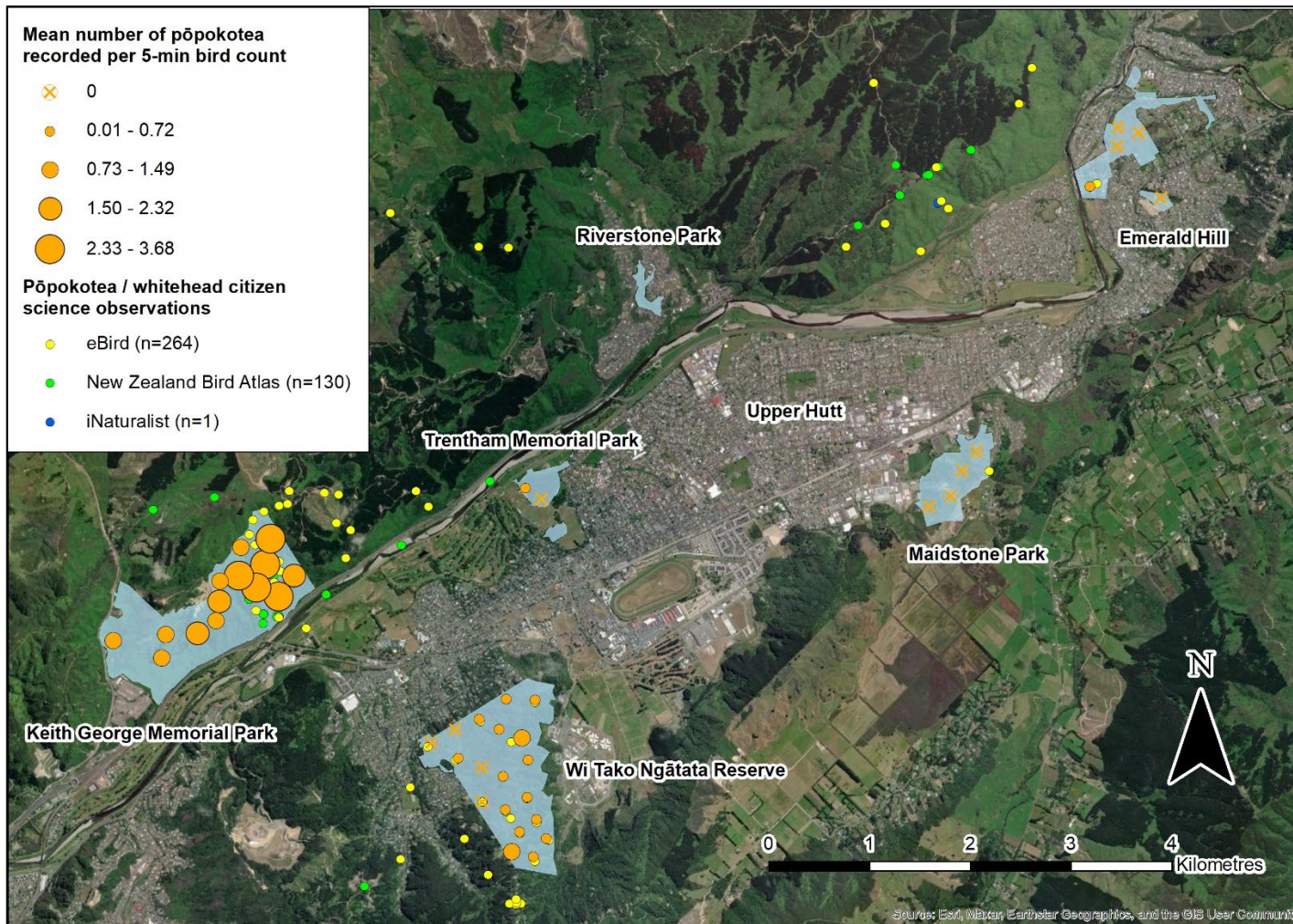


Figure 3.2.8: Distribution of pōpokotea / whiteheads in Upper Hutt City between 2011 and 2022. Orange circles represent pōpokotea / whitehead detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of pōpokotea / whiteheads detected per station between 2011 and 2021. Yellow, green and blue circles represent pōpokotea / whitehead observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

3.2.5 Pīwakawaka / New Zealand fantail (*Rhipidura fuliginosa*)



Image courtesy of Cheryl Marriner/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The pīwakawaka / NZ fantail was the fifth most frequently encountered native forest bird species during these five-minute bird counts, with a total of 599 individuals detected during 449 of 990 (45%) bird counts carried out since 2011. Pīwakawaka / NZ fantails have experienced a spectacular 1,370% increase in encounter rates between 2011 and 2021, from a mean of 0.07 (\pm 0.03 SE) birds recorded per five-minute bird count in 2011 to 1.03 (\pm 0.09 SE) birds recorded per count in 2021 (the coefficient of year on log abundance was 0.125;

95% CI 0.100 – 0.153; Table 3.2.1; Figure 3.2.9). This dramatic increase likely reflects a rapid population recovery following a mass mortality event that occurred in July and August 2011 as a consequence of two unusually heavy snowfall events in the region (McArthur *et al.* 2013). The pīwakawaka / NZ fantail is the fifth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 969 encounters with pīwakawaka / NZ fantails, demonstrating that this species is widespread in native forest, parkland and suburban habitats throughout Upper Hutt (Figure 3.2.10).

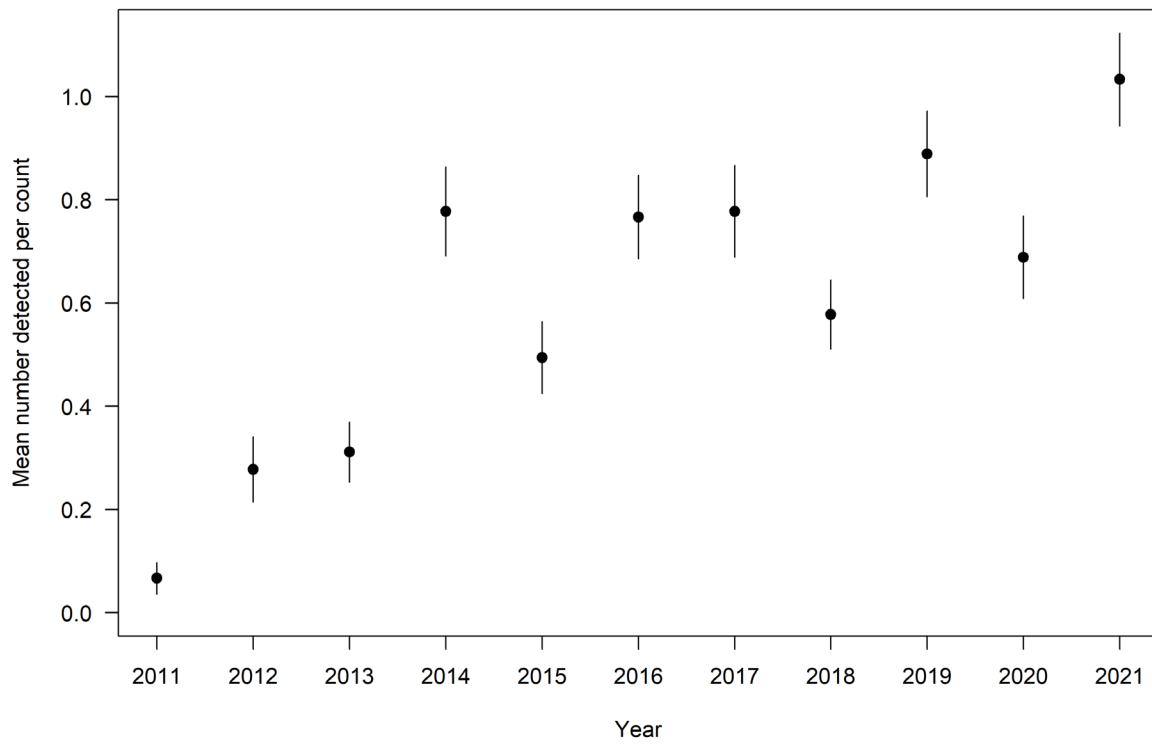


Figure 3.2.9: Mean (\pm SE) number of pīwakawaka / NZ fantails recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

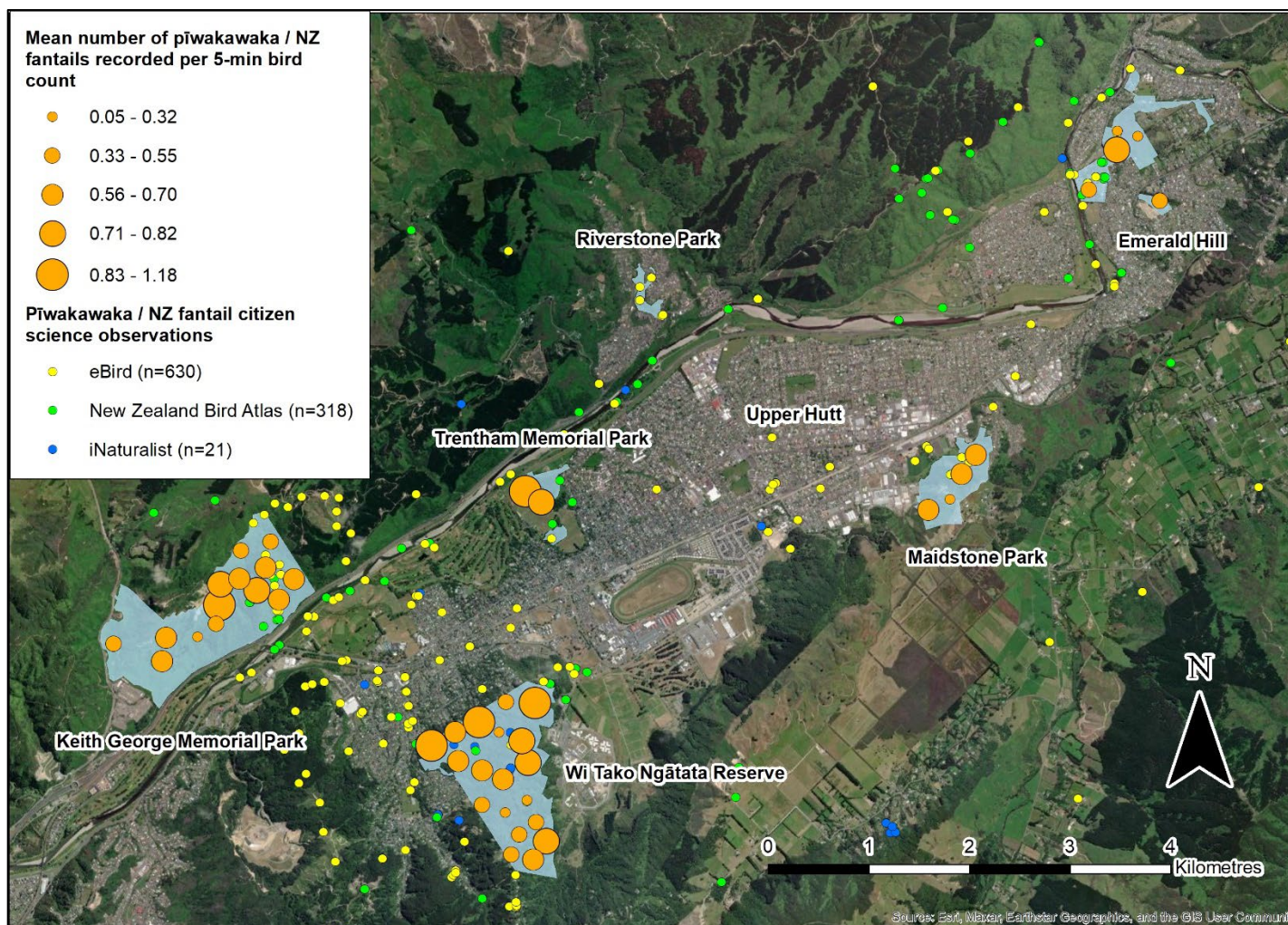


Figure 3.2.10: Distribution of pīwakawaka / NZ fantails in Upper Hutt City between 2011 and 2022. Orange circles represent pīwakawaka / NZ fantail detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of pīwakawaka / NZ fantails detected per station between 2011 and 2021. Yellow, green and blue circles represent pīwakawaka / NZ fantail observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

3.2.6 Miromiro / Tomtit (*Petroica macrocephala*)

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The miromiro / tomtit was the sixth most frequently encountered native forest bird species during these five-minute bird counts, with a total of 419 individuals detected during 280 of 990 bird counts (28%) conducted since 2011. Although mean annual miromiro / tomtit encounter rates have varied between 0.23 (\pm 0.05 SE) and 0.69 (\pm 0.11 SE) birds detected per count, there has been no overall increase or decrease in miromiro / tomtit encounter rates between 2011 and 2021 (Table 3.2.1; Figure 3.2.11). Among the reserves sampled, miromiro / tomtits are largely restricted to the mature beech forest in the eastern portion of Keith George Memorial Park and in the southern portion of Wi Tako Ngātata Reserve. The miromiro / tomtit is the eighth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 366 encounters with miromiro / tomtits, demonstrating that this species is mainly restricted to larger tracts of native and exotic forest habitat in reserves including Keith George Memorial Park, Wi Tako Ngātata Reserve and the Akatarawa Forest, as well as the Silverstream Spur, and is absent from open parkland and suburban habitats in Upper Hutt City (Figure 3.2.12).



Image courtesy of Paul Shaw/NZ Birds Online

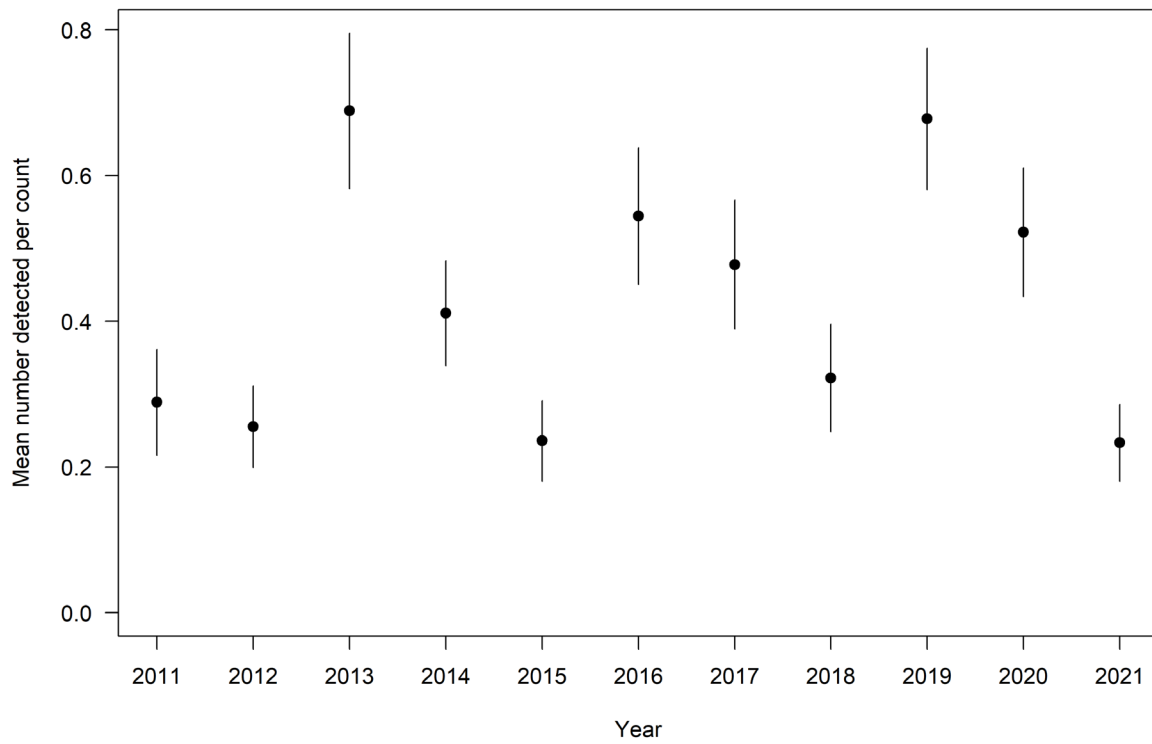


Figure 3.2.11: Mean (\pm SE) number of miromiro / tomtits recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

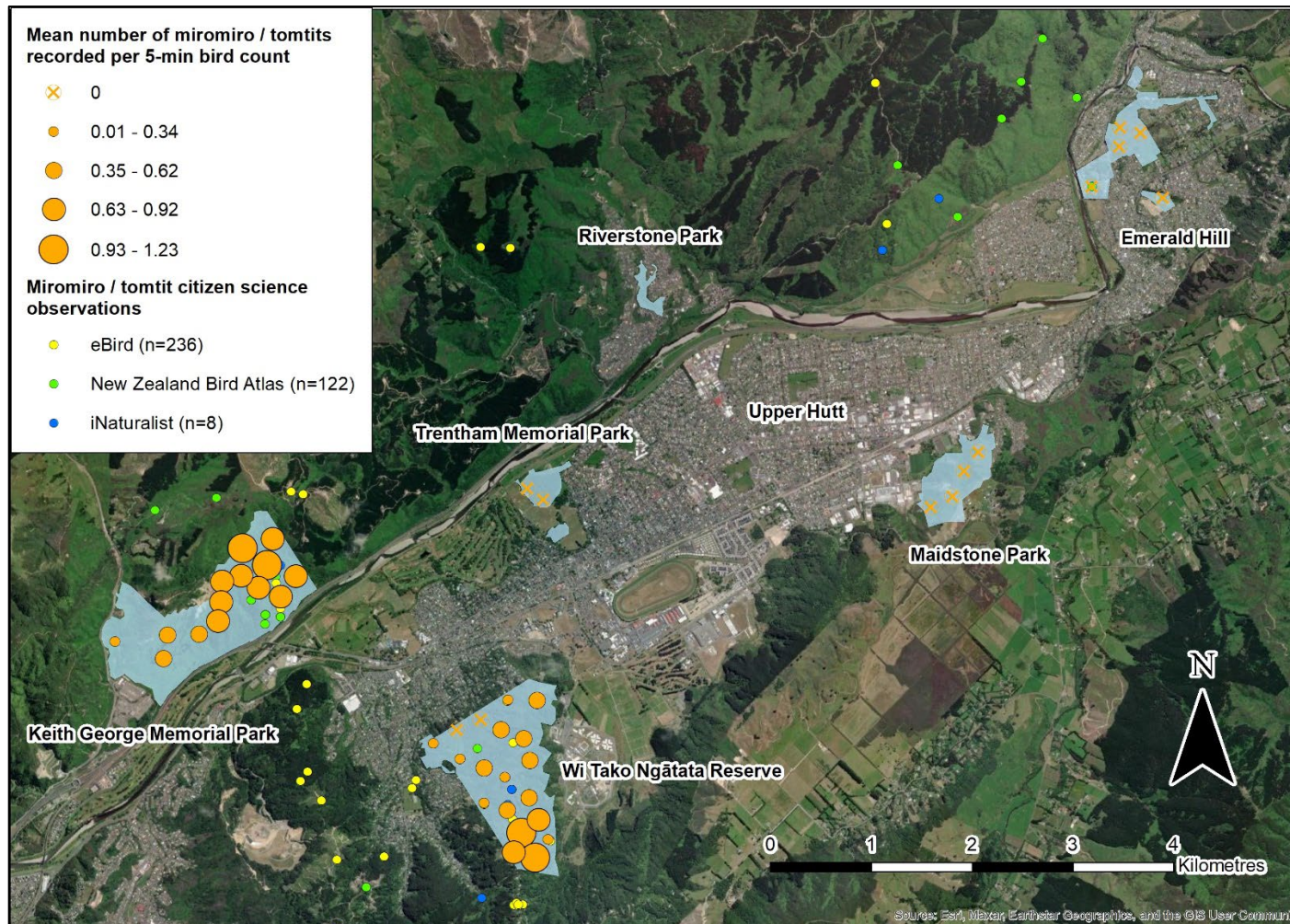


Figure 3.2.12: Distribution of miromiro / tomtits in Upper Hutt City between 2011 and 2022. Orange circles represent miromiro / tomtit detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of miromiro / tomtits detected per station between 2011 and 2021. Yellow, green and blue circles represent miromiro / tomtit observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

3.2.7 Korimako / Bellbird (*Anthornis melanura*)



Image courtesy of Craig McKenzie/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The korimako / bellbird has been the seventh most frequently encountered native forest bird species during these five-minute bird counts, with a total of 318 individuals detected during 222 of 990 bird counts (22%) conducted since 2011. Although mean annual korimako / bellbird encounter rates have varied between 0.11 (± 0.04 SE) and 0.52 (± 0.09 SE) birds detected per count, there has been no overall increase or decrease in encounter rates between 2011 and 2021 (Table 3.2.1; Figure 3.2.13). The

korimako / bellbird is the sixth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 440 encounters with korimako / bellbirds, demonstrating that this species is widespread in native forest habitats and regularly occurs in open parkland and suburban habitats in Upper Hutt (Figure 3.2.14).

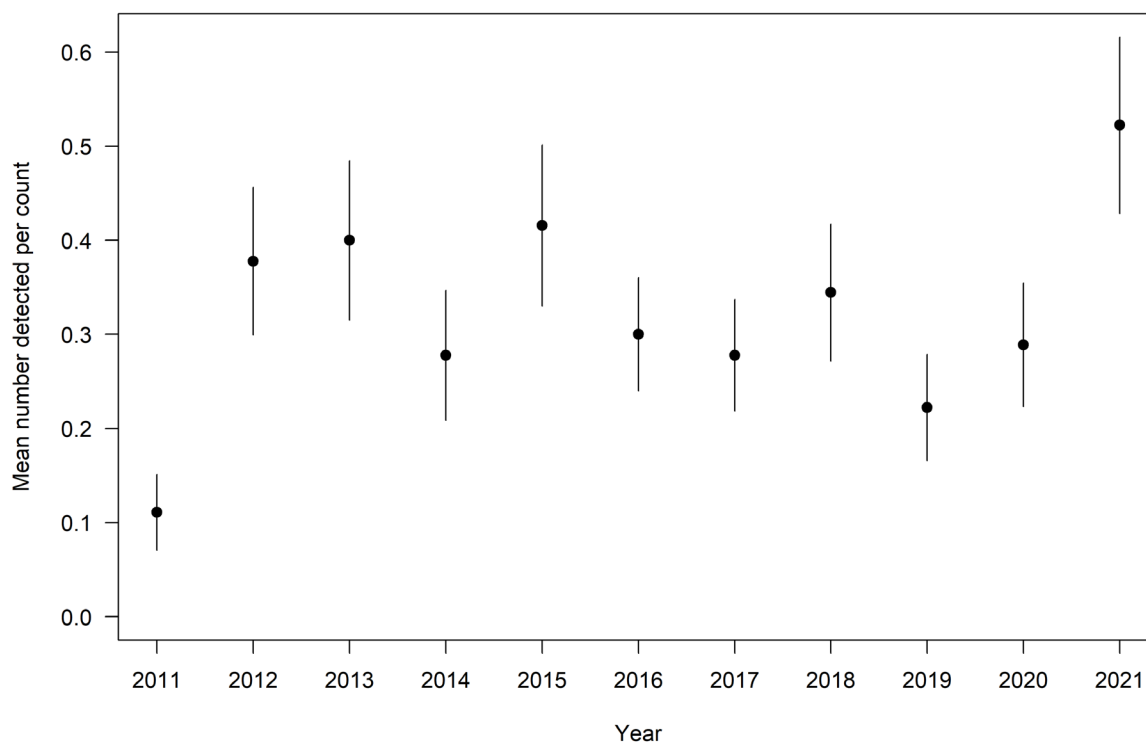


Figure 3.2.13: Mean (\pm SE) number of korimako / bellbirds recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

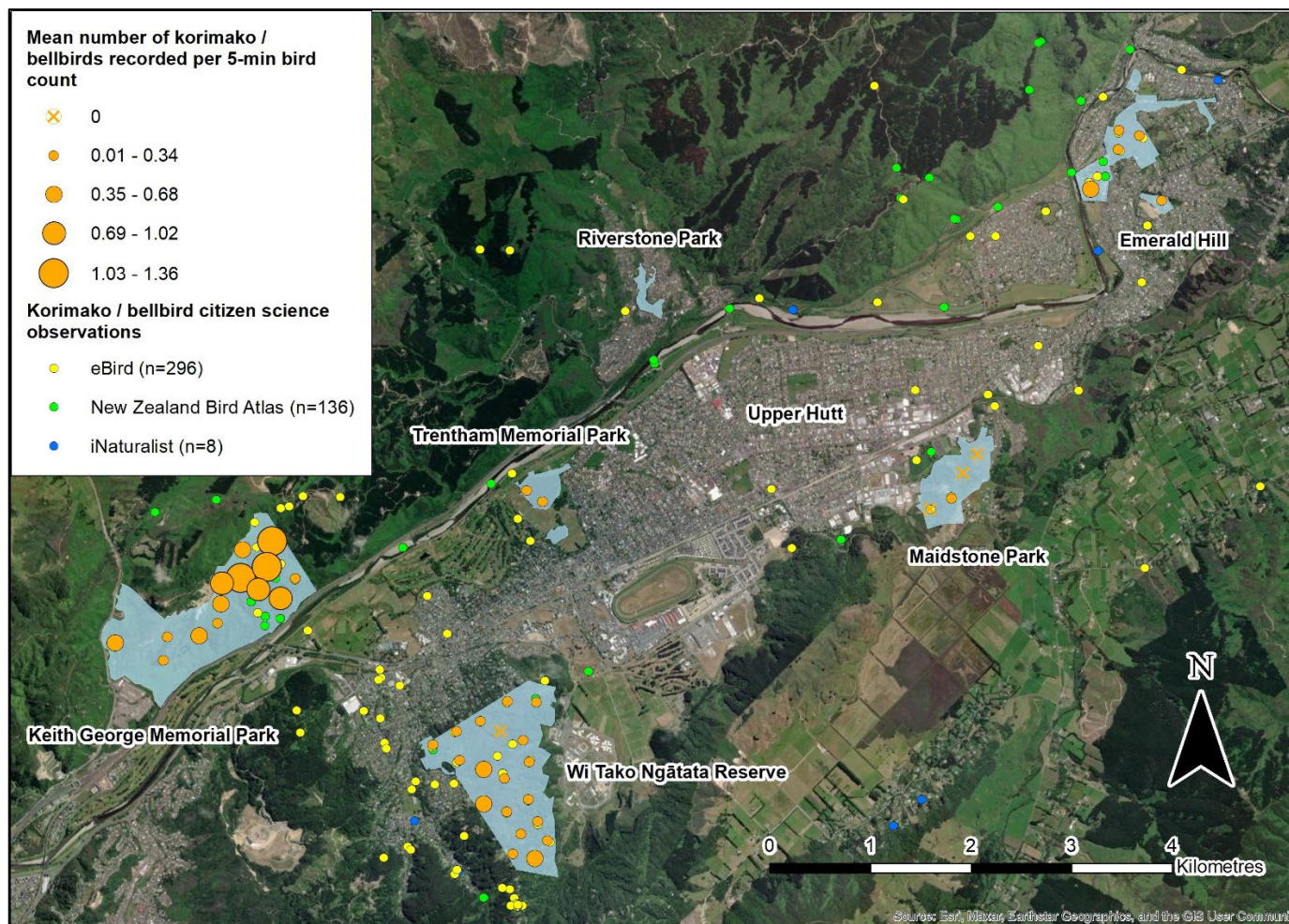


Figure 3.2.14: Distribution of korimako / bellbirds in Upper Hutt City between 2011 and 2022. Orange circles represent korimako / bellbird detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of korimako / bellbirds detected per station between 2011 and 2021. Yellow, green and blue circles represent korimako / bellbird observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

3.2.8 Pīpīwharau / Shining cuckoo (*Chrysococcyx lucidus*)



Image courtesy of Rob Lynch/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The pīpīwharau / shining cuckoo has been the ninth most frequently encountered native forest bird species during these five-minute bird counts, with a total of 181 individuals detected during 142 of 990 bird counts (14%) carried out since 2011. Pīpīwharau / shining cuckoo encounter rates have declined by 94% between 2011 and 2021, from a mean of 0.31 (± 0.07 SE) birds recorded per five-minute bird count in 2011 to 0.02 (± 0.02 SE) birds recorded per count in 2021 (the coefficient of

year on log abundance was -0.182 ; 95% CI $-0.255 - -0.094$; Table 3.2.1; Figure 3.2.15). The pīpīwharau / shining cuckoo is the tenth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 188 encounters with pīpīwharau / shining cuckoos, demonstrating that this species is mostly restricted to native forest habitats in Upper Hutt City, and is only an occasional visitor to open parkland and suburban habitats (Figure 3.2.16).

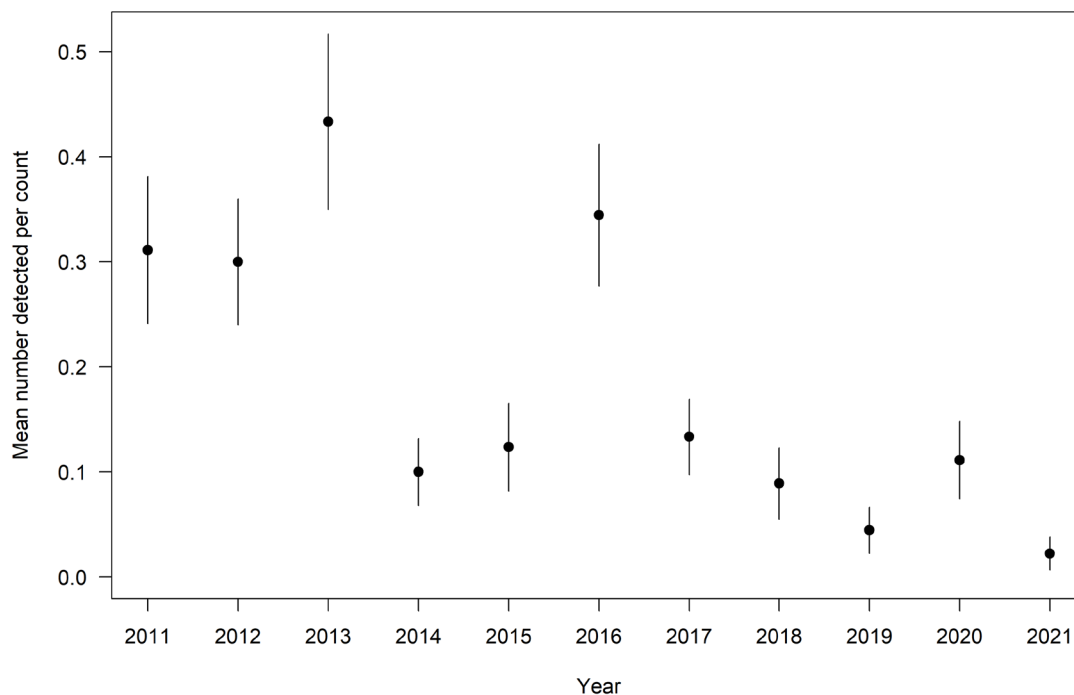


Figure 3.2.15: Mean (\pm SE) number of pīpīwharau / shining cuckoos recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

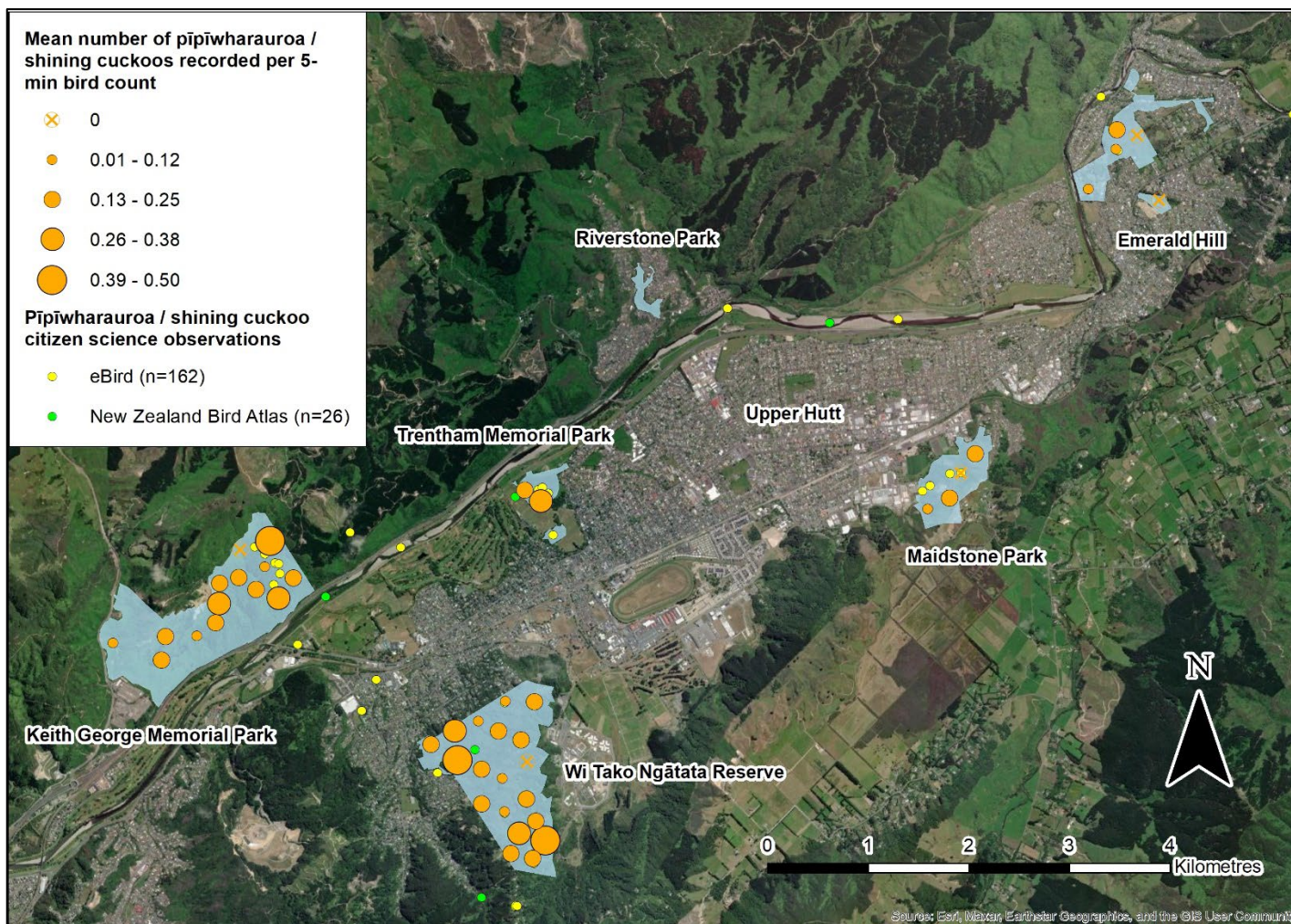


Figure 3.2.16: Distribution of pīpīwharau / shining cuckoos in Upper Hutt City between 2011 and 2022. Orange circles represent pīpīwharau / shining cuckoo detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of pīpīwharau / shining cuckoos detected per station between 2011 and 2021. Yellow and green circles represent pīpīwharau / shining cuckoo observations reported by local citizen scientists via eBird and the New Zealand Bird Atlas between 2011 and 2022.

3.2.9 Kōtare / New Zealand kingfisher (*Todiramphus sanctus*)



Image courtesy of Bartek Wypych/NZ Birds Online

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The kōtare / NZ kingfisher was the eighth most frequently encountered native forest bird species during these five-minute bird counts, with a total of 183 individuals detected during 156 out of 990 bird counts (16%) conducted since 2011. Although mean annual kōtare / NZ kingfisher encounter rates have varied between 0.05 (\pm 0.02 SE) and 0.27 (\pm 0.06 SE) birds detected per count, there has been no overall increase or decrease in encounter rates between 2011 and 2021 (Table 3.2.1; Figure 3.2.17). Kōtare / NZ kingfishers are particularly common in Wi Tako Ngātata Reserve,

Trentham Memorial Park and Maidstone Park, where the presence of mature forest (providing a lot of cavities for nesting) combined with the proximity of rivers, stream, seepages and open playing fields (providing good foraging habitat) may provide particularly high quality habitat for this species. The kōtare / NZ kingfisher is the ninth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 321 encounters with kōtare / NZ kingfisher, demonstrating that this species is widespread in native forest and open parkland habitats and is a regular visitor to suburban habitats in Upper Hutt (Figure 3.2.18).

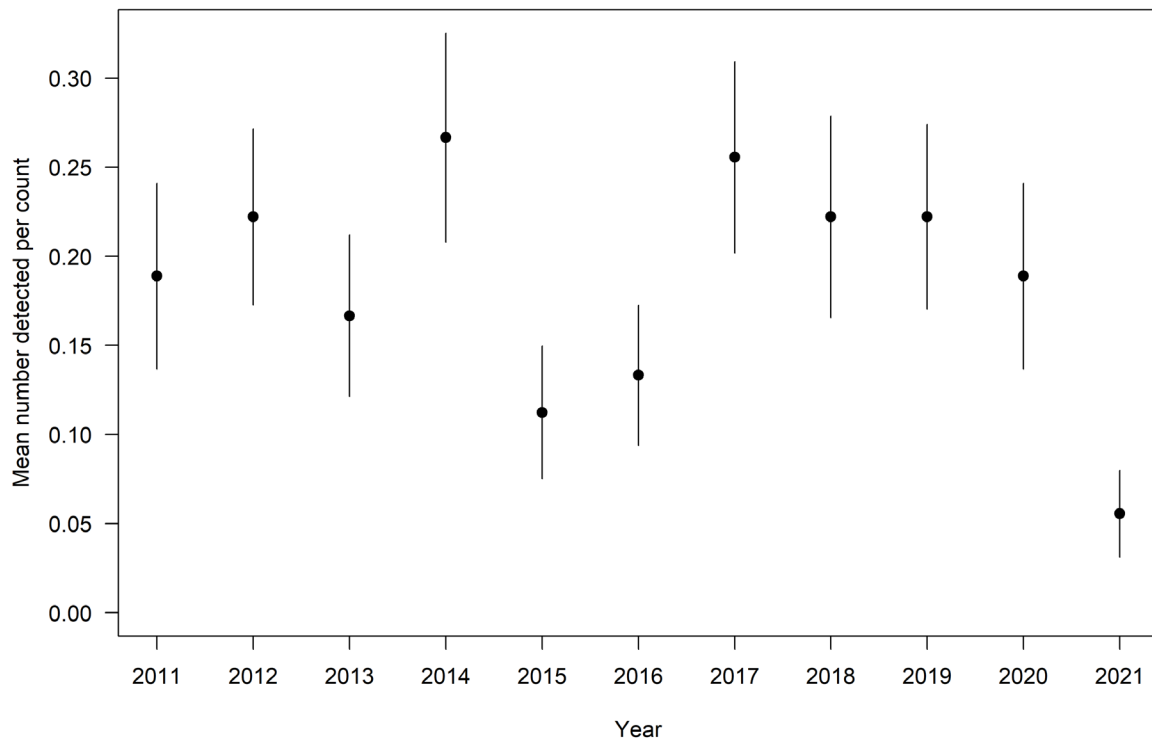


Figure 3.2.17: Mean (\pm SE) number of kōtare / NZ kingfishers recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

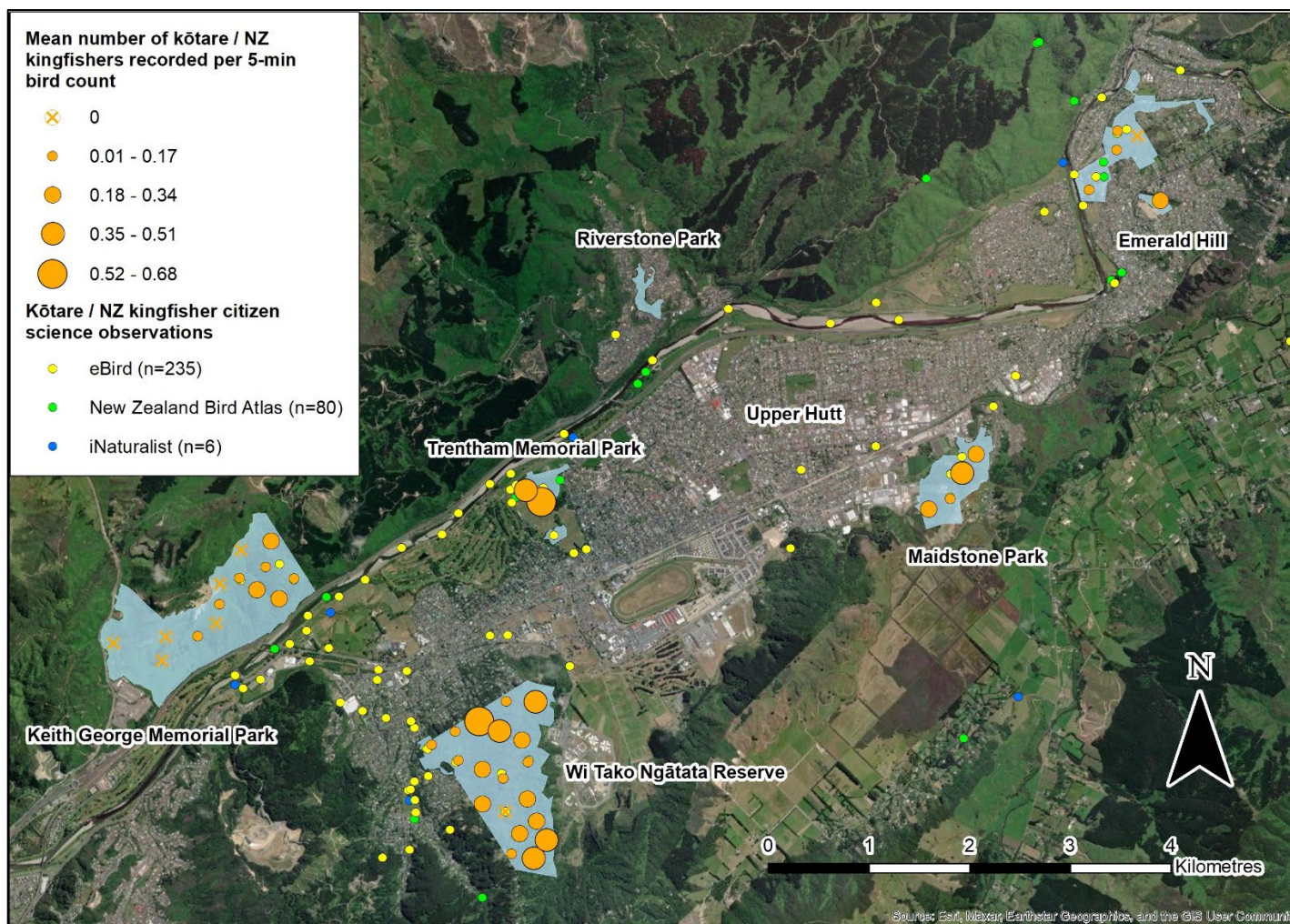


Figure 3.2.18: Distribution of kōtare / NZ kingfishers in Upper Hutt City between 2011 and 2022. Orange circles represent kōtare / NZ kingfisher detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of kōtare / NZ kingfishers detected per station between 2011 and 2021. Yellow, green and blue circles represent kōtare / NZ kingfisher observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

3.2.10 Kererū (*Hemiphaga novaeseelandiae*)

National conservation status: Not Threatened (Robertson *et al.* 2021).

Regional conservation status: Not Threatened (Crisp, 2020).

The kererū has been the tenth most frequently encountered native forest bird species during these five-minute bird counts, with a total of 160 individuals detected during 132 out of 990 bird counts (13%) conducted since 2011. Although mean annual kererū encounter rates have varied between 0.08 (± 0.03 SE) and 0.29 (± 0.06 SE) birds detected per count, there has been no overall increase or decrease in encounter rates between 2011 and 2021 (Table 3.2.1; Figure 3.2.19). The kererū is the fourth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 1026 encounters with kererū, demonstrating that this species is widespread in native forest, open parkland and suburban habitats in Upper Hutt (Figure 3.2.20). During spring each year, kererū are conspicuous along the Te Awa Kairangi/Hutt River, where they spend a great deal of time foraging on the emerging leaves of willow, lucerne and broom.



Image courtesy of Arindam Bhattacharya/NZ Birds Online

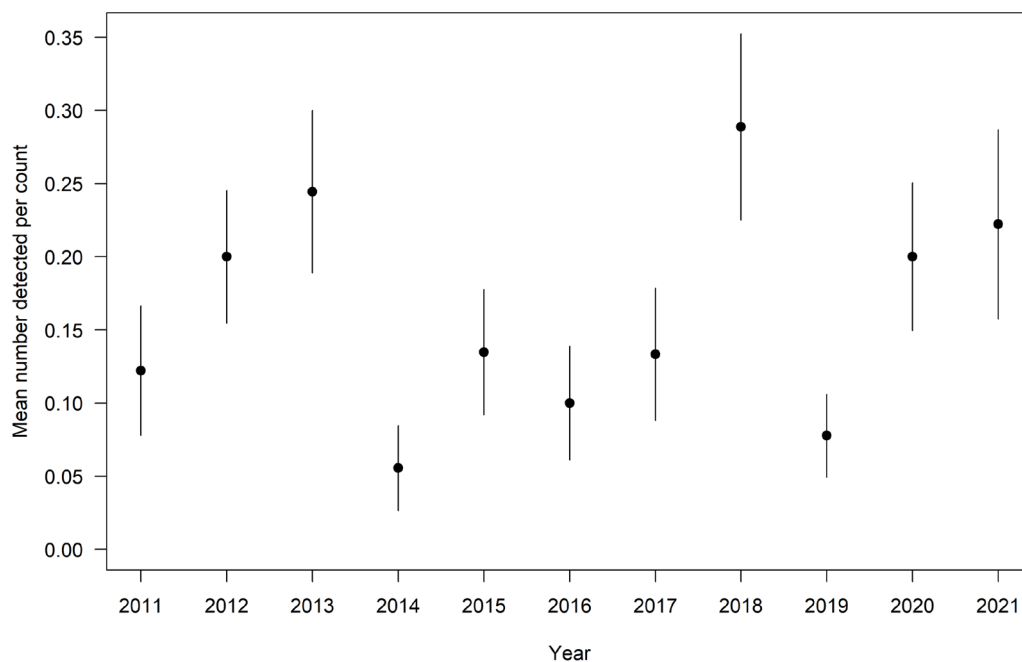


Figure 3.2.19: Mean (\pm SE) number of kererū recorded per five-minute bird count station in Upper Hutt City parks and reserves between 2011 and 2021.

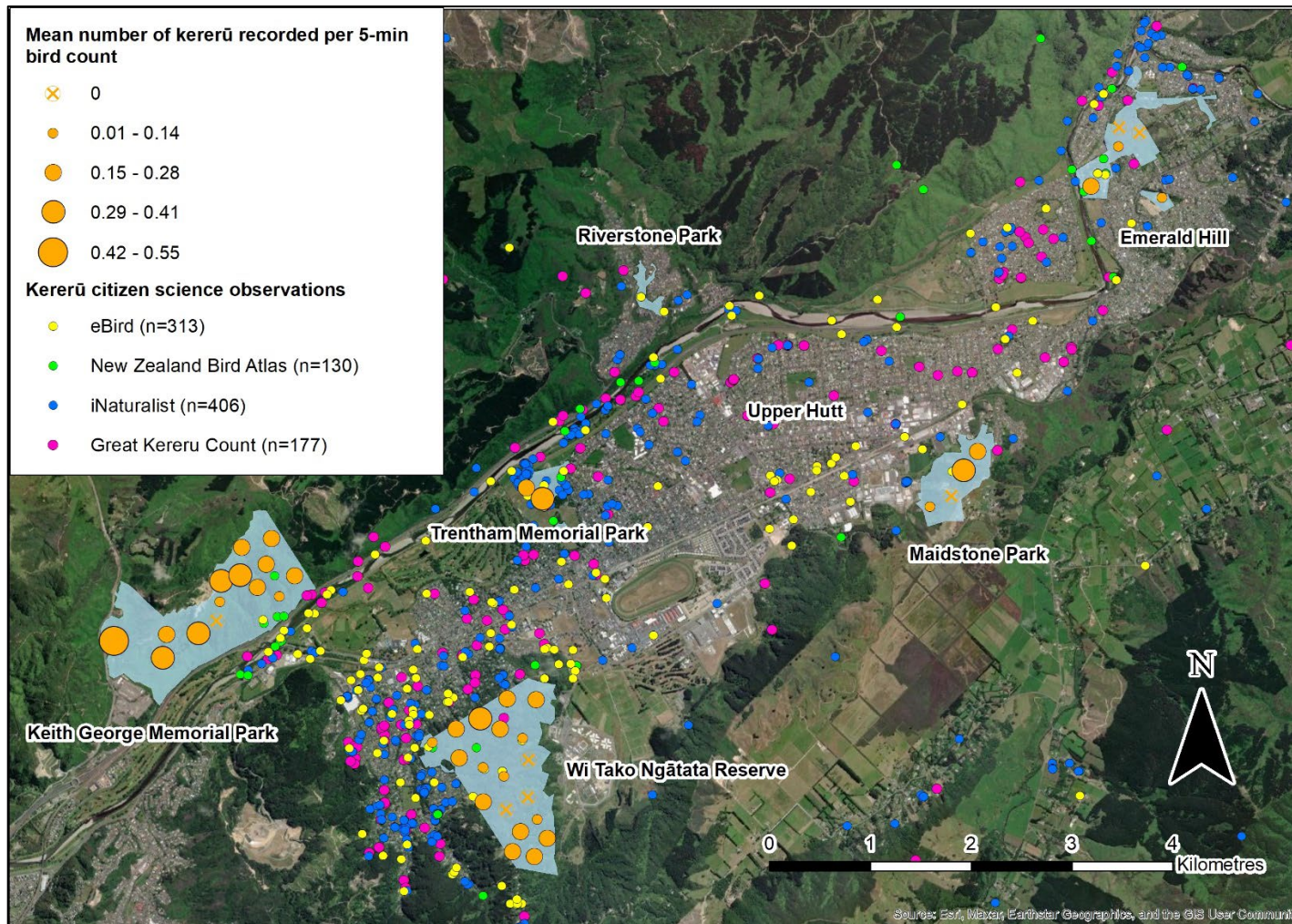


Figure 3.2.20: Distribution of kererū in Upper Hutt City between 2011 and 2022. Orange circles represent kererū detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of kererū detected per station between 2011 and 2021. Yellow, green, blue and purple circles represent kererū observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas, iNaturalist and the Great Kereru Count between 2011 and 2022.

3.2.11 Kārearea / New Zealand falcon (*Falco novaeseelandiae*)



Image courtesy of Steve Attwood/NZ Birds Online

National conservation status:

Nationally Increasing (Robertson *et al.* 2021).

Regional conservation status: Regionally Critical (Crisp, 2020).

The kārearea / NZ falcon has been the eleventh-equal most frequently encountered native forest bird species during these five-minute bird counts, with a total of six individuals detected during six counts carried out in Wi Tako Ngātata Reserve, Keith George Memorial Park and at Emerald Hill (Figure 3.2.21). The kārearea / NZ falcon is the eleventh most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported a total of 161 encounters with kārearea / NZ falcons, demonstrating that this species occurs at

naturally very low densities in native forest, open parkland and suburban habitats in Upper Hutt (Figure 3.2.21). Kārearea / NZ falcon sightings often peak in late summer and autumn, when juvenile birds are dispersing away from their natal territories.

3.2.12 Kākāriki / Red-crowned parakeet (*Cyanoramphus novaezelandiae*)



Image courtesy of Steve Attwood/NZ Birds Online

National conservation status: At Risk, Relict (Robertson *et al.* 2021).

Regional conservation status: At Risk, Recovering (Crisp, 2020).

The kākāriki / red-crowned parakeet was the eleventh-equal most frequently encountered native forest bird species during these five-minute bird counts, with a total of six individuals detected during four counts carried out in Wi Tako Ngātata Reserve and Keith George Memorial Park (Figure 3.2.22). The kākāriki / red-crowned parakeet is the fifteenth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported seven encounters with kākāriki / red-crowned parakeets demonstrating that this species is an occasional visitor to

native forest and open parkland habitats in the Upper Hutt suburb of Silverstream, and is unlikely to be maintaining a local, self-sustaining population in Upper Hutt City parks and reserves at present (Figure 3.2.22).

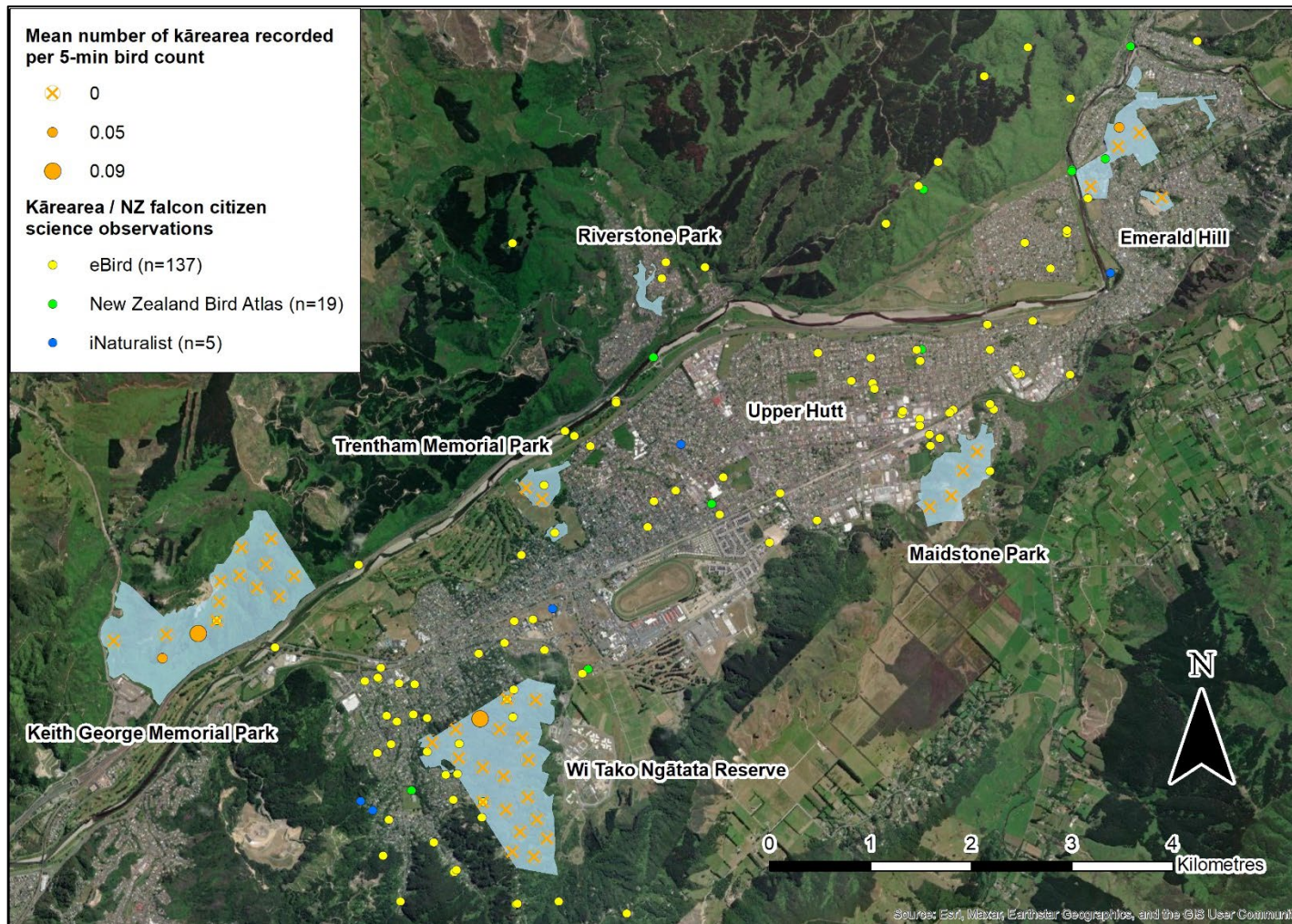


Figure 3.2.21: Distribution of karearea / NZ falcons in Upper Hutt City between 2011 and 2022. Orange circles represent karearea / NZ falcon detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of karearea / NZ falcons detected per station between 2011 and 2021. Yellow, green and blue circles represent karearea / NZ falcons observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

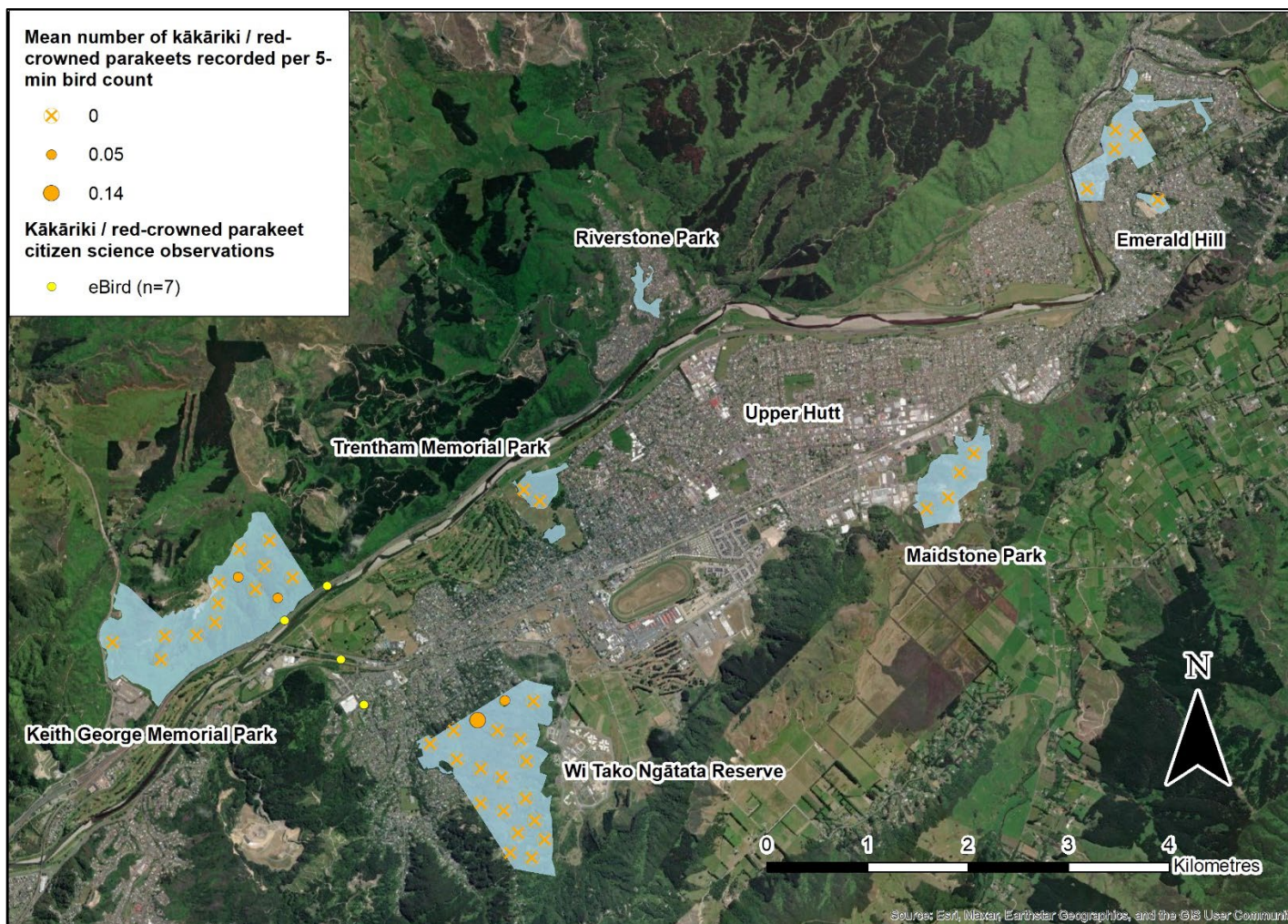


Figure 3.2.22: Distribution of kākāriki / red-crowned parakeets in Upper Hutt City between 2011 and 2022. Orange circles represent kākāriki / red-crowned parakeet detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of kākāriki / red-crowned parakeets detected per station between 2011 and 2021. Yellow circles represent kākāriki / red-crowned parakeet observations reported by local citizen scientists via eBird between 2011 and 2022.

3.2.13 Ruru / Morepork (*Ninox novaeseelandiae*)



Image courtesy of Adam Clarke/NZ Birds

National conservation status: Not Threatened
(Robertson *et al.* 2021).

Regional conservation status: Not Threatened
(Crisp, 2020).

The ruru / morepork was the thirteenth most frequently encountered native forest bird species during these five-minute bird counts, with a total of three individuals detected during three counts carried out in Wi Tako Ngātata Reserve and at Emerald Hill (Figure 3.2.23). Because these counts have been carried out during daylight hours only, ruru / moreporks are very unlikely to be encountered due to their nocturnal habits. In 2017, a single ruru / morepork was also encountered during the walk-through survey in Riverstone Park. This latter bird was located at its daytime roost after the observer (NM) investigated the alarm calls of a pīwakawaka / NZ fantail. In 2018, a ruru / morepork nest containing a single egg was also located by the authors at the base of a *Fuscospora* tree stump in Wi Tako Ngātata reserve. The ruru / morepork is the twelfth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported 73 encounters with ruru / moreporks, demonstrating that this species is regularly encountered in native forest, parkland and suburban habitats throughout Upper Hutt (Figure 3.2.23). This species is almost certainly being under-reported due to its nocturnal habits, so is likely to be much more common and widespread in forested habitats in Upper Hutt than these data would suggest. A dedicated survey or citizen science project will be needed to gain an accurate understanding of the abundance and distribution of ruru / moreporks in Upper Hutt City.

3.2.14 Tītipounamu / Rifleman (*Acanthisitta chloris*)

National conservation status: At Risk, Declining
(Robertson *et al.* 2021).

Regional conservation status: Not Threatened
(Crisp, 2020).

The tītipounamu / rifleman was the fourteenth most frequently encountered native forest bird species during these five-minute bird counts, with a total of two individuals detected during two counts carried out in Wi Tako Ngātata Reserve in 2011 and 2013 (Figure 3.2.24).

In 2016, a single tītipounamu / rifleman was encountered in Keith George Memorial Park when one of the authors (NM) was travelling between count stations (Figure 3.2.24), and another tītipounamu / rifleman was encountered between two count stations in Wi Tako Ngātata Reserve in 2021 (N. McArthur *personal observation*).

The tītipounamu / rifleman is the fourteenth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported nine encounters with tītipounamu / riflemen, demonstrating that this species is likely to be the rarest resident native forest bird species present in Upper Hutt parks and reserves, with tiny, relict populations present in both Keith George Memorial Park and Wi Tako Ngātata Reserve, and at Cannon Point in the Akatarawa Forest.



Image courtesy of John and Melody Anderson/New Zealand Birds Online

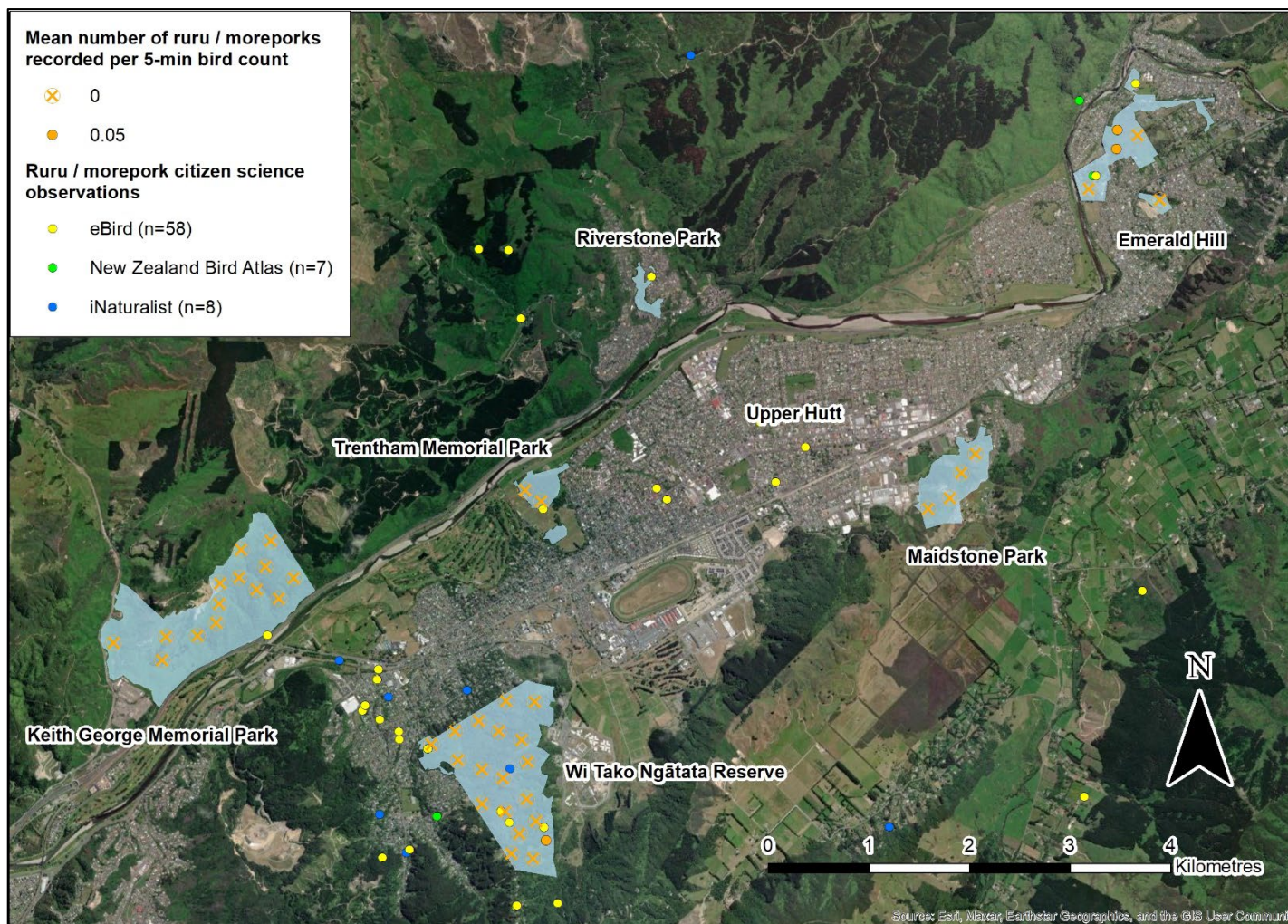


Figure 3.2.23: Distribution of ruru / moreporks in Upper Hutt City between 2011 and 2022. Orange circles represent ruru / morepork detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of ruru / moreporks detected per station between 2011 and 2021. Yellow, green and blue circles represent ruru / morepork observations reported by local citizen scientists via eBird, the New Zealand Bird Atlas and iNaturalist between 2011 and 2022.

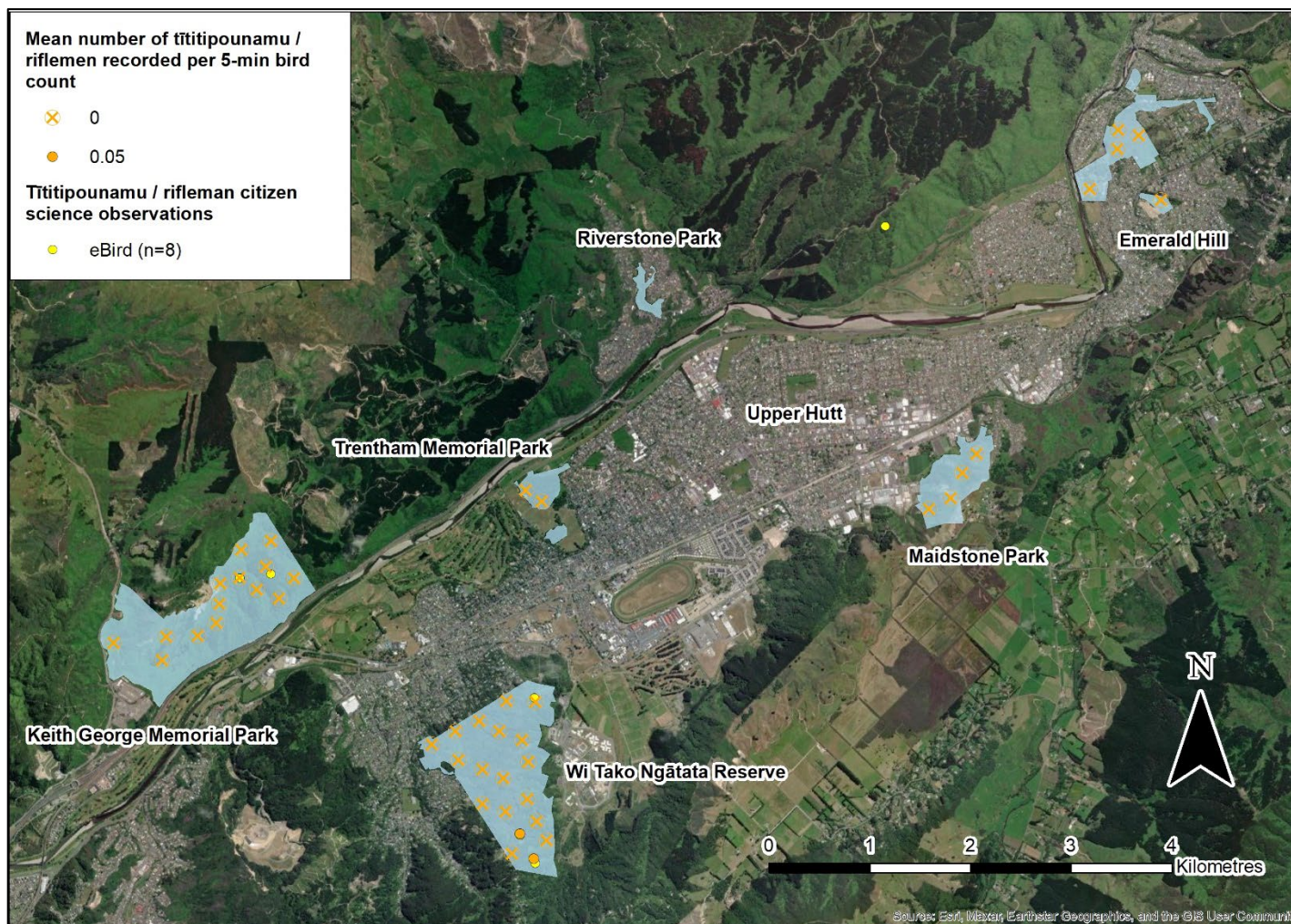


Figure 3.2.24: Distribution of tītīpounamu / rifleman in Upper Hutt City between 2011 and 2022. Orange circles represent tītīpounamu / rifleman detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of tītīpounamu / rifleman detected per station between 2011 and 2021. Yellow circles represent tītīpounamu / rifleman observations reported by local citizen scientists via eBird between 2011 and 2022.

3.2.15 Koekoeā / Long-tailed cuckoo (*Eudynamys taitensis*)



Image courtesy of Adam Clarke/NZ Birds Online

National conservation status:

Nationally Vulnerable
(Robertson *et al.* 2021).

Regional conservation status:

At Risk, Naturally Uncommon
(Crisp, 2020).

The koekoeā / long-tailed cuckoo has been the fifteenth most frequently encountered native forest bird species during these five-minute bird counts, with a single individual detected during one count carried out in Keith George Memorial Park in 2015 (Figure 3.2.25). The koekoeā / long-tailed cuckoo is the thirteenth most frequently reported native forest bird

species by citizen scientists in Upper Hutt City. Between 2011 and 2022, citizen scientists reported nine encounters with koekoeā / long-tailed cuckoos, demonstrating that this species is likely to be either a vagrant to, or passage migrant through, Upper Hutt City at the present time (Figure 3.2.25). This in turn indicates that the local pōpokotea / whitehead populations present in both Keith George Memorial Park and Wi Tako Ngātata Reserve are unlikely to be experiencing brood parasitism by these cuckoos.

3.2.16 Kākā (*Nestor meridionalis*)



Image courtesy of David Brooks/NZ Birds Online

National conservation status:

At Risk, Recovering (Robertson *et al.* 2021).

Regional conservation status:

Regionally Vulnerable (Crisp, 2020).

The kākā has not yet been detected during these five-minute bird counts and is the sixteenth most frequently reported native forest bird species by citizen scientists in Upper Hutt City. Kākā have been reported by citizen scientists on five occasions since 2019, including up to three kākā observed visiting properties in suburban Pinehaven between the 16th and 22nd of April 2019, and an

individual observed flying over a Mount Marua property on the 4th of April 2020 (Birds NZ Wellington Region Data 2019a and 2019b; Greater Wellington Regional Council Data 2020; Figure 3.2.26). These visiting birds are likely to be emigrants from one of the large and highly productive kākā populations now present in Wellington City, on Kāpiti Island and at Pūkaha Mount Bruce, raising the prospect that this species may recolonise Upper Hutt City in the coming years.

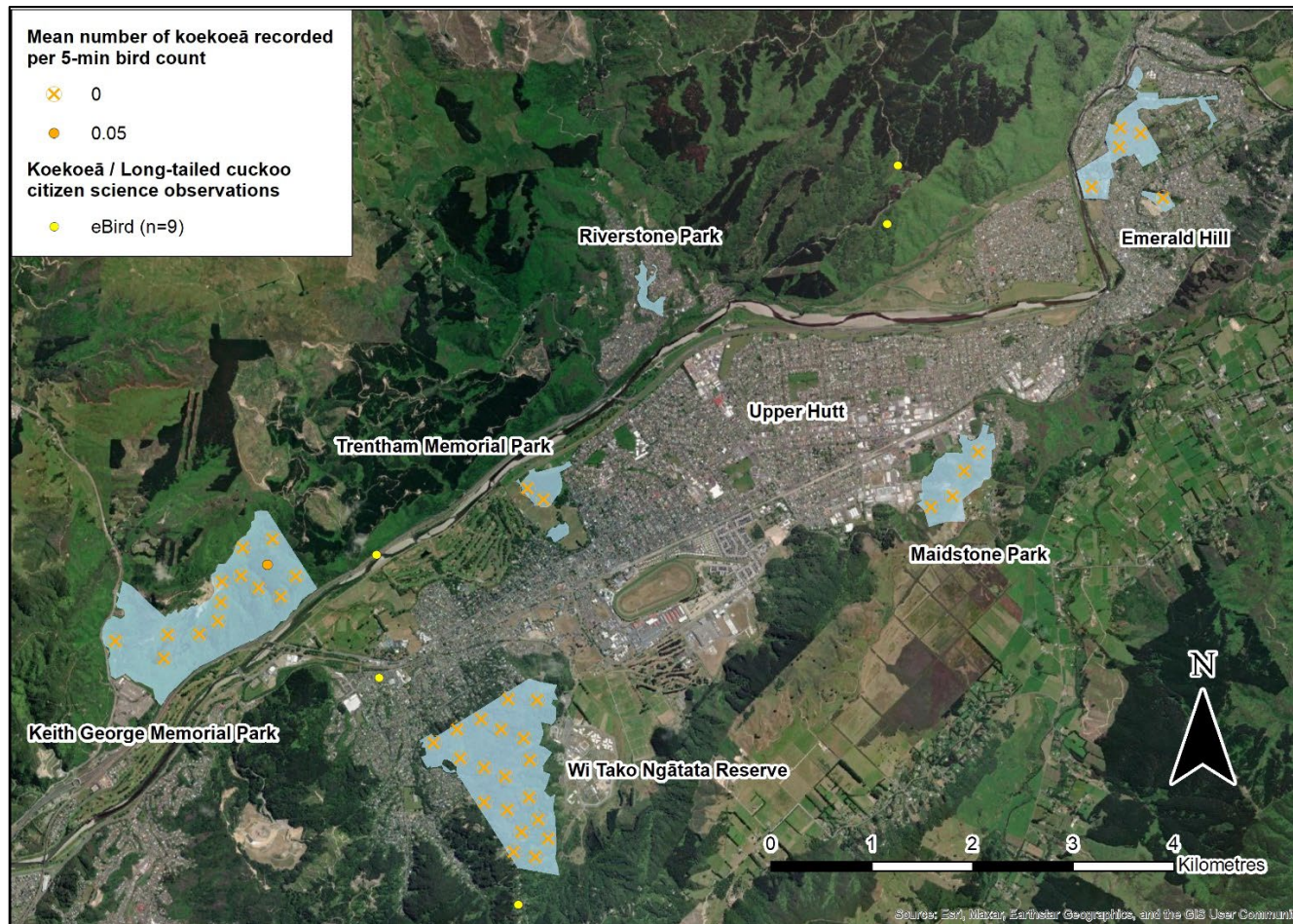


Figure 3.2.25: Distribution of koekoeā / long-tailed cuckoos in Upper Hutt City between 2011 and 2022. Orange circles represent koekoeā / long-tailed cuckoo detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of koekoeā / long-tailed cuckoos detected per station between 2011 and 2021. Yellow circles represent koekoeā / long-tailed cuckoo observations reported by local citizen scientists via eBird between 2011 and 2022.

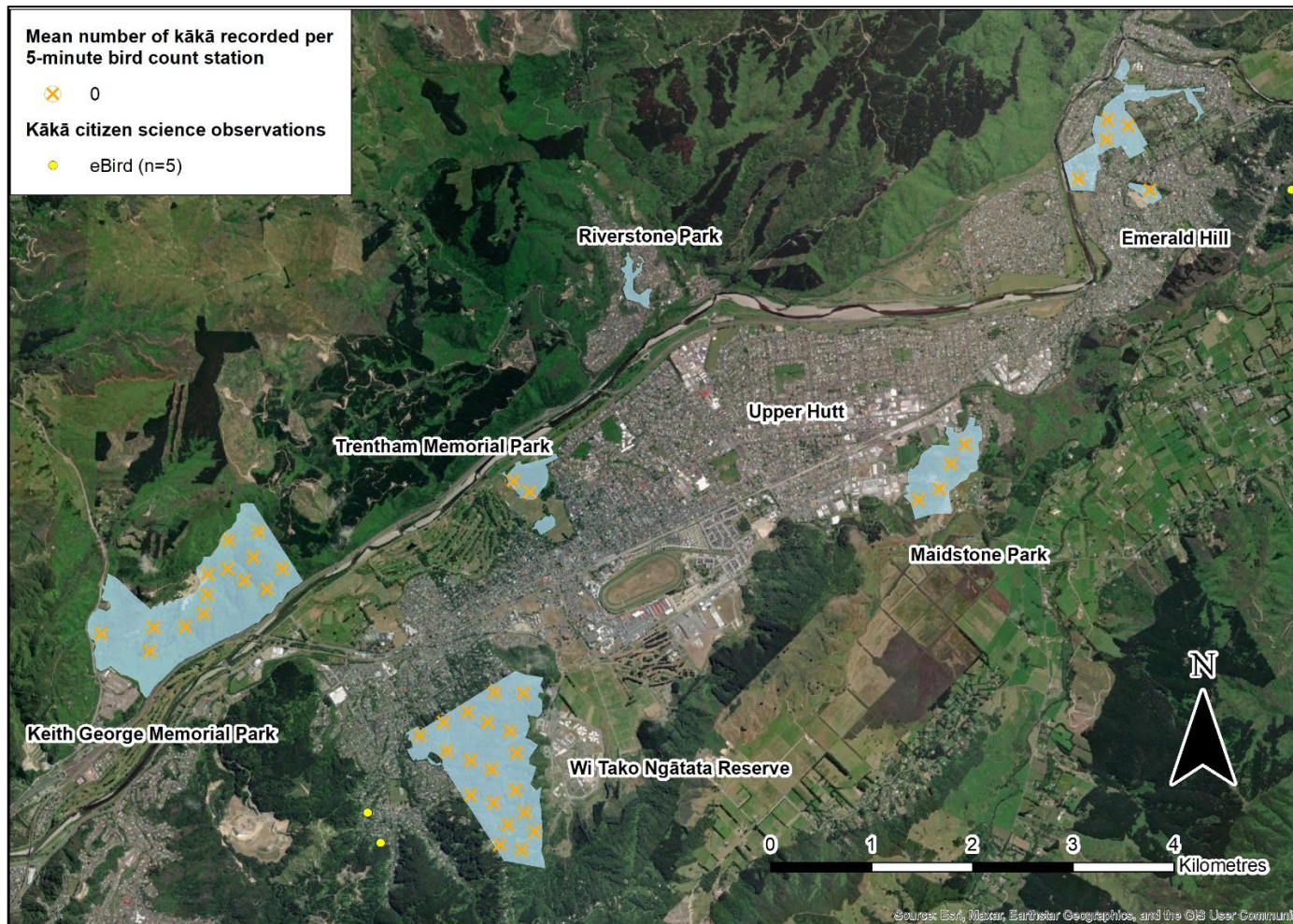


Figure 3.2.26: Distribution of kākā in Upper Hutt City between 2011 and 2022. Orange circles represent kākā detections at five-minute bird count stations, with the size of the circle corresponding to the mean annual number of kākā detected per station between 2011 and 2021. Yellow circles represent kākā observations reported by local citizen scientists via eBird between 2011 and 2022.

4. Discussion

4.1 Trends in the total abundance of native versus introduced bird species

The results of these bird counts show that the bird communities that inhabit Upper Hutt City parks and reserves have a high degree of indigenous dominance, with over twice as many native birds encountered per bird count each year on average, compared to introduced birds (Figure 3.1.1). This compares favourably to Wellington City parks and reserves, where an average of between only 15% and 30% more native than introduced birds have been encountered per bird count each year since 2011 (McArthur *et al.* 2021). This difference is likely due to the fact that the majority of the Upper Hutt City bird count data is collected from two relatively large and well-connected reserves containing stands of old-growth forest, whereas the majority of Wellington City bird counts are carried out in smaller, less well-connected reserves which are typically vegetated in younger, regenerating native forest. This being the case, the high degree of indigenous dominance found in these larger Upper Hutt reserves provides a useful illustration of the importance of maintaining both the habitat quality within these reserves and the connectivity of these reserves to nearby patches of native and exotic forest habitats (Ross *et al.* 2019). This in turn demonstrates the importance of achieving Goal 4, Objective 3 of Upper Hutt City's Open Space Strategy, namely that: *Biodiversity values are protected and enhanced by maintaining and developing ecological corridors and green spaces that link rivers, streams and surrounding hills* (UHCC 2018).

McArthur & Walter (2021) reported that modelling of these count data had detected a 20% decline in the mean number of native birds detected per bird count between 2011 and 2020 but believed that this trend wasn't cause for concern. The reason for this conclusion was that the upper 95% confidence limit of the coefficient estimate of the slope of the trendline of the preferred model was greater than zero, indicating a small statistical possibility that the true trend in numbers could actually either be stable or gradually increasing. Adding the 2021 bird count data to this analysis has now reversed this apparent trend, with the preferred model now indicating that the mean number of native birds counted per count has *increased* by 19% between 2011 and 2021. Both the upper and lower 95% confidence limits around the coefficient estimate of the slope of this new trendline are both >0, indicating that we now have a higher level of confidence that this increasing trend reflects a true increase in the mean number of native birds being counted in Upper Hutt City reserves.

4.2 Trends in the abundance of individual native forest bird species

The abundance of pīwakawaka / NZ fantails declined dramatically in Upper Hutt parks and reserves between 2010 and 2011 (Govella *et al.* 2011; McArthur *et al.* 2012), before undergoing a spectacular recovery between 2011 and 2021 (Figure 3.2.10). This initial decline was mirrored by similar dramatic declines in pīwakawaka / NZ fantail numbers observed between 2010 and 2011 in other locations including the Akatarawa Forest, Kaitoke Regional Park and the Wainuiomata Water Collection Area (Greater Wellington Regional Council, unpublished data). This sudden and widespread decline was almost certainly a consequence of two mass pīwakawaka / NZ fantail mortality events that occurred during the two unusually severe snowfall events that occurred in the Wellington region between the 24th and 26th of July and the 14th and 17th of August 2011 (NIWA 2012). During these events, snow

fell to sea-level in Wellington City and record low temperatures were recorded across the region. At Wallaceville in Upper Hutt for example, the maximum recorded temperature on the 15th of August was 4.2°C, the lowest ever observed at this site in 41 years of weather monitoring (NIWA 2011). Pīwakawaka / NZ fantails are known to be particularly susceptible to sudden declines and even local extinction following such severe weather events (e.g., Miskelly & Sagar 2008), but populations often quickly recover thanks to this species' high reproductive rate and good dispersal abilities (Heather & Robertson 2015; Powlesland 2013). The steady and substantial increase in the abundance of pīwakawaka / NZ fantails in Upper Hutt reserves that has occurred between 2011 and 2021 therefore appears to represent a recovery of the local population following the mass mortality events that occurred during the winter of 2011. These events highlight the potential susceptibility of local pīwakawaka / NZ fantail populations to impacts of human-induced climate change. Any increase in the frequency, duration or severity of adverse weather events occurring in Upper Hutt, particularly those that involve severely cold temperatures or prolonged bouts of torrential rain, has the potential to reduce the long-term viability of local pīwakawaka / fantail populations in Upper Hutt City and its parks and reserves (McGlone & Walker 2011).

McArthur & Walter (2021) reported that the mean annual encounter rate of pōpokotea / whitehead had increased by 29% between 2011 and 2020 and speculated that this may indicate that local predator control efforts have benefitted this species which is at moderate risk of depredation by mammalian predators (Innes *et al.* 2010; Parlato *et al.* 2015). Unfortunately, the addition of the 2021 pōpokotea / whitehead count data to this analysis has now changed this trend, with the preferred model now indicating that there has been no significant increase or decrease in pōpokotea / whitehead encounter rates since 2011. This result is consistent with patterns observed elsewhere, for example no change in pōpokotea / whitehead encounter rates have been observed in Wellington City parks and reserves over the same time period, despite the presence of a large and productive source population in Zealandia, and the extensive mammalian predator control efforts now occurring throughout Wellington City's parks and reserves (McArthur *et al.* 2021). Both of these results indicate that predator control efforts in both Upper Hutt and Wellington City have not yet reduced mammalian predator numbers to the extent required to allow local pōpokotea / whitehead populations to recover.

Mean annual encounter rates for riroriro / grey warblers, tauhou / silvereyes and pīpīwharau / shining cuckoos have declined by 86%, 76% and 94% respectively since 2011, although it appears unlikely that these observed declines have been caused by threats operating at a local level within these reserves. All three species are considered to be relatively strong dispersers, capable of crossing substantial gaps between patches of native forest habitat (Heather & Robertson 2015), so it is unlikely that any changes to habitat connectivity that have occurred over the past ten years (e.g., the harvesting of mature plantation forest on the northern and eastern boundaries of Keith George Memorial Park) have caused these declines. Similarly, all three species are considered to be relatively well-adapted to coexist with mammalian predators (Innes *et al.* 2010; Parlato *et al.* 2015), so it is unlikely that an increase in local depredation rates by mammalian predators has caused these declines. Indeed, none of the native forest bird species considered to be at higher risk of depredation by mammalian predators, including tūī, pōpokotea / whitehead and miromiro / tomtit, have shown declines over the past eleven years, suggesting that the current level of mammalian predator control within these reserves are succeeding in maintaining the existing populations of vulnerable native forest bird species. Instead, it is possible that the declines being observed in these three species are a consequence of environmental changes occurring at larger spatial scales. For example, the mean number of tauhou / silvereyes reported by citizen scientists participating in the New Zealand Garden Bird Survey has declined by 38% since 2009 (Brandt *et al.* 2020), suggesting that the local decline of

tauhou / silvereeyes observed in Upper Hutt City parks and reserves since 2011 may be part of a nationwide change in population size, distribution or habitat use. The 94% decline in pīpīwharau / shining cuckoo encounter rates is perhaps a little more concerning, given both the severity of this decline and the fact that this has been mirrored by a 35% decline in the encounter rates of pīpīwharau / shining cuckoos in Wellington City over the same time period (McArthur *et al.* 2022). It is possible this local decline in pīpīwharau / shining cuckoo encounter rates in Upper Hutt is being driven by the local decline in riroriro / grey warbler encounter rates since pīpīwharau / shining cuckoos are obligate brood parasites and rely entirely on riroriro / grey warblers to incubate their eggs and raise their young (Heather & Robertson 2015). Alternatively, this local decline in pīpīwharau / shining cuckoos may be a consequence of one or more factors acting to reduce pīpīwharau / shining cuckoo survival rates in their winter range in the western Pacific, or during migration.

Tītītipounamu / rifleman remain extremely uncommon in Upper Hutt reserves, to the extent that they are unlikely to maintain functional populations in the reserves in which they have been detected in the long term. Tītītipounamu / rifleman have only been detected at three locations in Wi Tako Ngātata Reserve over the past eleven years, with only one or two birds observed on any one occasion. During the 2016 counts, this species was detected in Keith George Memorial Park for the first time since these surveys commenced in 2005. Indeed, the only prior record of tītītipounamu / rifleman in Keith George Memorial Park currently known is an observation recorded by Masterton-based ornithologist R.H.D. Stidolph on the 20th of April 1925 (Stidolph 1925). This 2016 tītītipounamu / rifleman observation may therefore be the first observation of this species in Keith George Memorial Park in over 90 years. While current levels of mammalian pest control should be sufficient to allow local tītītipounamu / rifleman populations to recover and persist, our monitoring results suggest that this recovery is not occurring, probably due to the extremely low numbers currently present in these reserves and in nearby areas of forest habitat. Management options to improve the likelihood that tītītipounamu / rifleman will re-establish self-sustaining populations in both Wi Tako Ngātata Reserve and Keith George Memorial Park include the installation of nest boxes to improve nesting success (Briskie *et al.* 2014) and/or a supplementary translocation of individuals from a nearby source population such as the Wainuiomata/Orongorongo Water Collection Area.

Kākāriki / red-crowned parakeets have not been detected during these five-minute bird counts since 2013, so are unlikely to be maintaining a resident population in Upper Hutt reserves at the present time. Although the current mammalian pest control regime in both reserves may be sufficient to maintain local populations of kākāriki / red-crowned parakeets, the presence of introduced eastern rosellas (*Platycercus eximius*) at relatively high densities in both reserves may reduce the likelihood that kākāriki / red-crowned parakeets will successfully re-colonise at any time in the foreseeable future. Eastern rosellas are considered a potential competitor for nest sites with native hole-nesters such as kākāriki / red-crowned parakeets (Wright & Clout 2001; Galbraith 2010) and also act as reservoirs and vectors of avian pathogens such as beak and feather disease virus, which is known to cause increased mortality in wild parakeet populations (Ortiz-Catedral *et al.* 2009; Galbraith, 2010).

4.3 Spatial patterns in the distribution of native forest bird species

The distribution of native forest birds in Upper Hutt City parks and reserves has not changed substantially from that reported previously (McArthur *et al.* 2012; 2013; 2015; 2016; 2017; 2018 and 2019; McArthur & Walter 2021). Those species with the strongest dispersal abilities, or those that are the least susceptible to the impacts of mammalian predators and habitat fragmentation (including

tauhou / silvereye, tūi, riroriro / grey warbler and pīwakawaka / fantail) continue to have the most widespread distributions in Upper Hutt City parks and reserves. Those species with more limited dispersal abilities, or greater susceptibility to depredation by mammalian predators (including pōpokotea / whitehead, miromiro / tomtit and tītīpounamu / rifleman) have more localised distributions and are typically only present in the larger and better-connected reserves.

Keith George Memorial Park and Wi Tako Ngātata Reserve both continue to support populations of almost all of the native forest bird species detected during these five-minute bird counts between 2011 and 2021. This is unsurprising, given that these are by far the two largest reserves currently being monitored, both have been receiving mammalian predator control for a number of years, and both are relatively well connected to nearby tracts of native forest habitat in the Akatarawa Forest and Eastern Hutt hills. Both reserves should continue to be considered high priorities for biodiversity management within the Upper Hutt City parks and reserves network, as they both provide Upper Hutt City ratepayers with the opportunity to encounter the full range of native forest bird species that currently exists in the Upper Hutt parks and reserves network.

The new five-minute bird count monitoring design implemented from 2011 onwards has allowed us to map patterns in bird distribution in greater detail within both Keith George Memorial Park and Wi Tako Ngātata Reserve. One pattern that has emerged from this mapping is that several species, including miromiro / tomtit, pīwakawaka / fantail, korimako / bellbird and kōtare / NZ kingfisher appear to be significantly more abundant and/or conspicuous in the north-eastern portion of Keith George Memorial Park than in the south-western portion of the reserve. Similarly, both miromiro / tomtits and pōpokotea / whiteheads appear to be significantly more abundant and/or conspicuous in the southern half of Wi Tako Ngātata Reserve in comparison to the northern half of the reserve. In both cases, the portions of these reserves in which encounter rates for these species are higher both contain original mature stands of hard beech and black beech whereas the remainder of both reserves consists of a mosaic of original and secondary growth broadleaf forest, mixed beech-broadleaf forest and shrubland (Wassilief & Clark 1986; GWRC 2020). It is likely therefore, that both the north-eastern portion of Keith George Memorial Park and the southern portion of Wi Tako Ngātata Reserve provide particularly high-quality habitat for a number of native forest bird species, due to the presence of mature beech forest.

The incorporation of bird observation data collected by local citizen scientists into the distribution maps included in this report has enabled bird distribution in Upper Hutt City to be mapped in much greater detail than in previous reports. The reason for this is that the Upper Hutt City five-minute bird count dataset and local citizen science bird distribution datasets are highly complementary. The original aim of this Upper Hutt City five-minute bird count monitoring programme was to sample bird populations in forested habitats in Upper Hutt City's parks and reserve network, so it was not designed to provide any information on bird distribution in other habitats in the city such as suburban backyards. The majority of bird observations reported by local citizen scientists, however, are from these suburban habitats (e.g., Figure 4.1), so combining these two datasets provides us with a much more detailed and complete picture of bird distribution in Upper Hutt City than either of these datasets can provide on their own. The distribution maps constructed by combining these datasets have revealed that many of the native forest bird species present in Upper Hutt City are reported with greater frequency from suburbs with greater tree cover and more mature gardens (e.g., the suburbs of Pinehaven and Silverstream), and are reported at a lower frequency from suburbs with less mature tree cover (e.g., Trentham, Wallaceville and Ebdentown). This in turn suggests that efforts to increase tree cover in the central suburbs of Upper Hutt in particular could lead to improvements in habitat

quality for native birds that would usefully complement the predator eradication efforts being undertaken in the city.



Figure 4.1: A juvenile kārearea / NZ falcon photographed perched on the edge of a trampoline in suburban Upper Hutt. The bird had been attracted to this suburban garden by a flock of tiu / house sparrows (*Passer domesticus*) feeding on the lawn (Image courtesy of Sarah McAlpine).

Incorporating citizen science data into this bird monitoring programme also improves our ability to detect bird re-colonization events as they occur. Citizen scientists are best placed to detect the first few founder birds that arrive during a re-colonization event because they submit observations all year around from a large number of locations across the city. Indeed, such an event may be in the process of occurring after local residents reported the presence of up to three kākā in suburban Pinehaven over a six-day period in April 2019 (Birds NZ Wellington Region Data 2019a and 2019b), and a single kākā visiting a property in Mount Marua in April 2020 (Greater Wellington Regional Council Data 2020). These birds are likely to have dispersed from one of the large and productive kākā populations now established in Wellington City, on Kāpiti Island and at Pūkuha Mount Bruce, and these sightings represent possibly the first time that kākā have been sighted in suburban Upper Hutt for over 100 years.

Despite the quantity of citizen science data that does exist, it is our impression that the rate at which bird observations are being reported by Upper Hutt residents has not yet reached its upper limit. Instead, we believe that current reporting rates are being limited by the degree to which biodiversity reporting tools are being promoted locally, the limited training opportunities available to local citizen scientists to learn how to use these tools and the lack of feedback citizen scientists receive regarding their observations. Developing a more coordinated and systematic approach towards improving local citizen scientists' awareness of the value of their observations, their awareness of tools available to record and share their observations and how to access the training they need to use these tools effectively would increase both the quality and quantity of citizen science data available to local agencies for environmental reporting and decision making. Investing additional time and resources

into mobilising citizen scientists to contribute towards native bird monitoring in Upper Hutt City would be consistent with the current global trend towards 'crowd sourcing' bird observations from skilled birdwatchers, capturing these observations in open-access databases and then using new analytical techniques to identify ecological patterns in these large datasets (Sullivan *et al.* 2014). For example, observational data from the global eBird database are now being used to inform conservation action and environmental policy around the world, including in the Wellington region (Sullivan *et al.* 2017). Such an initiative would also contribute towards the implementation of Upper Hutt City's Open Space Strategy, which includes a commitment to carry out bird counts in Upper Hutt's parks and reserves, *in collaboration with...the local community* (UHCC 2018).

Although our knowledge of the distribution of diurnal, or day-active bird species in Upper Hutt City has improved substantially over the past eleven years, the distribution of the one relatively widespread nocturnal native forest bird species in Upper Hutt City is very poorly understood. The ruru / morepork may be relatively common in Upper Hutt City parks and reserves, and trends in ruru / morepork encounter rates and distribution over time could provide an additional measure of the outcomes of local efforts to manage and improve native bird habitats within the city. An opportunity therefore exists to fill this knowledge gap by running a citizen science project specifically aimed at mapping the distribution of ruru / morepork in Upper Hutt City and quantifying encounter rates as an indirect measure of abundance. We suggest that such a project could be modelled on the 2011 Hamilton City morepork survey, whereby volunteers were assigned to a pre-defined set of survey locations over a period of five consecutive nights (Morgan & Styche 2012). This project would also serve a secondary purpose of providing Upper Hutt City residents with an additional opportunity to engage with their surrounding natural environment, learn more about the birds around them and improve their skills as citizen scientists.

5 Recommendations

Based on the results described in this report, we suggest that Upper Hutt City Council considers adopting the following recommendations:

- That the Council continues to work with stakeholders and the local community to deliver mammalian predator control in Upper Hutt City parks and reserves and in suburban gardens, and that predator control be prioritised towards larger and more well-connected reserves such as Keith George Memorial Park and Wi Tako Ngātata Reserve, and towards suburbs with greater levels of mature tree cover. This action will contribute towards achieving **Goal 4, Objective 1** of Upper Hutt City's Open Space Strategy (UHCC 2018).
- That the Council continues to work with stakeholders and the local community to maintain and enhance levels of habitat connectivity between individual reserves and surrounding forested areas. This action will contribute towards achieving **Goal 4, Objective 3** of Upper Hutt City's Open Space Strategy (UHCC 2018).
- That the Council considers adopting and supporting initiatives to increase mature tree cover in the central suburbs of Upper Hutt City, to improve habitat quality for native bird species. Trees and shrubs planted should be appropriately eco-sourced for the area, and consideration should be given to planting a range of species that will provide seasonal, year-round food resources for native nectivorous and frugivorous bird species including tūī, tauhou / silvereye, kererū and korimako / bellbird. This action will contribute towards achieving **Goal 4, Objective 3** of Upper Hutt City's Open Space Strategy (UHCC 2018).
- That the Council continues to undertake this five-minute bird count monitoring programme on an annual basis, to provide a consistent, repeatable measure of the state and trends in the diversity, abundance and distribution of birds in Upper Hutt City parks and reserves. This action will contribute towards achieving **Goal 4, Measure 2** of Upper Hutt City's Open Space Strategy (UHCC 2018).
- That the Council considers approaching the Upper Hutt branch of Forest and Bird and/or the Wellington branch of Birds New Zealand (the Ornithological Society of New Zealand) to suggest a project to install tītītipounamu / rifleman nest boxes in the southern portion of Wi Tako Ngātata Reserve and in the eastern portion of Keith George Memorial Park to improve nesting success in the local, relict tītītipounamu / rifleman population. Assistance with this project could be sought from local organisations such as the Upper Hutt Menz Shed and advice on nest box design and installation could be provided by Zealandia staff. This action will contribute towards achieving **Goal 4, Objective 1** of Upper Hutt City's Open Space Strategy (UHCC 2018).

- That the Council considers approaching the Upper Hutt branch of Forest and Bird and/or the Wellington branch of Birds New Zealand (the Ornithological Society of New Zealand) to suggest a project to look at the feasibility of carrying out a supplementary translocation of tītītipounamu / rifleman to both Keith George Memorial Park, and Wi Tako Ngātata reserve to improve the viability of these two relict populations. The Wainuiomata/Orongorongo Water Collection Area supports a large and well-managed tītītipounamu / rifleman population which could act as a source population for such a translocation, and the proximity of these source and release sites have the added advantage of helping to minimise both the cost and logistical constraints of such a translocation. This action will contribute towards achieving **Goal 4, Objective 1** of Upper Hutt City's Open Space Strategy (UHCC 2018).
- That the Council considers investing additional resources into a ruru / morepork citizen science survey in Upper Hutt City, to improve our knowledge of the abundance and distribution of this native bird species in Upper Hutt. This action will contribute towards achieving **Goal 4, Measure 2** of Upper Hutt City's Open Space Strategy (UHCC 2018).

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Appendix

This appendix contains a list of all of the bird species encountered in each of the Upper Hutt City parks and reserves surveyed during these five-minute bird counts between 2011 and 2021 (P = species detected). Scientific names, common names (both Māori and English) and taxonomic order have been sourced from Checklist Committee (OSNZ) (2022). The national threat rankings used are those New Zealand Threat Classification System rankings listed in Robertson *et al.* (2021) and the regional threat rankings are those listed in Crisp (2020).

Cloustonville Park

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|------------------------|----------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| rakiraki | mallard | <i>Anas platyrhynchos</i> | Introduced and Naturalised | Introduced and Naturalised | | | | | P | | | | | | |
| kererū | New Zealand pigeon | <i>Hemiphaga novaeseelandiae</i> | Not Threatened | At Risk, Recovering | | | P | | | P | | | | | |
| pīpīwharau | shining cuckoo | <i>Chrysococcyx lucidus</i> | Not Threatened | Not Threatened | P | P | P | | | P | | P | | P | |
| kāhu | swamp harrier | <i>Circus approximans</i> | Not Threatened | Not Threatened | | | | | | P | | | | | |
| kōtare | New Zealand kingfisher | <i>Todiramphus sanctus</i> | Not Threatened | Not Threatened | | | | P | | | | | P | P | |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------------|---------------------|--------------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| kākā uhi whero | eastern rosella | <i>Platycercus eximius</i> | Introduced and Naturalised | Introduced and Naturalised | P | | | | | | | | | | |
| korimako | bellbird | <i>Anthornis melanura</i> | Not Threatened | Not Threatened | | P | P | P | P | P | | | | P | P |
| tūi | tui | <i>Prosthemadera novaeseelandiae</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | |
| riroriro | grey warbler | <i>Gerygone igata</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | |
| Pōpokotea | whitehead | <i>Mohoua albicilla</i> | Not Threatened | Not Threatened | P | | P | P | P | P | P | P | P | | |
| pīwakawaka | New Zealand fantail | <i>Rhipidura fuliginosa</i> | Not Threatened | Not Threatened | | | | P | P | | P | P | P | P | P |
| miromiro | tomtit | <i>Petroica macrocephala</i> | Not Threatened | Not Threatened | | P | P | P | P | | | | | P | |
| warou | welcome swallow | <i>Hirundo neoxena</i> | Not Threatened | Not Threatened | P | | | P | | | | | | P | |
| tauhou | silvereve | <i>Zosterops lateralis</i> | Not Threatened | Not Threatened | P | P | | P | | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------|---------------------|---------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| manu pango | Eurasian blackbird | <i>Turdus merula</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | | P | P | P |
| manu-kai-hua-rakau | song thrush | <i>Turdus philomelos</i> | Introduced and Naturalised | Introduced and Naturalised | P | | P | | | | | | P | P | |
| | dunnock | <i>Prunella modularis</i> | Introduced and Naturalised | Introduced and Naturalised | | P | | P | | | | | | | |
| tiu | house sparrow | <i>Passer domesticus</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | | | | | |
| pahirini | chaffinch | <i>Fringilla coelebs</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| | European greenfinch | <i>Chloris chloris</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | | | | | P |

Emerald Hill and Harcourt Park

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|--------------------|----------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| kakīānau | black swan | <i>Cygnus atratus</i> | Not Threatened | Not Threatened | | | | | P | | | | | | |
| rakiraki | mallard | <i>Anas platyrhynchos</i> | Introduced and Naturalised | Introduced and Naturalised | | | | | | | P | | | | |
| tikaokao | California quail | <i>Callipepla californica</i> | Introduced and Naturalised | Introduced and Naturalised | | | | | | | | | | P | |
| kererū | New Zealand pigeon | <i>Hemiphaga novaeseelandiae</i> | Not Threatened | At Risk, Recovering | | | | | | | P | P | | P | |
| pīpīwharau | shining cuckoo | <i>Chrysococcyx lucidus</i> | Not Threatened | Not Threatened | P | P | P | | | P | | | P | | |
| pūkeko | pukeko | <i>Porphyrio melanotus</i> | Not Threatened | Not Threatened | P | | | P | | | | | | | |
| | spur-winged plover | <i>Vanellus miles</i> | Not Threatened | Not Threatened | | | | | | P | | | | | P |
| kāhu | swamp harrier | <i>Circus approximans</i> | Not Threatened | Not Threatened | | | | P | | | | | | | |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------------|------------------------|--------------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| ruru | morepork | <i>Ninox novaeseelandiae</i> | Not Threatened | Not Threatened | | | | | P | | | | | | |
| kōtare | New Zealand kingfisher | <i>Todiramphus sanctus</i> | Not Threatened | Not Threatened | P | | P | P | | P | | P | P | P | |
| kārearea | New Zealand falcon | <i>Falco novaeseelandiae</i> | Nationally Increasing | Regionally Critical | | | | P | | | | | | | |
| kākā uhi whero | eastern rosella | <i>Platycercus eximius</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | | P | P | P | P | P | P | P | |
| korimako | bellbird | <i>Anthornis melanura</i> | Not Threatened | Not Threatened | | P | P | | P | P | P | P | P | | P |
| tūī | tui | <i>Prosthemadera novaeseelandiae</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| rīroriro | grey warbler | <i>Gerygone igata</i> | Not Threatened | Not Threatened | P | P | P | | P | P | P | P | P | P | P |
| pōpokotea | whitehead | <i>Mohoua albigilla</i> | Not Threatened | Not Threatened | | | | P | | P | | | | | |
| makipai | Australian magpie | <i>Gymnorhina tibicen</i> | Introduced and Naturalised | Introduced and Naturalised | P | | | P | | P | | | | | |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------|---------------------|-----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| pīwakawaka | New Zealand fantail | <i>Rhipidura fuliginosa</i> | Not Threatened | Not Threatened | | P | P | P | P | P | P | P | P | P | P |
| warou | welcome swallow | <i>Hirundo neoxena</i> | Not Threatened | Not Threatened | | | | P | P | | | | | | |
| tauhou | silvereve | <i>Zosterops lateralis</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| tāringi | common starling | <i>Sturnus vulgaris</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | | P | P | | P | P | P |
| manu pango | Eurasian blackbird | <i>Turdus merula</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| manu-kai-hua-rakau | song thrush | <i>Turdus philomelos</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| | dunnock | <i>Prunella modularis</i> | Introduced and Naturalised | Introduced and Naturalised | P | | P | P | P | P | P | P | P | P | P |
| tiu | house sparrow | <i>Passer domesticus</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|---------------------|----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| pahirini | chaffinch | <i>Fringilla coelebs</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| | European greenfinch | <i>Chloris chloris</i> | Introduced and Naturalised | Introduced and Naturalised | | P | P | P | P | P | P | P | P | P | P |
| | common redpoll | <i>Acanthis flammea</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | | P | P | | | P | | P | P |
| kōurarini | European goldfinch | <i>Carduelis carduelis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | | P | P | | P | P | P |
| hurukōwhai | yellowhammer | <i>Emberiza citrinella</i> | Introduced and Naturalised | Introduced and Naturalised | | P | P | P | P | P | | | | | P |

Keith George Memorial Park

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------|----------------------------|----------------------------------|----------------------------|-----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| pūtangitangi | paradise shelduck | <i>Tadorna variegata</i> | Not Threatened | Not Threatened | | | P | | P | | | | P | P | |
| tikaokao | California quail | <i>Callipepla californica</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | | | | | P | P | P | |
| kererū | New Zealand pigeon | <i>Hemiphaga novaeseelandiae</i> | Not Threatened | At Risk, Recovering | P | P | P | P | P | P | P | P | P | P | P |
| koekoeā | long-tailed cuckoo | <i>Eudynamys taitensis</i> | Nationally Vulnerable | At Risk, Naturally Uncommon | | | | | P | | | | | | |
| pīpīwharau | shining cuckoo | <i>Chrysococcyx lucidus</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | |
| pūkeko | pukeko | <i>Porphyrio melanotus</i> | Not Threatened | Not Threatened | | | | P | P | | P | | P | P | |
| | spur-winged plover | <i>Vanellus miles</i> | Not Threatened | Not Threatened | P | | | | | | | | P | P | |
| karoro | southern black backed gull | <i>Larus dominicanus</i> | Not Threatened | Not Threatened | P | P | P | | | | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------------|------------------------|--------------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| kāhu | swamp harrier | <i>Circus approximans</i> | Not Threatened | Not Threatened | | | | P | | | | | P | | |
| kōtare | New Zealand kingfisher | <i>Todiramphus sanctus</i> | Not Threatened | Not Threatened | P | P | P | P | | P | P | P | P | P | |
| kārearea | New Zealand falcon | <i>Falco novaeseelandiae</i> | Nationally Increasing | Regionally Critical | | | | | P | P | | | | | |
| kākā uhi whero | eastern rosella | <i>Platycercus eximius</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | |
| kākāriki | red-crowned parakeet | <i>Cyanoramphus novaezelandiae</i> | At Risk, Relict | At Risk, Recovering | | | P | | | | | | | | |
| korimako | bellbird | <i>Anthornis melanura</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| tūī | tui | <i>Prosthemadera novaeseelandiae</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| riroriro | grey warbler | <i>Gerygone igata</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| pōpokotea | whitehead | <i>Mohoua albicilla</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------|---------------------|------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| makipai | Australian magpie | <i>Gymnorhina tibicen</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | | | P | | |
| pīwakawaka | New Zealand fantail | <i>Rhipidura fuliginosa</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| miromiro | tomtit | <i>Petroica macrocephala</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| warou | welcome swallow | <i>Hirundo neoxena</i> | Not Threatened | Not Threatened | | | | | | | | | | | P |
| tauhou | silvereeye | <i>Zosterops lateralis</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| tāringi | common starling | <i>Sturnus vulgaris</i> | Introduced and Naturalised | Introduced and Naturalised | | | | | | | | | P | P | |
| manu pango | Eurasian blackbird | <i>Turdus merula</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| manu-kai-hua-rakau | song thrush | <i>Turdus philomelos</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | | | P | | P | P | P | |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|---------------------|----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| | dunnoek | <i>Prunella modularis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| tiu | house sparrow | <i>Passer domesticus</i> | Introduced and Naturalised | Introduced and Naturalised | | | | | | | P | | P | P | |
| pahirini | chaffinch | <i>Fringilla coelebs</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| | European greenfinch | <i>Chloris chloris</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | P | P | | | | P | P | |
| | common redpoll | <i>Acanthis flammea</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | P | P | | | | | P | P |
| kōurarini | European goldfinch | <i>Carduelis carduelis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | | P | P | P | P |
| hurukōwhai | yellowhammer | <i>Emberiza citrinella</i> | Introduced and Naturalised | Introduced and Naturalised | P | | | P | P | P | | | | | |

Maidstone Park

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------|----------------------------|----------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| pūtangitangi | paradise shelduck | <i>Tadorna variegata</i> | Not Threatened | Not Threatened | | | | | | | | | | P | |
| tikaokao | California quail | <i>Callipepla californica</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | | | | | | P | | |
| kererū | New Zealand pigeon | <i>Hemiphaga novaeseelandiae</i> | Not Threatened | At Risk, Recovering | P | P | P | | | P | P | | P | P | |
| pīpīwharau | shining cuckoo | <i>Chrysococcyx lucidus</i> | Not Threatened | Not Threatened | P | P | P | | | P | P | | | | P |
| pūkeko | pukeko | <i>Porphyrio melanotus</i> | Not Threatened | Not Threatened | | | | | P | | | | | | P |
| | spur-winged plover | <i>Vanellus miles</i> | Not Threatened | Not Threatened | | | | | P | P | P | P | P | | P |
| karoro | southern black backed gull | <i>Larus dominicanus</i> | Not Threatened | Not Threatened | P | | | P | | | P | | P | P | P |
| kāhu | swamp harrier | <i>Circus approximans</i> | Not Threatened | Not Threatened | | | | P | | | | P | | | |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------------|------------------------|--------------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| kōtare | New Zealand kingfisher | <i>Todiramphus sanctus</i> | Not Threatened | Not Threatened | P | P | P | | P | P | P | P | P | P | P |
| kākā uhi whero | eastern rosella | <i>Platycercus eximius</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | | P | P | P | P | P | P | P | P |
| korimako | bellbird | <i>Anthornis melanura</i> | Not Threatened | Not Threatened | | | P | | | | | | | | |
| tūī | tui | <i>Prosthemadera novaeseelandiae</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| riroriro | grey warbler | <i>Gerygone igata</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| makipai | Australian magpie | <i>Gymnorhina tibicen</i> | Introduced and Naturalised | Introduced and Naturalised | P | | | | | P | | | | | |
| pīwakawaka | New Zealand fantail | <i>Rhipidura fuliginosa</i> | Not Threatened | Not Threatened | | P | P | P | P | P | P | P | P | P | P |
| kairaka | Eurasian skylark | <i>Alauda arvensis</i> | Introduced and Naturalised | Introduced and Naturalised | P | | P | | P | | | | | | |
| warou | welcome swallow | <i>Hirundo neoxena</i> | Not Threatened | Not Threatened | | | | | | | P | | | P | |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------|--------------------|----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| tauhou | silvereeye | <i>Zosterops lateralis</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| tāringi | common starling | <i>Sturnus vulgaris</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | P | | | | P | |
| manu pango | Eurasian blackbird | <i>Turdus merula</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| manu-kai-hua-rakau | song thrush | <i>Turdus philomelos</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | |
| | dunnock | <i>Prunella modularis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | | P | P | P | P | P | P | |
| tiu | house sparrow | <i>Passer domesticus</i> | Introduced and Naturalised | Introduced and Naturalised | | P | P | | | | P | P | | | P |
| pahirini | chaffinch | <i>Fringilla coelebs</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|---------------------|----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| | European greenfinch | <i>Chloris chloris</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | P | | | P | P |
| | common redpoll | <i>Acanthis flammea</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | P | P | | | |
| kōurarini | European goldfinch | <i>Carduelis carduelis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | | P | P | P | P | P |
| hurukōwhai | yellowhammer | <i>Emberiza citrinella</i> | Introduced and Naturalised | Introduced and Naturalised | P | | P | P | P | P | P | P | | | |

Riverstone Park

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|----------------------------|--------------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| tikaokao | California quail | <i>Callipepla californica</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | P | | | | | |
| kererū | New Zealand pigeon | <i>Hemiphaga novaeseelandiae</i> | Not Threatened | At Risk, Recovering | | | | | P | | | P | | P | |
| | spur-winged plover | <i>Vanellus miles</i> | Not Threatened | Not Threatened | | | P | | | | | | | | |
| karoro | southern black backed gull | <i>Larus dominicanus</i> | Not Threatened | Not Threatened | | | | P | | | | | | | |
| ruru | morepork | <i>Ninox novaeseelandiae</i> | Not Threatened | Not Threatened | | | | | | | P | | | | |
| tūī | tui | <i>Prosthemadera novaeseelandiae</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| riroriro | grey warbler | <i>Gerygone igata</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| pīwakawaka | New Zealand fantail | <i>Rhipidura fuliginosa</i> | Not Threatened | Not Threatened | | | | P | | | P | P | P | | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------|--------------------|----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| kairaka | Eurasian skylark | <i>Alauda arvensis</i> | Introduced and Naturalised | Introduced and Naturalised | P | | | | | | | | | | |
| warou | welcome swallow | <i>Hirundo neoxena</i> | Not Threatened | Not Threatened | | | | | | | P | P | | | |
| tauhou | silvereve | <i>Zosterops lateralis</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| tāringi | common starling | <i>Sturnus vulgaris</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | P | P | | P | | | |
| manu pango | Eurasian blackbird | <i>Turdus merula</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| manu-kai-hua-rakau | song thrush | <i>Turdus philomelos</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | | | | P | | | | |
| | dunnock | <i>Prunella modularis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | | | P | P | P | | P | P |
| tiu | house sparrow | <i>Passer domesticus</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|----------------|----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| pahirini | chaffinch | <i>Fringilla coelebs</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| | greenfinch | <i>Chloris chloris</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | P | P | | P | |
| | common redpoll | <i>Acanthis flammea</i> | Introduced and Naturalised | Introduced and Naturalised | | P | P | P | | | | P | | | |
| kōurarini | goldfinch | <i>Carduelis carduelis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | | | | | P | | P | |
| hurukōwhai | yellowhammer | <i>Emberiza citrinella</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | P | | | | | | | |

Trentham Memorial Park

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------------|------------------------|--------------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| tikaokao | California quail | <i>Callipepla californica</i> | Introduced and Naturalised | Introduced and Naturalised | | | | | P | | | | | | |
| kererū | New Zealand pigeon | <i>Hemiphaga novaeseelandiae</i> | Not Threatened | At Risk, Recovering | | P | P | | P | P | | | P | P | P |
| pīpīwharau | shining cuckoo | <i>Chrysococcyx lucidus</i> | Not Threatened | Not Threatened | P | P | P | | P | P | P | | P | | P |
| | spur-winged plover | <i>Vanellus miles</i> | Not Threatened | Not Threatened | | | | | P | P | | | | | |
| kōtare | New Zealand kingfisher | <i>Todiramphus sanctus</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | | P | P | P |
| kākā uhi whero | eastern rosella | <i>Platycercus eximius</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| tūī | tui | <i>Prosthemadera novaeseelandiae</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------|---------------------|-----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| riroriro | grey warbler | <i>Gerygone igata</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| pōpokotea | whitehead | <i>Mohoua albicilla</i> | Not Threatened | Not Threatened | | | | | | | | | P | | |
| makipai | Australian magpie | <i>Gymnorhina tibicen</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | | | | | |
| pīwakawaka | New Zealand fantail | <i>Rhipidura fuliginosa</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| tauhou | silvereeye | <i>Zosterops lateralis</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| tāringi | common starling | <i>Sturnus vulgaris</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | | P | P | P | P | P | | P | |
| manu pango | Eurasian blackbird | <i>Turdus merula</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| manu-kai-hua-rakau | song thrush | <i>Turdus philomelos</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | | | P | P | P | | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|---------------------|----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| | dunnock | <i>Prunella modularis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | | P | P | P | | P | P |
| tiu | house sparrow | <i>Passer domesticus</i> | Introduced and Naturalised | Introduced and Naturalised | | P | | | | | | | P | | |
| pahirini | chaffinch | <i>Fringilla coelebs</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| | European greenfinch | <i>Chloris chloris</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | | | | | P | P | | |
| | common redpoll | <i>Acanthis flammea</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | | | | P | |
| kōurarini | European goldfinch | <i>Carduelis carduelis</i> | Introduced and Naturalised | Introduced and Naturalised | | P | | P | | | | | | | |

Wi Tako Ngātata Reserve

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------|----------------------------|----------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| pūtangitangi | paradise shelduck | <i>Tadorna variegata</i> | Not Threatened | Not Threatened | P | | P | | | | | P | P | P | |
| rakiraki | mallard | <i>Anas platyrhynchos</i> | Introduced and Naturalised | Introduced and Naturalised | | P | | | | | | | | | |
| tikaokao | California quail | <i>Callipepla californica</i> | Introduced and Naturalised | Introduced and Naturalised | | | | | | P | | | P | P | |
| kererū | New Zealand pigeon | <i>Hemiphaga novaeseelandiae</i> | Not Threatened | At Risk, Recovering | P | P | P | P | P | P | P | P | P | P | P |
| pīpīwharauoa | shining cuckoo | <i>Chrysococcyx lucidus</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | |
| pūkeko | pūkeko | <i>Porphyrio melanotus</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| | spur-winged plover | <i>Vanellus miles</i> | Not Threatened | Not Threatened | | P | P | | | P | P | P | P | P | P |
| karoro | southern black-backed gull | <i>Larus dominicanus</i> | Not Threatened | Not Threatened | | P | P | P | P | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------------|------------------------|------------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| matuku moana | white-faced heron | <i>Egretta novaehollandiae</i> | Not Threatened | | | | | | P | | | | | | |
| kāhu | swamp harrier | <i>Circus approximans</i> | Not Threatened | Not Threatened | | P | | P | P | | P | P | P | | P |
| ruru | morepork | <i>Ninox novaeseelandiae</i> | Not Threatened | Not Threatened | | | | | | | | P | | | |
| kōtare | New Zealand kingfisher | <i>Todiramphus sanctus</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| kārearea | New Zealand falcon | <i>Falco novaeseelandiae</i> | Nationally Increasing | Regionally Critical | | | P | | | | | P | | | |
| kākā uhi whero | eastern rosella | <i>Platycercus eximius</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| kākāriki | red-crowned parakeet | <i>Cyanoramphus novaezelandiae</i> | At Risk, Relict | At Risk, Recovering | P | | | | | | | | | | |
| tītītipounamu | rifleman | <i>Acanthisitta chloris</i> | At Risk, Declining | At Risk, Declining | P | | P | | | | | | | | |
| korimako | bellbird | <i>Anthornis melanura</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|---------------------|--------------------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| tūī | tui | <i>Prosthemadera novaeseelandiae</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| riroriro | grey warbler | <i>Gerygone igata</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| pōpokotea | whitehead | <i>Mohoua albicilla</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| makipai | Australian magpie | <i>Gymnorhina tibicen</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | P | P | P | | | P | | |
| pīwakawaka | New Zealand fantail | <i>Rhipidura fuliginosa</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| miromiro | tomtit | <i>Petroica macrocephala</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |
| kairaka | Eurasian skylark | <i>Alauda arvensis</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | | | | | | | | |
| warou | welcome swallow | <i>Hirundo neoxena</i> | Not Threatened | Not Threatened | | | | P | P | P | | | | P | |
| tauhou | silvereeye | <i>Zosterops lateralis</i> | Not Threatened | Not Threatened | P | P | P | P | P | P | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------|---------------------|---------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| tāringi | common starling | <i>Sturnus vulgaris</i> | Introduced and Naturalised | Introduced and Naturalised | | | P | | | | P | | P | P | |
| manu pango | Eurasian blackbird | <i>Turdus merula</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| manu-kai-hua-rakau | song thrush | <i>Turdus philomelos</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | | | P | P | P | P | P | P |
| | dunnock | <i>Prunella modularis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| tiu | house sparrow | <i>Passer domesticus</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| pahirini | chaffinch | <i>Fringilla coelebs</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| | European greenfinch | <i>Chloris chloris</i> | Introduced and Naturalised | Introduced and Naturalised | | P | P | P | P | | P | P | P | P | P |

| Māori Name | Common Name | Scientific Name | National Threat Ranking | Regional Threat Ranking | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|------------|--------------------|----------------------------|----------------------------|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| | common redpoll | <i>Acanthis flammea</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | P | | | | | P | |
| kōurarini | European goldfinch | <i>Carduelis carduelis</i> | Introduced and Naturalised | Introduced and Naturalised | P | P | P | P | P | P | P | P | P | P | P |
| hurukōwhai | yellowhammer | <i>Emberiza citrinella</i> | Introduced and Naturalised | Introduced and Naturalised | | | | P | | | | | | | P |