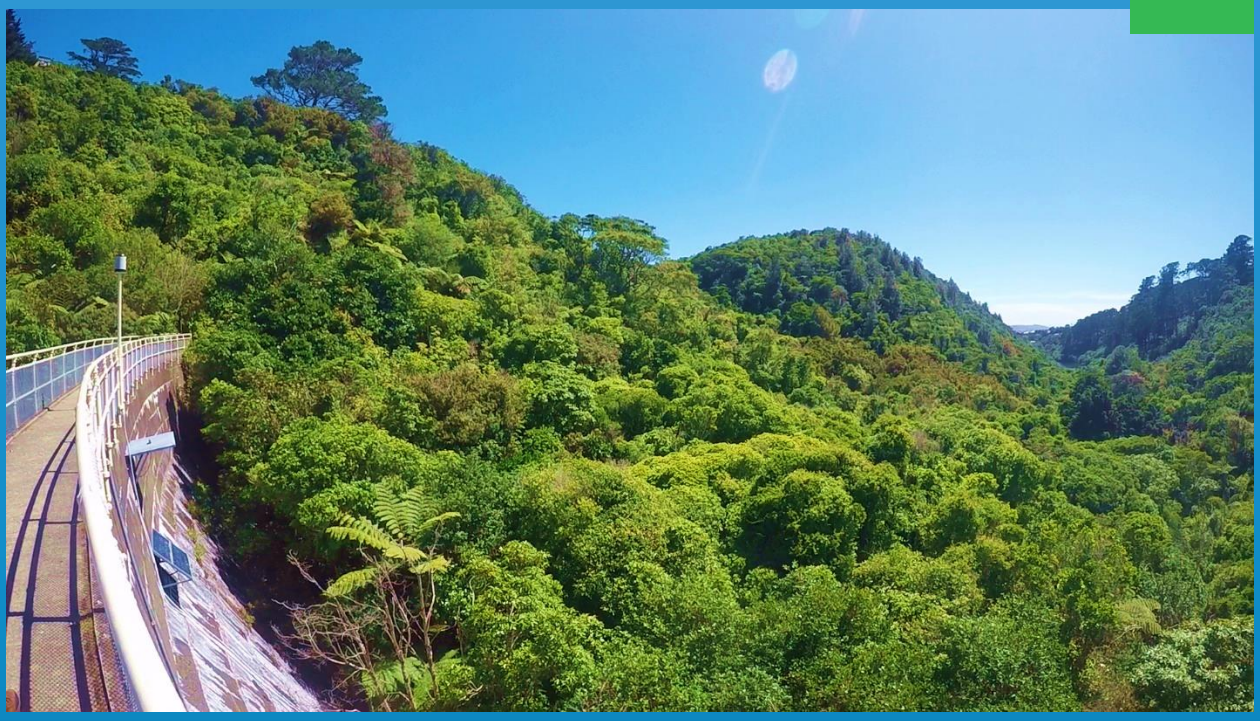

Identifying Public Knowledge, Behavior, and Perception of Native New Zealand Birds

Submitted to: Wellington City Council and ZEALANDIA
By: Kurt Bilis, MacKenzie Brandes, Constantine "Tino" Christelis, and Justin Harris

March 1, 2017

Absolutely Positively Wellington City Council
Me Heke Ki Pōneke

ZEALANDIA
TE MĀRA A TĀNE

WPI

Identifying Public Knowledge, Behavior, and Perception of Native New Zealand Birds

An Interactive Qualifying Project
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfilment of the requirements for the
degree of Bachelor of Science

by
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Date:
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Abstract

The Wellington City Council and ZEALANDIA seek to better understand public awareness of native birds and conservation efforts so they can better strategize about outreach campaigns in the future. Through interviews with experts in social media, education, and conservation we assessed current approaches to outreach. Through surveys we assessed public awareness of native birds and conservation efforts. We found that current WCC and ZEALANDIA engagements within the community have been successful in educating the public about native birds and there is evidence that using narratives in outreach better connects individuals to the issues. Our recommendations include developing a heightened presence in social media, a potential outreach campaign, and a suggestion for future study.

Executive summary

Once known as a "bird land," New Zealand was home to bird species unlike anywhere else in the world (ZEALANDIA, 2016b). Unfortunately, the introduction of foreign species and clearing land for farming by European settlers in the late eighteenth to early nineteenth century caused extensive damage to the native ecosystem. Whether by predation, competition, or habitat destruction many endemic species are now endangered or have gone extinct.

ZEALANDIA, a wildlife sanctuary in Wellington, is working to restore native species by increasing public awareness of birds and conservation efforts. To help build awareness of conservation efforts in Wellington, the Wellington City Council coordinates with the sanctuary to involve the community in outreach and education initiatives to further protect native species (Wellington City Council, 2012). The Wellington City Council provides funding for ZEALANDIA's projects and appoints trustees who work closely with the sanctuary (ZEALANDIA, 2016b). This partnership enables both organizations to rebuild native bird populations and to involve the public in pest eradication efforts.

The goal of this project was to assess public awareness and knowledge of native bird species in the Wellington metropolitan area. Threatened birds of interest fell into three categories: Nationally Critical, Nationally Endangered, and Nationally Vulnerable. The study focused on the tūī, saddleback, and kākā, pictured below in Figure A. These birds were chosen because they spanned conservation threat levels.

Figure A: Tūī, saddleback, and kākā *left to right* (Robertson, 2013; Parker, 2013; Department of Conservation, n.d.d.)

Methodology

We evaluated educational materials, including signage, pamphlets, exhibits, and posters in ZEALANDIA. We also assessed residential neighborhoods that abut the sanctuary (the so-called 'halo district') to gauge interactions between humans and birds. A summary of our approach can be seen in Figure B.

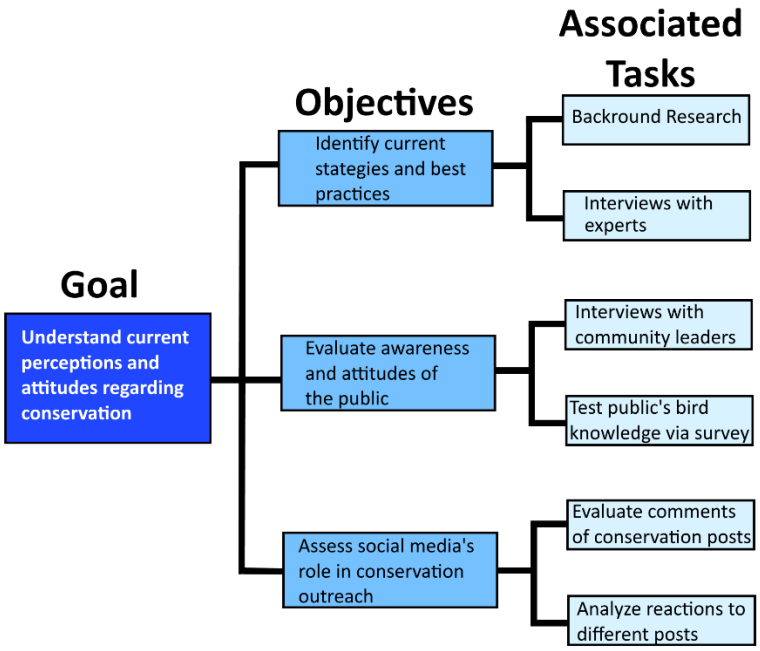

Figure B: Methodological tasks

In order to assess public awareness, knowledge, and attitudes, we conducted a survey of residents from the Wellington metro area. The survey included questions on bird recognition, kākā feeding habits, attitudes to nature.

The Wellington City Council and ZEALANDIA use social media outlets to reach a broad audience on topics of conservation and to rally support within the community. We assessed comments on social media posts qualitatively for tone and content. We identified patterns and trends among responses. From our findings we determined the general relationship between social media and public perceptions and knowledge.

Results and analysis

Our data revealed positive news about area respondents. The 418 respondents were from 60 Wellington suburbs with 48% (200) from the halo region. The survey was taken by 38% males and 62% females with 42 being the average age of survey respondents. Over half the participants indicated they had a bachelor's degree as their highest level of education. Out of all the respondents, 4% identified as Māori or Pasifika. In regards to the nature-relatedness scale, 82% identified with the upper bounds of the scale indicating they feel more connected to nature.

Our bird identification test found high success rates even though we intentionally included more species that might be more difficult to recognize. The tūī was recognized and named correctly by almost 99% of respondents. The saddleback, which we expected to be the most difficult to identify, was identified 76% of the time. The common sparrow, despite what its name may imply, was only identified by 87% of respondents. The kākā was identified by 85% of participants possibly because of its resemblance to the kea, another native parrot which is slightly smaller than the kākā (Figure C).

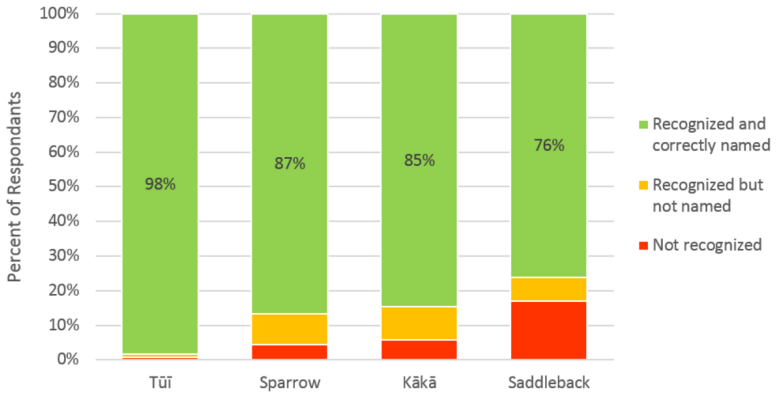

Figure C: Bird naming

When identifying native birds, the tūī again received the most correct responses at 99% and the common sparrow was the most difficult for respondents in this case, with 13% unable to state it was a non-native bird. Although there were 13% of respondents who could not properly identify it as non-native, this score is reasonably low. Below are the results of responses identifying birds as native (Figure D).

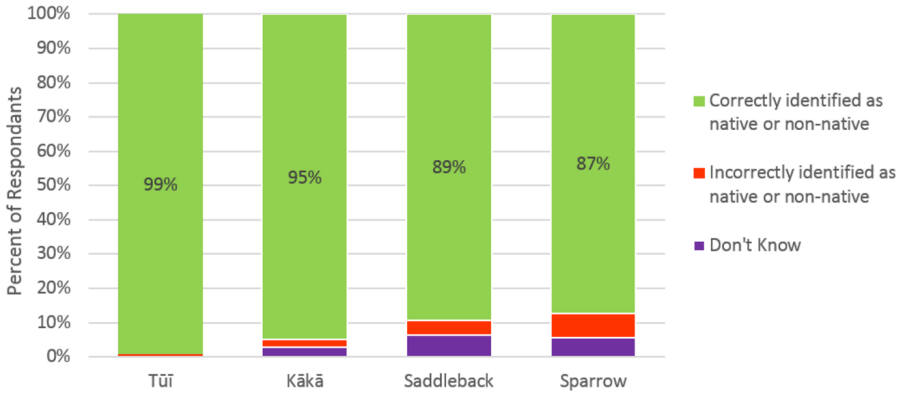

Figure D: Bird identification as native species

Participants were also asked to name what visual features helped them recognize each bird and responses are represented via word cloud (Figure E).

(a) tūī

(b) saddleback

(c) common sparrow

(d) kākā

Figure E: Visual recognition word clouds for *(a)* tūī, (*b*) saddleback, *(c)* sparrow, and (*d*) kākā

There was no significant difference in bird recognition between halo and non-halo residents. Halo residents who scored above 87.5% made up 77.6% of the population whereas non halo residents in the same category made up 74.2% of the population.

We were encouraged to find that the percentage of people feeding kākā has declined from 19% to 4% in 2017, and we assume that this decline is a result of educational efforts and ongoing coverage by the media about this issues (Figure F). Furthermore, it appears that those who are still feeding the kākā are following the guidelines “Feeding Birds at Home” put out by ZEALANDIA, which may reduce the harms that might result from inappropriate feeding. Ideally, no members of the public would be feeding kākā.

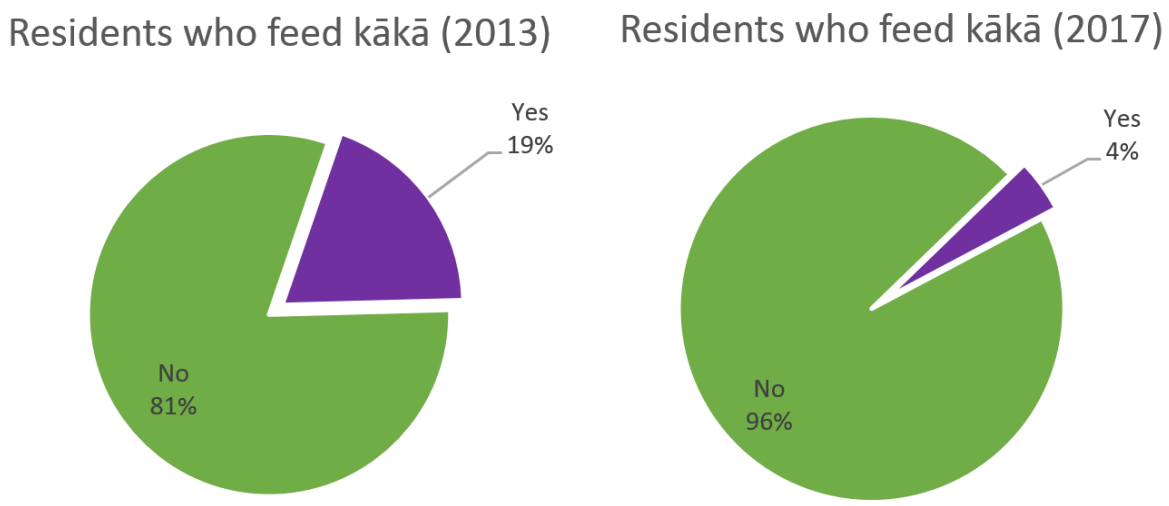

Figure F: Four-year comparison of halo residents who feed kākā

From conversations with experts we conclude that hands-on programs may be the best way to engage the public. It was also clear from our discussions that presenting a compelling narrative is key. Negative articles and posts on social media that discourage particular activities are not received well and most residents disregard the suggestions. Narratives that play on emotions and create connections between birds and people are much more effective and help to spread awareness further.

Recommendations

At the conclusion of our assessment, we developed two tiers of recommendations for the Wellington City Council and ZEALANDIA to contribute to their endeavors for conservation outreach and community engagement.

1. Social media platforms

In our research we discovered that social media can boost messages and get them to a broader audience faster. Some platforms such as reddit allow for a much more interactive information source. The WCC and ZEALANDIA can use reddit as a means to create an ongoing conversation between their organizations and the public. Given our group's background in reddit and the surprisingly enthusiastic and engaging comments we received on our survey distribution post, we are very optimistic about the possibility of the Wellington City Council and ZEALANDIA using reddit as a community engagement platform. The /r/Wellington subreddit community is especially fond of their city, so it is not too far-fetched to speculate that the community would welcome WCC and ZEALANDIA with open arms. The format reddit provides with its forum-based structure allows for much more "intimate" conversations with individuals, and can be an effective way to receive in-depth qualitative feedback. On reddit, everyone is a "user", so WCC and ZEALANDIA would have to create reddit accounts, and would then be free to use basic reddit features (creating text and/or linked posts, commenting on posts, and being able to send and receive private messages). The upkeep on a reddit account would be simple enough for a student intern to manage part-time and report their discussions with the community to the council.

In addition, we also recommend both WCC and ZEALANDIA further investigate the reactions of individuals to conservation Facebook posts. As discussed, tracking the trends of individual users on Facebook is not currently possible. However since Facebook was the most popular choice in our survey when we asked participants to name their conservation news outlets we feel it is worth working around this shortcoming. Using a program similar to the one which we outlined in our discussion, both organizations could get a better understanding for what reactions their posts create in the community. With this information they could better cater their posts to encourage locals to get involved rather than viewing the post and disregarding the importance the message carries.

2. Community outreach

In addition to expanding social media efforts, one way to encourage mindfulness of native birds could involve a wristband sponsorship program. Many of the birds in the sanctuary are tagged with colorful bands by researchers in order to track them. We developed an idea for creating colored silicone wristbands as part of the program to match that of the birds in the sanctuary. As discussed previously, we have found engaging experiences tend to be the most successful for raising awareness. These wristbands provide an interactive way for individuals to make a connection with some of the native birds inside the sanctuary as well as be a method of fundraising (Figure G).

Figure G: Variety of wristbands for sponsorship program

The funds raised by this program could be used to cover its own initial startup but also could be used as a standalone fundraiser for ZEALANDIA in order to maintain the sanctuary.

The word clouds we created from the data in our survey responses could prove useful for future conservation outreach campaigns. The common features that many used to help identify the birds could be used by a digital artist to make designs that catch the eyes of the public. Simple artwork like this could be used in a variety of awareness programs such as a pre-field trip program to ZEALANDIA where they are used as learning flashcards, creating street art, partnering with local businesses to incorporate designs into their products, or games.

We encourage that WCC continues working with reputable groups, such as ZEALANDIA, and local schools to maintain clear consistent recommendations around bird conservation efforts. The Wellington City Council is excellent in ensuring a consistent message between organizations during conservation campaigns, so we recommend they continue this strategy for future efforts because the community could greatly benefit from a consistent voice.

Conclusion

The ZEALANDIA sanctuary's safe haven for native wildlife is a promising step towards restoring the populations that were destroyed through the settlement of the country. Residents abutting the sanctuary in the region known as the halo therefore are tied to the success of this revival. Programs to educate and involve these individuals to understand and help protect these birds to ensure their return to the area are vital. Through our research we have uncovered that Wellington residents find themselves strongly influenced by nature and are familiar with the native birds that share the area with them. We also have a better understand for how these residents receive their information when it comes to these topics. Increased efforts to utilizing these sources to involve even more of the public would accelerate the progress being made.

With the recommendations we have put forth, WCC and ZEALANDIA stand to both optimize their current outreach programs and target newer and unexplored audiences. Reaching younger demographics through social media will be the foundation of an educated society that emphasizes conservation first when making decisions that will impact the environment.

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Authorship

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Chapter 2: Literature review	K.B. M.B.	C.C. J.H.	C.C. J.H.	K.B. M.B.
Chapter 3: Methodology	M.B. C.C.	K.B. J.H.	K.B. J.H.	M.B. C.C.
Chapter 4: Results and discussion	K.B. C.C.	M.B. J.H.	M.B. J.H.	K.B. C.C.
Chapter 5: Recommendations and conclusion	K.B. J.H.	M.B. C.C.	M.B. C.C.	K.B. J.H.
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Appendix C: Interview guide for experts	M.B.	C.C. J.H.	K.B.	
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Appendix E: Survey	C.C.	K.B.	M.B. J.H.	
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Chapter 1: Introduction

New Zealand hosts many unique species within its beautiful landscape. Rocky mountains, active volcanoes, dense rainforests, and expansive plains provided diverse environments for a variety of flora and fauna. Once known as a "bird land" (ZEALANDIA, 2016b), New Zealand was home to bird species unlike anywhere else in the world. Unfortunately, the introduction of foreign species and clearing land for farming by European settlers in the late eighteenth and early nineteenth century caused extensive damage to the native ecosystem. Whether by predation, competition, or habitat destruction many endemic species are now endangered or have gone extinct.

In recent decades, conservation efforts have focused on restoring the island's native plant and animal populations to pre-colonization levels. Conservation areas and sanctuaries have been designated to protect vulnerable ecosystems from adverse interactions with the built world. ZEALANDIA, a sanctuary located in the heart of Wellington, was established in 1999 by the Karori Wildlife Sanctuary Trust. The sanctuary includes an enclosed environment free of invasive pests for the purpose of promoting local endangered species of reptiles, birds, and invertebrates (a full list from ZEALANDIA's website can be seen in Appendix A). Much has been achieved in the sanctuary's short existence, and the staff look forward to achieving the bigger goals set forth in their 500-year plan to completely restore the ecosystem within the sanctuary to its pre-settlement state (ZEALANDIA, 2016b). To promote their work, the grounds allow visitors, volunteers, and workers to observe and appreciate the sanctuary. Already, ZEALANDIA's restoration has made notable advancements with the removal of most foreign species from within its enclosure, allowing the native populations within to thrive without interference.

A key feature to the success of the sanctuary is the large fence around the perimeter, which contains native species and eliminates outside interference. Some birds, however, can leave the enclosure by flying or "hopping" the fence that keeps the grounded native wildlife contained. As birds journey in and out of the sanctuary, they visit surrounding suburban neighborhoods and interact with humans in ways that can inadvertently damage their health. Birds may become dependent on humans in the neighborhood and return to backyards repeatedly where they can be exposed to predators, such as cats, dogs, and stoats, or they may consume

inappropriate foods. Negative changes in wildlife habits and diet is a major concern for the sanctuary.

The goal of this project was to assess public awareness and knowledge of native bird species. To accomplish this, we conducted a site assessment of the ZEALANDIA sanctuary and the residential areas in the surrounding "halo" region, which is a one-kilometer buffer zone in the residential area around ZEALANDIA. We identified current strategies in bird conservation and public outreach in the Wellington region via interviews with staff from the Wellington City Council and Department of Conservation. We surveyed local public awareness, knowledge, and attitudes towards birds and bird conservation. Lastly, we assessed social media in the context of public outreach and engagement with local residents. These data provided Wellington City Council and ZEALANDIA with strategies to support conservation education and wildlife integration.

Chapter 2: Literature review

This chapter summarizes the background and relevant studies that provided a foundation to understand our research. Understanding New Zealand's approach to bird conservation through various Wellington organizations, local government agencies, citizens that live near the ZEALANDIA sanctuary, as well as indicating important birds are key to this study. Relevant and influential organizations which are typically involved in similar projects were discussed to identify the impact of this study given the context of previous work. A set of studies were compared to recognize notable problems and promising ideas that applied to our research.

2.1: Current New Zealand conservation efforts

New Zealand takes great pride in supporting its unique environment and wildlife and has embarked on one of the most intensive and comprehensive efforts to try and restore threatened species, especially birds. The Department of Conservation (DOC) is at the forefront of these efforts, leading the nation towards the goal of restoring the native environment. The agency classifies endangered species that are part of ZEALANDIA's ecosystem. The DOC has programs dedicated to protecting and restoring species, places, and heritage while providing locals the chance to observe and participate as a way to encourage public awareness and engagement (Department of Conservation, n.d.f). One program encourages the banding of birds which helps researchers analyze bird's life cycle and habits, but also identifies the migration and movement of species (Department of Conservation, n.d.b.). Several surveys on the DOC website urge residents to report sightings and provide feedback.

Kākā, for example, are a well-known and well-cited example of a native bird at risk as opposed to other birds which do not have as distinctive features. Currently the DOC is establishing a national program which aims to sustain South Island kākā populations in the forests, as well as to study pest control on the North Island to recover populations. They suggest those who are interested in the conservation efforts volunteer their time, properly dispose of trash, consider capturing predators, keep pets inside at night, and plant native vegetation in backyards to encourage safe and healthy habitats (Department of Conservation, n.d.d).

Other programs target pests and predators. Battle for Our Birds, for example, is an effort that works to eliminate rats, possums and stoats in the areas endangered birds are located. According to the Department of Conservation, this is the most successful program in pest control

(Department of Conservation, n.d.a). Two short YouTube videos are included on the DOC's website and promoted through social media. The program itself explains how biodegradable 1080, a small rodent pesticide, is spread by aircraft to target these predators, in conjunction with traditional methods of trapping. It also explains that pest levels are constantly monitored by the DOC staff (Department of Conservation, n.d.a).

In 2015, TVNZ One News produced a segment called "Kindness killing NZ native birds, warn conservationists" (Boswell, 2015). The segment showed Wellington resident, Matt Robertson and his son, feeding the kākā bird properly with slices of apple. Robertson explains feeding kākā with nuts is damaging because the nuts stop the calcium from entering the bones, which results in a bone disorder. A factsheet titled "Feeding Birds at Home" produced by ZEALANDIA also explains how to properly feed and take an active role in protecting birds, the kākā in particular (Figure 1). The publication begins by drawing the reader in with personal connections, explaining "if you enjoy the sights and sounds of wild, native birds in your garden, and want to contribute to their remarkable return to Wellington, this fact sheet is for you" (ZEALANDIA, n.d.a). A full text copy of the pamphlet can be found in Appendix B. Kākā feeding is an incredibly important topic in bird conservation due to lots of misunderstanding among locals for bird feeding.

Figure 1: Feeding birds at home (ZEALANDIA, n.d.a.)

A specific section addresses the pitfalls of feeding birds explaining that many problems can arise despite good intentions (ZEALANDIA, n.d.a.). According to the publication, feeding increases predation risks, impairs avian nutrition, may increase negative interactions and cause property damage, and can create an over-abundance of dominant species (ZEALANDIA, n.d.a). ZEALANDIA, the Wellington City Council, Wellington Zoo, Department of Conservation, Forest and Bird, and the Ornithological Society of New Zealand all endorse the information provided in the factsheet (ZEALANDIA, n.d.a.) and support the strategies to protect the kākā. While this factsheet focuses on the kākā, the strategies can easily be adapted for other species.

Credited with bringing the kākā back to Wellington the ZEALANDIA sanctuary, founded by the Karori Sanctuary Trust, is described as "the world's first fully-fenced urban ecosanctuary" (ZEALANDIA, 2016b). This trust manages ZEALANDIA and is a "not-for-profit, community-led" organization (ZEALANDIA, 2016b). They devote much of their research into sustaining the wildlife reserve and developing ZEALANDIA into a successful conservation area. A second focus includes discouraging the feeding of endangered native birds to ensure that the birds' growth will not be stunted by an unnatural diet (Nature Space, n.d.). ZEALANDIA installed an 8.6-kilometer fence made out of tightly wound mesh designed to keep predatory and non-native species out of the sanctuary (see Figure 2). In order to do this, a "hood" is placed at the top of the fence, which keeps predators from climbing over, as well as a skirt that stretches deep into the ground preventing predators from burrowing under (Sisterskit, 2010). With the aid of this fence, ZEALANDIA aims to reach its 500-year goal and recreate the ecosystem the country lost with the settlement of the island.

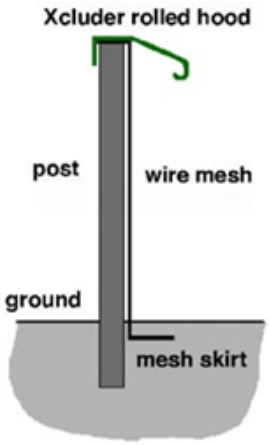

Figure 2: Fence design (New design of pest proof fence, 2008)

As shown below in Figure 3, the sanctuary covers roughly 224 hectares on the west edge of metropolitan Wellington. The northern and north-western ends of the sanctuary are hemmed in by the suburban communities of Karori, Northland, Kelburn, and Brooklyn. The remainder of the sanctuary abuts more rural areas that were previously cleared, but are now regenerating native New Zealand species (ZEALANDIA, 2016b).

Figure 3: ZEALANDIA and the greater Wellington area (Google Maps)

ZEALANDIA strives to engage residents in the immediate area (the halo) around the sanctuary through social media, flyers, and events to better inform them about the purpose of the sanctuary. Residents have a chance to volunteer and partake in events at ZEALANDIA which encourages them to actively participate in their 500-year mission. The community may be partly responsible for some of the challenges birds face, but are also a solution to it. Ultimately the residents can develop a community that is mindful of the native wildlife.

To help motivate the population surrounding ZEALANDIA to become part of the solution, the Wellington City Council coordinates with the sanctuary to involve the community (Wellington City Council, 2012). The WCC provides funding for ZEALANDIA's projects and appoints trustees who work closely with the sanctuary (ZEALANDIA, 2016b). From this partnership, the WCC is able to manage and deliver conservation outreach to Wellingtonians through ZEALANDIA. The Wellington City Council stands to gain essential data on the

perceptions of conservation and environmental awareness among residents to make more informed decisions and actions when promoting new programs and initiatives regarding conservation.

2.2: Human interactions with birds

While predatory non-native animals pose a threat to native wildlife, humans also pose a great risk to the well-being of these native species. Humans interact with animals in a variety of different ways across the globe based on different cultures and customs. A common and relatable example of interaction is the relationship many individuals form with pets. There has already been significant research in the area of human coexistence with nature, which have concluded that even minimal interactions with animals and the outdoors can result in better stress management and increased positivity among the community (Nicholas & Gullone, 2001). Unfortunately, not all interactions between humans and animals are mutually beneficial. Research shows that interactions such as feeding can have negative effects on an animal's well-being (Orams, 2002). Food fed to animals may be unhealthy or inedible. They can become accustomed to eating food provided by humans, which can lead to dependency problems and malnutrition due to lack of a natural diet (Orams, 2002).

In modern day New Zealand, there exists an especially interesting relationship between the residents and wildlife. The country as a whole is well aware of the mistakes made over the past few centuries with the introduction of non-native wildlife into the New Zealand ecosystem along with habitat destruction. Other direct forms such as window and automobile strikes are also large threats to birds but revolutionary undertakings in conservation efforts are being made all over the country by spreading awareness to actively trying to rid the islands of non-native species altogether. According to a report put out by the Audubon Society, a sizable source of bird mortality that is often overlooked. Birds mistake a reflection in the glass as a real image and within the city this occurs at night due to the use of lights. Countries across the world have begun to take part in light dimming programs to decrease the chance of window strikes (Wild Bird Care Charitable Trust, 2016). The sensitivity of New Zealanders about these issues, while well meant, often manifests in actions that end up being negative for the health of the wildlife.

For example, residents interested in "helping" by feeding the endangered animals are actually hampering their recovery. The most endangered bird for which this case applies is the

kākā parrot. In Wellington, kākā must not only avoid cats and other predators, but must also meet a well-balanced diet to satisfy their delicate digestive system. The majority of bird feed used in New Zealand is composed of bread and seed, both of which are not only unhealthy for many native birds, but are also a large contributing factor to the persistence of introduced wildlife (Galbraith et al. 2015). Residents supply bird feed for the kākā which habituates them to an unnatural lifestyle. Their return to the feeders puts them at greater risk for being spotted by a predator (Chug, 2010). Wellington residents are not only negatively affecting the health of native birds in their interactions, but are also unknowingly assisting non-native birds by giving them a strong presence in urban communities, which creates competition. Beyond the kākā, understanding other threats to native birds in Wellington requires specific knowledge of the species' habits to better position conservation efforts that reflect their particular vulnerabilities. In order to do that, we outline several key types of birds that are part of this study ("Habitat Loss • Environment Guide", 2015).

2.3: Targeted birds of interest profiles

Given these ongoing threats, some native New Zealand birds currently at risk have been identified by WCC as birds of interest for this research in particular for this research in particular. The impression was that local residents' awareness of these birds was lacking and the birds' populations are decreasing. Endangered birds fall into three categories: Nationally Critical, Nationally Endangered, and Nationally Vulnerable. Each category corresponds with the threat level the birds face, and how the birds need to be protected and cared for. Nationally Critical means that the species' risk for extinction is immediate, while the other categories indicate action is needed to increase population levels (Department of Conservation, n.d.c). Our project focused on the tūī, saddleback, and kākā, pictured below in Figure 4. The birds chosen spanned all conservation levels, and were intentionally chosen so that each could be represented in future field work.

Figure 4: Tūī, saddleback, and kākā left to right (Robertson, 2013; Parker, 2013; Department of Conservation, n.d.d)

1. Tūī

Endemic to New Zealand, the tūī (*Prosthemadera novaeseelandiae*) are not endangered, but are threatened by habitat loss and predation. The tūī can be found across the main islands but are scarce along the Southern Alps where the country is dry. They are adaptable birds that can be located in places that have a flowering habitat, such as in suburban areas, and are common within the native forests (Department of Conservation, n.d.h). Their diet consists primarily of nectar which makes them important pollinators, but insects constitute a good food source as well. They become aggressive when feeding and will fight either other tūīs or other species for the nectar. Tūī have distinctive white throat tufts (poi) that stand out against their blue-green body which shine in the sunlight (Robertson, 2013). Both male and females look similar but the males are larger.

2. Saddleback

Belonging to the wattlebird family the saddleback has two endemic species differentiating from the North Island (*Philesturnus rufusater*) and South Island (*P. carunculatus*). Although they are different species both have recovering as their current conservation status (Department of Conservation, n.d.h). The majority of the efforts that helped saved the saddlebacks have taken place on offshore sanctuaries (ZEALANDIA, 2016a). Although many were transferred the birds can be found in coastal and regenerating forests. Since these birds tend to remain grounded their diet consists of invertebrates found within rotting wood. The birds are well-known for the two orange wattles on the sides of their beaks and can be further identified by a brown saddle on their backs. Male and females are difficult to distinguish but the males usually have larger wattles and wing lengths (Parker, 2013).

3. Kākā parrot

The range of the kākā parrot (*Nestor meridionalis*) has become limited to small localized forests in the South Island but also in various areas on the North Island. Risks to the kākā include predatory mammals such as possums, rats, and stoats, along with a plague. In order to eat, they have a special brush tongue for nectar and a strong bill, which helps open seeds and also helps them to climb as a "third leg" (Department of Conservation, n.d.d). Seeds, rata (New Zealand tree), flax, and nectar make up the kākā's diet, but occasionally they go after grubs and invertebrates (Department of Conservation, n.d.d). Two subspecies include variations from the islands: North Island kākā and South Island kākā. Feather patterns of brown and green with bright colored patches of scarlet and orange under the wings can help identify the birds. However, the South Island kākā is more vivid and larger (Department of Conservation, n.d.d). In 1996, the first captive-bred kākā were released into the Pukaha Mount Bruce Forest, a location on the North Island where they have not lived in 50 years (Department of Conservation, n.d.d). This release is part of ongoing work at the wildlife center in the forest.

2.4: Building on the 2013 study of kākā interactions

In 2013, a group of WPI students conducted a study regarding the New Zealand kākā titled "Evaluating the Interactions between Wellington Residents and the Threatened Kākā Parrot". The goal of the project was to assist ZEALANDIA in gaining a better understanding of local halo residents with regards to their relationship with kākā parrots and to synthesize a list of recommendations for outreach. The Wellington City Council and ZEALANDIA felt that the research previously completed was useful enough to repurpose some of their work towards a wider range. Our project builds from this study with the similarity in topics and all of the groundwork they have laid. The main difference between projects is in breadth of topic; the old project was only concerned with awareness and attitudes of kākā parrots whereas this project is concerned with general bird conservation awareness.

To properly evaluate the bird-human interactions the study identified important locations, surveyed residents, and constructed focus groups. They began with an initial site assessment of ZEALANDIA along with neighboring suburbs of Karori and Highbury, which border ZEALANDIA's fence, to identify areas to distribute surveys at locations with frequent kākā interactions. A link to the official survey was printed on flyers distributed to reduce the amount

of paper needed. Over two days they distributed 1000 flyers to the most accessible houses (Cote, Durand, LaRoche, & Warden, 2013). Questions on the survey included frequency of kākā sightings and if the kākā was fed what was it fed, how often, and when the feeding began. Supplementing the surveys were focus groups that provided more open ended discussion.

From the 1000 surveys distributed in the suburbs, 202 residents responded with 106 submitted from Karori and 96 from Highbury, which is a 20.2% response rate (Cote, Durand, LaRoche, & Warden, 2013). The survey results indicated that 78% of residents do not feed the kākā. Out of the 22% that did feed the kākā 20% began feeding longer than two years ago, 43% in the past two years, 12% in the past 12 months, and 25% in the past six months. They indicated that 38.1%, or most, feed the kākā less than monthly and 28.57% feed them daily or several times a day (Cote, Durand, LaRoche, & Warden, 2013). They also discovered that 46% of residents saw the kākā several days within the past 12 months and 25.7% saw them within the past 12 months (Cote, Durand, LaRoche, & Warden, 2013). From this project we anticipated a response rate from a conservation topic to be similar. These survey questions were useful to test again to see whether or not anything had changed in four years.

2.5: Additional case studies in relevant methodologies

"Public perception" and measuring awareness of conservation of native birds includes determining if the public is even aware how they interact with endangered birds day-to-day. It is possible that the public might not be conscious that native birds face endangerment in New Zealand and therefore do not actively attempt to prevent their extinction. In an Indian study of public consciousness, perception of the Dandeli Wildlife Sanctuary was assessed to see if local residents knew of its existence. Examining this case highlights how levels of awareness were gauged as "[they] assessed subjects' knowledge of the protected area through three questions regarding its (1) existence, (2) location, and (3) regulations" (Olomi-Sola, et al, 2011). This flowchart approach of gauging awareness not only concludes whether the person is or is not aware, it also indicates to what extent the individual has capacity. In Table 1, the tiers of citizens that show knowledge of the sanctuary are displayed (see below). There are progressively fewer respondents after subsequent questions.

	Dandeli city, $n=256$		DWS, $n=169$		Pooled $n=425$	
	%	n	%	n	%	n
Respondents who reportedly know about the existence of DWS	48.8[a]	125	69.8	118	57.2	243
Respondents with correct knowledge about DWS location	20.3[a]	52	48.5	82	31.5	134
Respondents with correct knowledge about regulations concerning DWS	35.2[a]	90	55.0	93	43.1	183
Respondents giving correct answers to all the questions	16.4[a]	42	41.4	70	26.4	112

Table 1: Respondents to sanctuary awareness survey (Olomi-Sola, et al, 2011)

This method allows for more meaningful data that can possibly provide for various types of awareness. Evaluating the extents of awareness allows for higher precision when eventually concluding possible solutions to implement.

Continuing on this notion, another mode of awareness queries if the public is capable of identifying various birds and if they can categorize them as endangered native birds or non-native birds. An interesting study from Australia conducted by the University of Sydney examined if the public could recognize an invasive toad from regular local frogs. The group collected data through surveys which involved a quiz with images of frogs and toads at various life stages (eggs, tadpoles, young, and adult). These data would be useful for creating possible conservation methods or pest eradication techniques (Somaweera, Somaweera, & Shine, 2010).

After analyzing the techniques used in Australia, there are some positive practices that could apply to conservation efforts in Wellington. Understanding if the public would even be able to distinguish endangered native birds from non-native birds indicates where efforts need to begin. If a majority cannot distinguish differences, education on this topic would be a priority. If birds are easily recognizable by the public, promoting safe interactions with them would be better suited.

One campaign in New Zealand called Predator-Free New Zealand (PFNZ) currently is working on making a nationally scaled version of current methods from their island sanctuaries. This proposal called for mammalian predators to be eliminated since they directly caused extinction of a quarter of species over 700 years (Russell, et. al, 2015). This campaign faced many difficult problems in regards to invasive predators specifically attempting to eliminate all in a singular operation and technology such as traps and poisons dates back over 50 years

(Russell, et. al, 2015). Their national identity focuses on this "100% pure" mentality which drives the conservation programs. The public fully supports this identity with regards to conservation methods but many oppose the use of 1080 (Russell, et. al, 2015). This chemical poses a risk to other animals that are not intentionally targeted since the poison is sprayed by helicopter over habitats that pests and non-pests share. This mentality is not unanimously accepted, but necessary to effectively protect endangered species (Russell, et. al, 2015). This perception is important when explaining why care for the endangered birds is imperative.

Determining the relevance of media in the role of increasing public awareness is displayed in a case study from Japan about climate change. In this study they understood that the public was aware of climate change but wanted to investigate the relationship between media and their understanding since it has been proven that media is a dominant source of information for the public (Sampei & Aoyagi-Usui, 2009). For their research, they evaluated newspaper articles from 1998 to 2007 regarding global warming and then conducted surveys every month from 2004 to 2007 comparing responses to number of articles that were published over that period. They found that many more respondents deemed climate change a top issue in the world after large numbers of front page articles were published. Their research proved that these articles created much concern amongst the public towards the issue, but it rarely lasted more than a month. This is interesting for our research as further understanding of this trend leads to more effective methods for engaging the public with conservation. Targeting more modern media platforms like online social media creates a continuous awareness plan compared to the newspaper's disjointed method.

2.6: Summary

The literature revealed three key points that have informed our work. We learned that ZEALANDIA is not alone in its conservation efforts. Other organizations with similar objectives collaborate to create an environment in the Wellington community that seeks to provide residents with tools and knowledge to achieve the "100% pure" vision. The dynamic between birds and the built world, which includes window strikes and habitat destruction, is clearly a controversial topic. Specific birds can be increasingly put at risk by public interaction. In particular, citizens need to pay close attention to their interactions with wildlife and the consequences of their actions. Finally, we found best practices for identifying public perception with regard to

conservation issues. Analyzing previous methods of data collection allows for better insight into public awareness. This literature review provided us with essential information which has helped us in determining a baseline for our work, and has allowed us to better understand our project's context after having collected data.

Chapter 3: Methodology

The goal of our project was to work with Wellington City Council and ZEALANDIA to identify strategies that will improve public awareness regarding native bird species. To achieve the overarching goal, we completed the following four objectives:

- Conducted a site assessment of the ZEALANDIA sanctuary and its surrounding halo region;
- Identified current strategies in bird conservation and public outreach in the Wellington region;
- Evaluated public awareness, knowledge, and attitudes towards birds and bird conservation; and,
- Assessed comments and shares on social media in public outreach and engagement.

Tasks set forth by our objectives are outlined in the sections below.

3.1: Objective 1: Conducted site assessment

Understanding baseline attitudes about conservation strategies in Wellington provided a foundation for the project. We conducted site assessments at the ZEALANDIA sanctuary on January 13th and 16th, 2017. Through observation and photographs we documented the location, content, and appearance of informational materials, including educational signage, pamphlets, exhibits, and posters. We also noted the availability and costs of tours within the visitor's center and along the trails. This was an important part of our initial assessment as it gave us a baseline for outreach and education on conservation conducted by ZEALANDIA.

In addition to the actual bounded site of ZEALANDIA, we assessed the surrounding residential neighborhoods in the halo district to gage bird-human interactions, note local features of interest, and to generally gain a better understanding of local residential neighborhood layouts. We also noted the differences between neighborhoods. Over the course of these assessments we used the application MapMyFitness to track our movement throughout the halo while marking points of interest.

We systematically assessed the suburbs of Northland, Karori, Kelburn, Highbury, and Brooklyn on January 12, 13, 16, and 17, 2017 respectively. This included parks, businesses, and other commonly used outdoor public spaces. Understanding how crowded these areas become, as well as how often bird sightings occur was important in getting an idea of public survey feasibility and understanding bird-human interactions. We took notes and photographed locations of interest for our site assessment. We looked for common indicators of bird

interaction, which included bird feeders, birdbaths, backyards, and parks along with tūī, saddleback, and kākā themselves.

3.2: Objective 2: Identify current strategies in conservation

We interviewed conservation professionals in order to better understand current techniques like “Battle for Our Birds” and what opinions exist about them. We used open-ended interview format with questions focused on thoughts about current techniques as well as any other baseline data of interest. This includes questions regarding youth education, sponsored programs, research interests, and more. A general interview guide can be found in Appendix C, though most interviews varied depending on the person.

Interviews began with a member of WCC who is involved with oversight of parks in the Wellington area and conservation organizations. A strategy referred to as “snowball sampling” (Berg, 2007) was used to identify additional interviewees. All participants were notified about our affiliation with Worcester Polytechnic Institute (WPI), ZEALANDIA and WCC, and the nature of our research. We requested permissions regarding the right to record and quote the individual about their responses. After the completion of the interview they were provided the opportunity to review their responses before being analyzed and incorporated in our report.

Elementary teachers were chosen to be interviewed since they aid in the development of children's knowledge and attitudes, and thus have a unique perspective on how conservation topics are distributed. Teachers we contacted if their school fell within a two-kilometer radius circle (Figure 5).

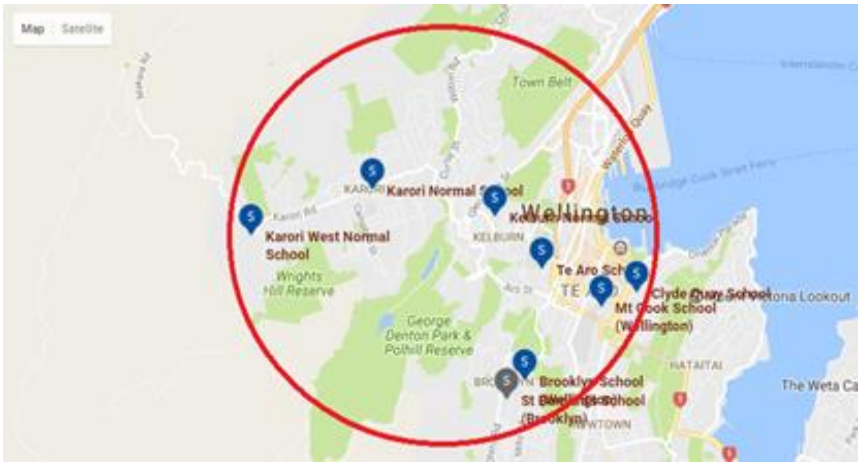

Figure 5: Elementary school range

The names and distances of these schools from ZEALANDIA's Visitor Center are noted in Appendix D. Of the eight schools that fell within the region, only one responded so we were unable to gather meaningful opinions. In addition, we reached out ZEALANDIA's education coordinator, but he was unavailable to meet with us.

3.3: Objective 3: Evaluated public awareness, knowledge, and attitudes

In order to test public awareness, knowledge, and attitudes, we created a survey that allowed us to gather data from a larger population than would be possible through observation and in-depth interviews (Ward, 2014). The survey is located in Appendix E.

The survey includes questions on bird recognition, kākā feeding habits, a nature-relatedness scale, participant behavior, and demographics. A preliminary question inquires the suburb in which the participant lives. In addition to the significance of this data, this question also serves as a filter before going on to complete the rest of the survey in order to discourage non-Wellingtonians from completing the survey.

The first section of the survey was created to assess a respondent's ability to distinguish different species of birds and if the bird was endemic. If respondents believed they were able to recognize the species, they were asked follow up questions inquiring how they were able to distinguish the bird and if they have seen it near their home. Understanding why certain birds are more distinguishable than other species is useful for improving conservation outreach material. If a certain species is often unrecognizable then efforts need to be made to raise awareness since visual recognition is most important according to WCC.

Birds chosen to test residents on included the tūī, the saddleback, the kākā, and the common sparrow. These birds were chosen to account for each type of endangerment level, but also on degree of difficulty. The tūī is easy to identify based on certain features along with it being a popular image across New Zealand. The saddleback is more difficult to identify since it spends most of its time low to the ground and looks similar to the huia, an extinct species. The kākā was chosen because it is easily recognizable due to all the attention in the past few years from conservation efforts, but also because it is endangered. The common sparrow was chosen as a non-native bird that has a high presence in the greater Wellington region.

The second section of the survey revisited the survey questions asked by the previous ZEALANDIA study on kākā parrot feeding habits. Reusing these questions enabled us to

directly compare our results to findings made by the previous research done four years ago. In addition to these recycled questions, as per request by WCC and ZEALANDIA, we inquire about why, how, and when residents stopped feeding kākā. The third section of our survey included questions which asked the participant about how much they agreed or disagreed with various statements regarding attitudes and interactions with nature. Questions were taken from the NR-6 scale which is considered a standard for assessing nature-relatedness among many organizations, ZEALANDIA included (Nisbet & Zelenski, 2013). These questions allowed us to see if there is a connection between accuracy with bird recognition and personal feelings towards nature. In the final section, we asked participants some follow-up questions to better understand their personal behavior with regards to conservation and basic demographic information. We inquired the respondent to identify their sources for news on conservation-related topics, which allowed us to do follow-up research on sources participants selected as relevant. Participants were also asked to rank threats to native birds based on the significance of the threat, giving us more data on resident awareness of conservation issues. Finally, we asked respondents to self-identify their knowledge on conservation and bird topics. Acquiring data on participant age, gender, education, and Māori or Pasifika identification helped us understand the connection between the demographics of residents in the halo and their knowledge regarding birds that frequent their neighborhoods.

Before distributing the survey to the public, it was pretested among WCC staff. Their answers were analyzed to ensure responses met with our design intent. Participants were encouraged to actively critique the survey as they took it and to provide feedback. Confusing questions, formatting, and overall survey flow was assessed and edited accordingly.

Initially we planned to do intercept surveys within the halo neighborhoods. This would entail approaching individuals and presenting them with the survey flyer (Appendix F). After our site assessment evaluation and conversation with our sponsors we decided to change our process of surveying. The promising potential of email as a distribution method convinced us to move to surveying the public through online services. The Wellington City Council manages various email lists which it has access to (Appendix G). In addition to these lists, we used community applications and social media to reach an even broader sample. One application called *Neighbourly* allows for the local residents and organizations to communicate with each other. We were able to use this to survey within specific neighborhoods of interest. Similar to

Neighbourly, we targeted specific suburbs through Facebook neighborhood pages, as well as the online forum reddit. The distribution methods can be seen below in Figure 6, and screenshots of survey posts through social media can be seen in Appendix F.

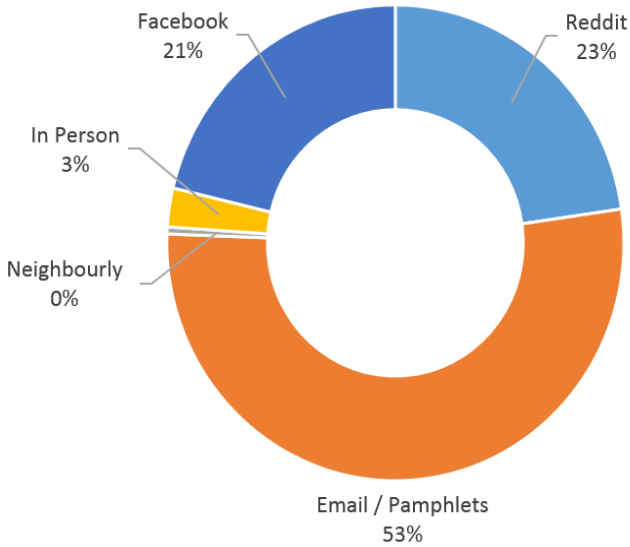

Figure 6: Responses by distribution method (n = 418)

After two weeks 418 respondents took our survey. Email, Facebook, and reddit were the most effective means of soliciting responses. We received 95 (23%) completed surveys from posting on reddit and 221 (53%) from emails. E-mail had the most continuous flow of responses even days after the initial distribution.

3.4: Objective 4: Assessed the role of social media

Social media is a powerful tool in the modern world, and one that is utilized daily by many for both personal and professional reasons alike. Websites like Facebook, Twitter, and *Neighbourly* not only offer new media with which users may utilize to talk to one another, but also offer a platform for businesses and organizations to inform targeted audiences of news and events. The Wellington City Council and ZEALANDIA use social media outlets to reach a broad audience on topics of conservation and to rally support within the community for working towards their respective missions.

In order to find popular posts on the topic, we searched for media distributed by the Wellington City Council, ZEALANDIA, and various newspaper outlets to find relevant posts.

Relevant posts were defined as having to do with bird conservation, awareness, and interactions. Within each post the number of likes and shares were identified along with comments. We analyzed comments qualitatively by looking at the tone of the comment and the content. Identifying trends and similarities among responses allowed us to relate them to social media posts.

Once we found the comments and post content that were most relevant to our research we selected a few posts of particular interest. By analyzing reactions to these posts we could further sort them based on the general theme of the post. Because Facebook allows reactions where users are able to state their emotions as happy, sad, or angry, we were able to sort posts more accurately. The comments would also become points of interest because of the potential reactions displayed. We analyzed the themes of comment threads based on what users said since controversial topics often arise.

Chapter 4: Results and discussion

This chapter outlines the data collected throughout the course of the research by objective as well as a discussion of our findings.

Part 1: Results

4.1: Objective 1: Site assessment of ZEALANDIA sanctuary and the halo

To begin our study, we assessed the ZEALANDIA site and the residential district which falls within the halo to get a sense for what resources are in place. Our engagement with of the area revealed how ZEALANDIA really is just the heart of an abundant green habitat for birds and residents alike. Beginning with the visitor center, we found a welcoming environment for both locals and tourists alike. The Center itself hosts a series of informative exhibits, as well as a café, rest stations, shuttle drop, and souvenir shop.

The main gallery features a video directed by Peter Jackson, which sets a serious tone about ZEALANDIA's mission in the context of development and conservation programs taking actions to return the landscape to what it once was. A quote by Henri Bergson along the outer wall further emphasizes ZEALANDIA's vision for visitors within the sanctuary reading "The future can no longer be 'What is going to happen?' It is 'What are we going to do?'"

A range of pamphlets was available for visitors in addition to other stations that offer membership, donation requests, other educational materials, and private tour availabilities (Figure 7).

Figure 7: Brochures for inviting public engagement

All of these displays are intended to promote and explain ZEALANDIA's goals and encourage public engagement. Not only does ZEALANDIA wish to raise funding to accomplish their goals, they seek to encourage members of the public to do their part to help bring back native wildlife. ZEALANDIA believes that creating an informed and motivated community will be the long-term solution to foster native wildlife growth.

As visitors move through the Center, they are directed into the fenced sanctuary through a bio-security gate. The main trails in the northern end of the sanctuary are easily walkable and wheelchair accessible, with more demanding hiking trails in the southern end of the property. Informative signage explains the fence and other features which are designed to protect the wildlife (Figure 8).

Figure 8: Sample fence with animal jumping height examples

Interpretive signs are located at key locations along the sanctuary paths. These signs include information about specific species and how native birds should properly be treated to

sustain healthy development (Figures 9 and 10). Using an official ZEALANDIA map, we tracked our movement throughout the sanctuary and added various markers to indicate the locations of different types of signage (Figure 11).

Figure 9: Birds Feeding Here? Signage to raise awareness of bird diet

Figure 10: South Island Takahē, informational signage

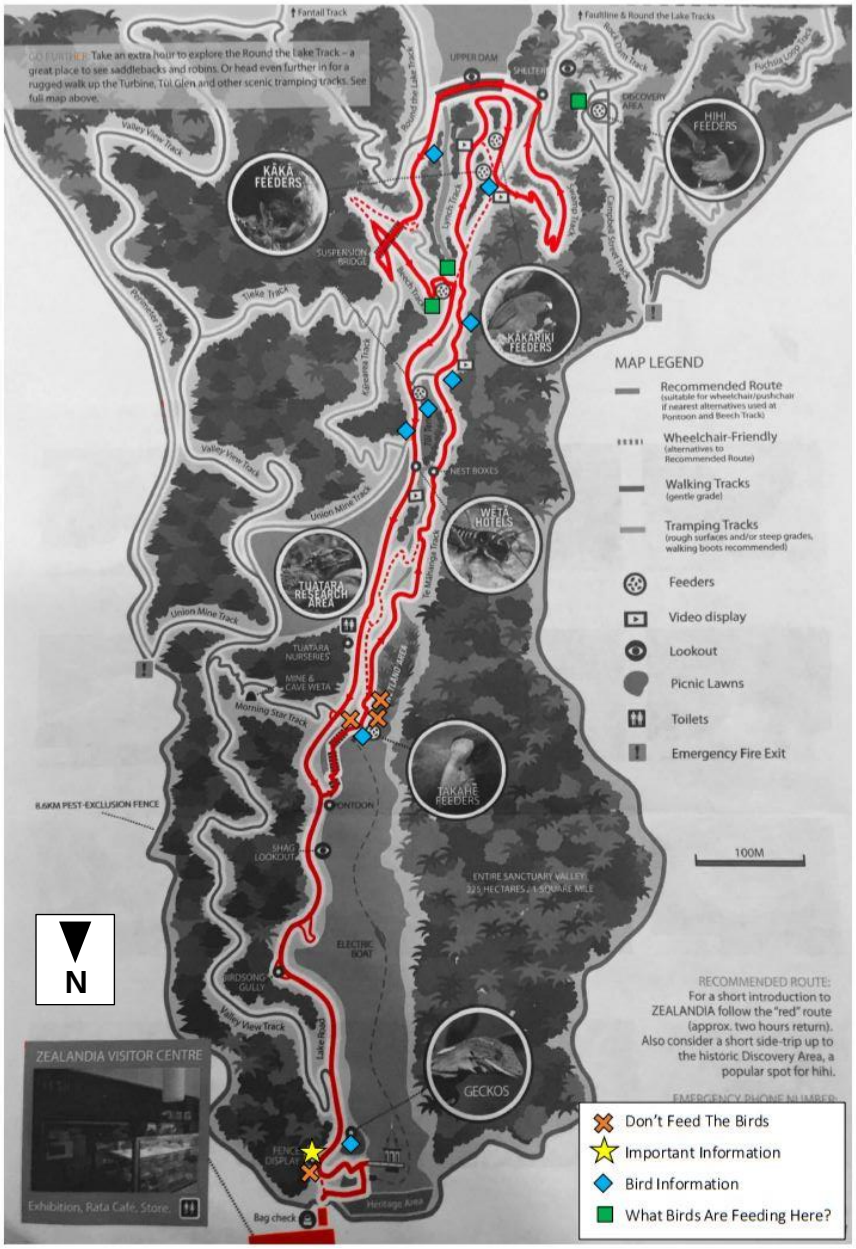

Figure 11: ZEALANDIA trails and signage

The sanctuary's use of educational materials and astonishing views allows visitors to have both a personal and intimate experience with nature while still learning about the ecosystem. Developing a personal connection with the species helps visitors understand the need for bird conservation and awareness. The vast area ZEALANDIA's trails cover encourages multiple visits and allows for the guest to see something new with each return.

To better understand the nature of the suburban areas that abut the sanctuary, we walked several of the streets in Karori, Northland, Kelburn and Brooklyn between January 12 and 17 (Figure 12). The routes took us through neighborhoods, public commercial areas, and parks.

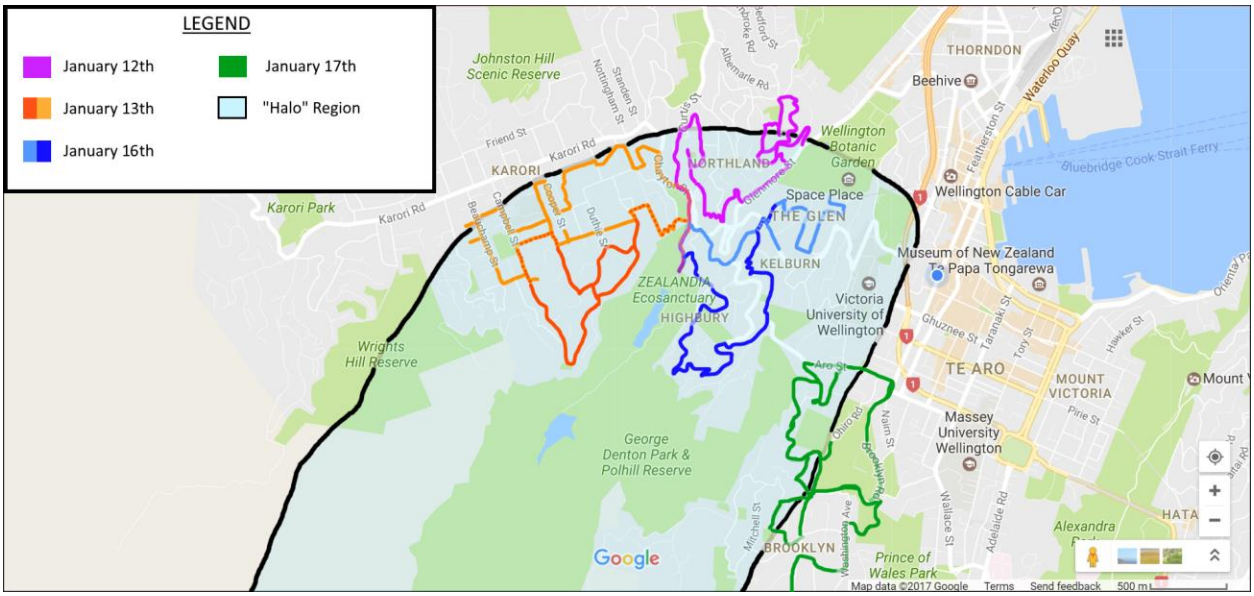

Figure 12: Site assessment routes

Most of the suburbs surrounding ZEALANDIA consisted of many steep slopes and houses built into cliff-like foundations. For this reason, a lot of the roads did not allow for the passage of automobiles. Private walkways led to houses since they were often off the roads and tucked away, making them difficult to access (Figures 13 and 14). The exception was Karori, which is generally flatter and has higher building and road densities.

Figure 13: Pathways to tucked away houses

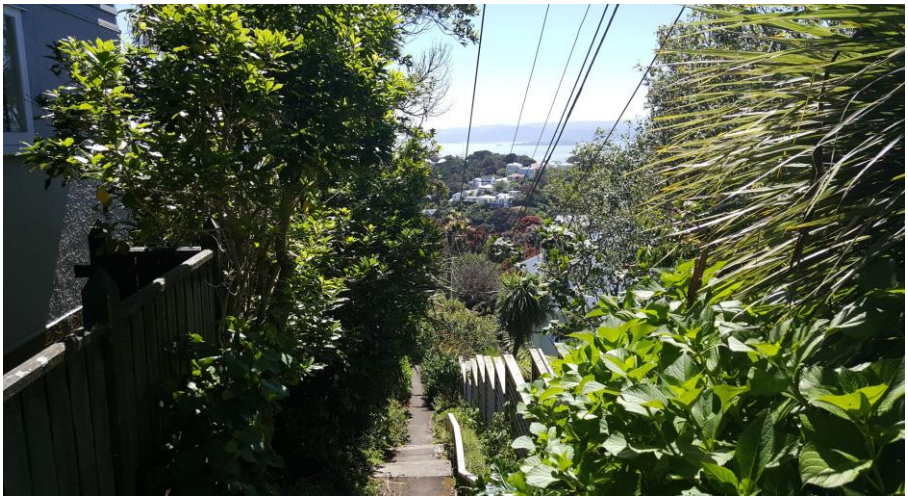

Figure 14: Stairway from a street at one elevation to another

There were few “birds of interest” present in our halo assessment, with most sightings being tūī and sparrows. Kākā were only seen occasionally flying high above, and no saddleback were found at all. We noted that areas with larger numbers of native trees, such as rātā, as well as DOC-maintained parks had more birds. We encountered cats in some neighborhoods like Karori roaming about the gardens and pathways with no restriction. From our simple investigation, we also noted that bird feeders which contain suet or seeds were scarce.

The site assessment helped us understand what daily bird-human interactions might occur. It also showed us that distributing a survey of the public in person would be challenging since few individuals were out and about.

4.2: Objective 2: Identify current strategies in conservation through interviews

We conducted three interviews, which gave us specific insight to how locals and specific groups participate in conservation efforts. To that end, we first interviewed members of the Wellington City Council and later reached out to local elementary school principals to collect the viewpoint of educational efforts in the area. These individuals were chosen because they interact with large groups so their opinions on community engagement are important to consider. We reached out to members in the conservation community including the ZEALANDIA staff, the Department of Conservation and professors at Victoria University, but they were unavailable to participate for various reasons, including the coinciding summer vacation. In general, the

interviews that we conducted revealed that hands-on interactive programs were considered the most effective.

To understand the agency's perspective in the Wellington region, we interviewed a representative of the Wellington City Council's team on urban conservation. WCC is most successful educating the public through community groups and letting the experts lead the discussion on conservation. This works out well and is popular among residents since it is the community members giving the facts and not WCC staff. The Wellington Zoo, ZEALANDIA, the Department of Conservation, the Greater Wellington Regional Council, Victoria University, and Wellington Regional Environmental Educators Forum (REEF), are groups that WCC backs to provide content for the public. We learned that making personal connections also increases willingness to listen to the messages from these organizations. When programs are targeted to a specific audience and show real implications, residents are more likely to engage, which has the effect of making them change their actions. The "fanfare" around the birds makes residents recognize their significance as there has been recent emphasis celebrating native wildlife for its uniqueness to New Zealand (Interview 2, January 30, 2017).

Although the programs are successful, difficulties sometimes arise because WCC has an overwhelming amount of information, or that educational programs need to be conducted gradually rather than hastily pushing out all their content. Another problem for WCC then becomes developing programs that have a lasting effect on participants so that in the end they feel motivated to get out and do their part. When controversial conservation topics are discussed within the community, the conversation is easiest when the proper groups are involved. In the past, WCC has worked with organizations popular amongst cat owners to distribute information on the controversial topic of cats and native wildlife.

The interview gave a better understanding as to how the Wellington City Council currently handles awareness campaigns. Once the public realizes how personal these topics are to them they tend to get involved and take matters into their own hands. The Wellington City Council seeks to make a connection between the issues and the residents which generates long-term conservation involvement.

One way that we can measure area conservation activities and perceptions is through social media analysis. To learn more, we reached out to an expert in social media. In the interview we discussed past successes and failures experienced when spreading information.

When posting about significant topics, they have found that storytelling is the most useful approach. They explained that readers are likely to disagree with the article if there are no facts provided, and that you cannot just tell them to start or stop doing something because it is "bad". Analyzing social media posts to see if they use this storytelling approach and comparing it to the reactions that post received allowed us to test this statement. Social media is a fairly new tool when it comes to spreading awareness for the agency so it has a lot of untapped potential, and the amount of outreach it can provide is much higher than any other medium currently available.

We also inquired about how to track the success of a post, which is difficult to do. Often posts can become quite popular, but that is not an effective way to measure if it is changing user's actions. Though it is difficult to tell, the number of shares a post receives as well as the tone in the comment section are good indicators if the article is successful (Interview 3, February 8, 2017). We decided to look further into the tone of social media comments which can be found in section 4.4.

To get the perspective of an educator we reached out to a local school principal. Our interview aimed to gauge the elementary school's participation, interest, and curriculum towards bird conservation. Our respondent began with a discussion about the students' ability to distinguish native and non-native birds. They felt that there are certain students who would be able to make the distinction because they are older and have participated in bird conservation before. The school believes conservation is the most important subject to teach and this is a commitment they will uphold. They also pride themselves for their strong environmental education studies, which allows for students to learn about topics like birds. The school also believes interactions within the community are important, especially for educational opportunities with conservation practices. Classroom activities included trapping programs, maintaining vegetable gardens and bees, building a greenhouse made out of recycled materials, and a program on a sustainable coast. Students learn about native birds through classes but there are no hands-on activities like the ones previously listed. These programs excite students as they are interactive and allow them to take personal action.

Since it is important for conservation to begin at a young age it was good to see some schools taking the initiative. The principal felt the hands-on activities they already perform have produced a good reaction among students so when we asked what else they feel could be done their only reply was the involvement of bigger programs. They felt if they could make a personal

relationship with ZEALANDIA they could provide a better education on the topic for the children (Interview 1, January 27, 2017).

These interviews provided us with a snapshot as to how some of the key leaders in the Wellington community currently address conservation education and outreach. Whether the target audience is children or adults there are effective and ineffective ways to market this material. Our interviews have shown that outreach does not only have to be optimized and efficient, but that it can be engaging as well.

4.3: Objective 3: Evaluating public awareness, knowledge, and attitudes

We distributed a survey containing 34 questions on four topics. We gathered 418 responses over a 2-week period through various distribution portals, and we pooled the data into a singular dataset (see Appendix I). Figure 15, below, is the entry page to our survey.

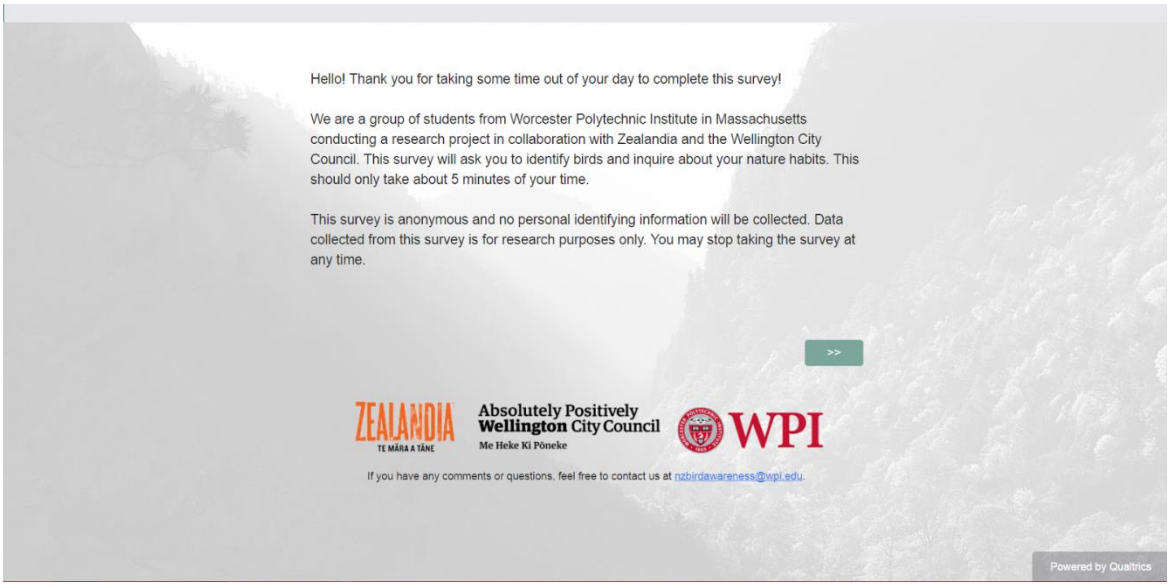

Figure 15: Survey entry page

The survey asked participants to identify four birds and whether they were native or non-native. The majority of respondents were able to properly identify all the birds. For example, the most recognized bird was the tūī which was identified 99% of the time. The saddleback was least recognized with only 76% able to identify it, but still a majority. All bird recognition rates can be seen below in Figure 16.

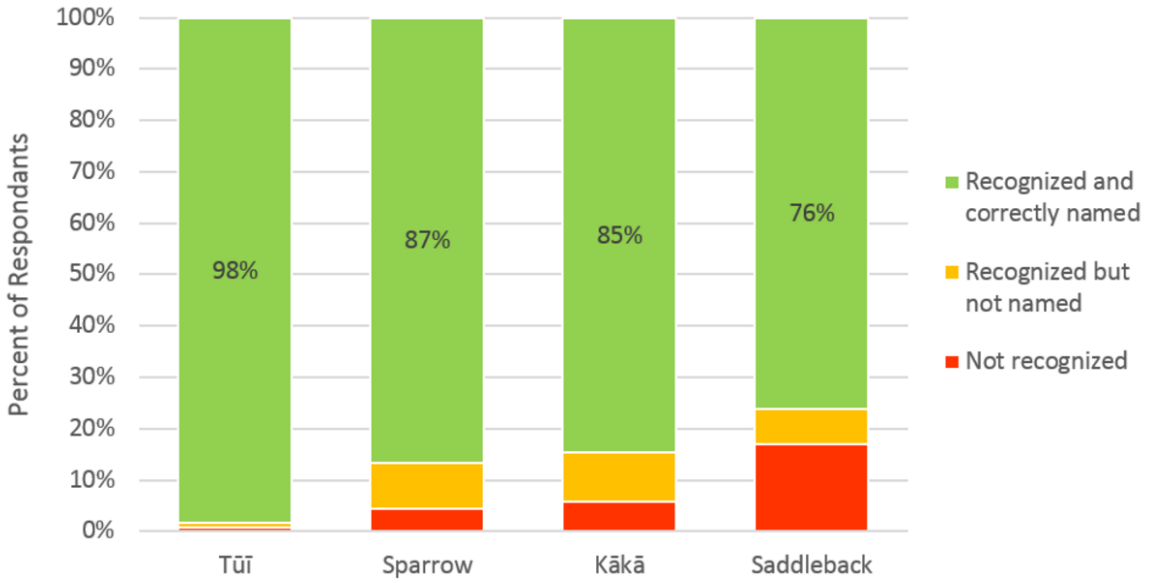

Figure 16: Bird recognition

When identifying native birds, the tūī again received the most correct responses at 99%. However, the common sparrow was the most difficult for respondents in this case, with 13% unable to state it was a non-native bird. Although there were 13% of respondents who could not properly identify it as non-native, this score is reasonably low. Below are the results of responses identifying birds as native (Figure 17).

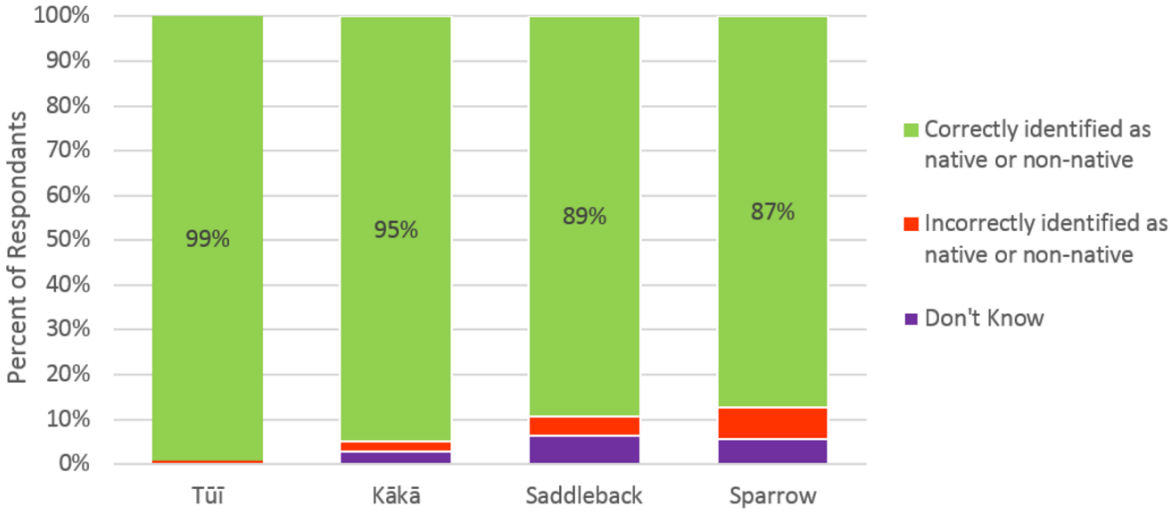

Figure 17: Bird identified as native species

To effectively analyze how respondents did on the bird questions, a “score” value was created. The score can vary from zero to eight, and is based on the sum of the respondent's correct responses for the bird section (looking specifically at name/recognition and if the bird is native). Figure 18 shows the distribution of scores, 75% of respondents got a score of 7 out of 8 or above. This shows the respondents are well educated when it comes to native birds.

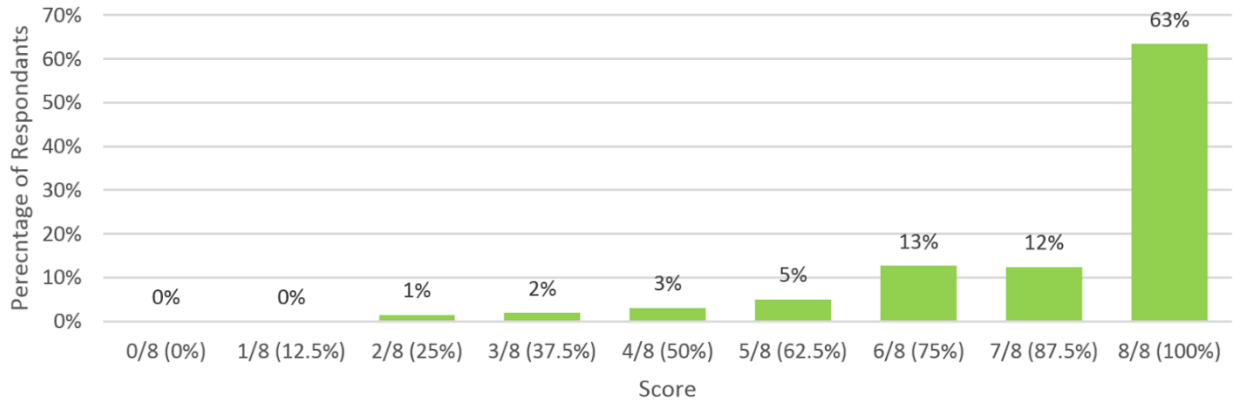

Figure 18: Respondent “total scores”

Participants were asked to name what visual features helped them recognize each bird. These responses were recorded via text box so a word cloud was created to display the most common responses (see Figure 19). The larger words indicate that they were used more commonly amongst participants. Since respondents were only prompted to answer this question when they identified the bird the number of responses varied, as signified by n.

(a) tūī (n=415)

(b) saddleback (n=347)

(c) common sparrow (n=400)

(d) kākā (n=394)

Figure 19: Visual recognition word clouds for *(a)* tūī, (*b*) saddleback, *(c)* sparrow, and (*d*) kākā

From the data we collected, it seems as if our sample knew the identities of the birds we tested against in our survey, even though we intentionally included the saddleback as a more difficult bird to recognize. The saddleback was expected to be the most difficult but 76% were still able to successfully identify it. The common sparrow was unable to be identified by 13% of respondents, which was surprising given its presence. The kākā confused 15% of participants possibly because of its resemblance to the kea, another native parrot which is slightly smaller than the kākā. Eighty percent of incorrect responses identified the kākā as a kea. With 75% of respondents scoring a 7 out of 8 or higher, we can deduce that in general Wellington residents have good knowledge of birds from the area.

The 418 respondents were from 60 Wellington suburbs (Figure 20). Forty-eight percent (200) of respondents were from suburbs in the halo region, including Karori, Northland, Highbury, Kelburn, and Brooklyn.

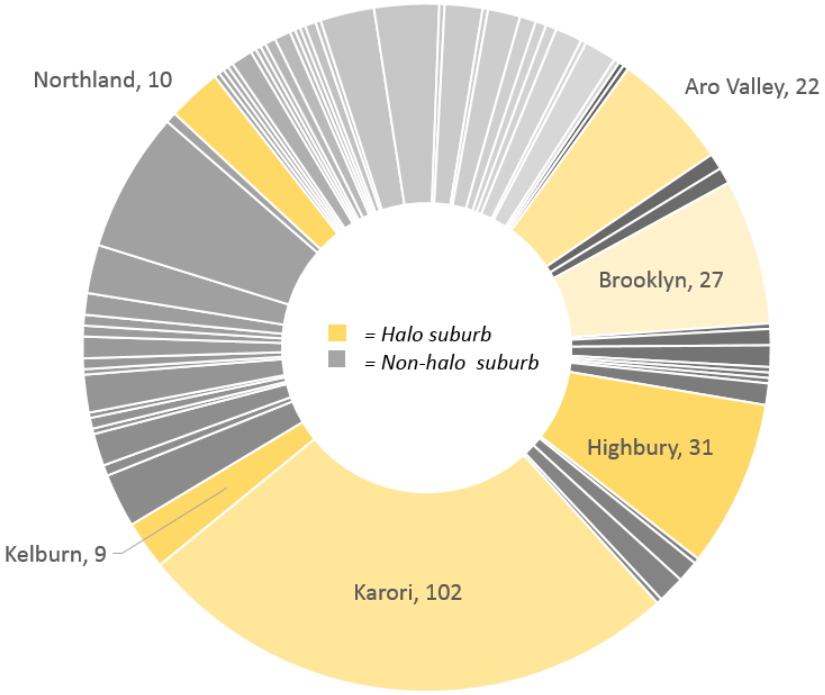

Figure 20: Suburbs represented in sample (n = 65)

Demographics showed that the survey was taken by 38% males and 62% females. There was a spread of age with 42 being the average age of survey respondents (Figure 21).

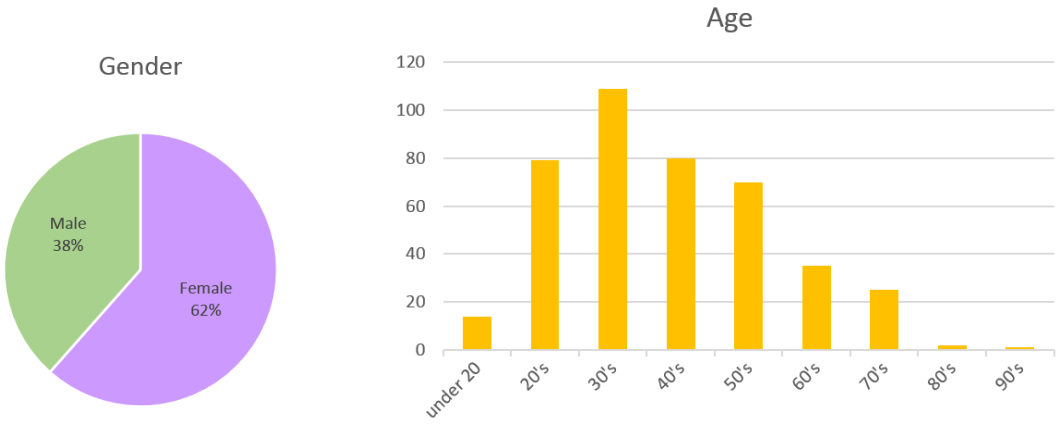

Figure 21: Gender and age demographics

Over half the participants indicated they had a bachelor's degree as their highest level of education and only 16% indicated they had not completed a university program. Out of all the respondents, 4% identified as Māori or Pasifika (Figure 22).

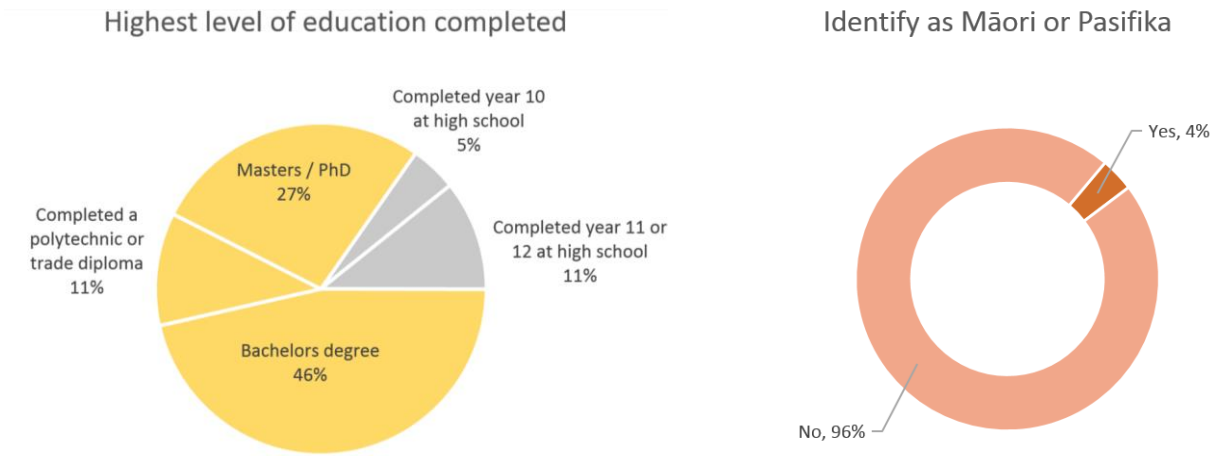

Figure 22: Demographics for highest level of education received and Māori or Pasifika identification

Our survey is a good representation of the population when compared to the 2013 Wellington census. According to the census, the median age of locals is 38 years old similar to our sample at 41 years old. Our sample's percentage of participants that were over the age of 65 was 11% (46) compared to the census' 13%. It is also recorded that 1.4% of the Wellington population is Māori, compared to our sample 4% which is slightly higher than the population average. However, our sample was 61% female, which was an overrepresentation of the population. The census states an even gender split, which our sample slightly misrepresents. Also our sample had a much higher education level than that of the general level of Wellington. About 84% of respondents have received a bachelor's degree or higher whereas in the general population only 28% have received this degree ("QuickStats about a place", 2013).

Further analysis showed that there were no unusual trends with our results. When comparing the differences among halo and non-halo residents, results for performance on bird questions were similar. Halo residents who scored above 7 out of 8 made up 77.61% of the population whereas non halo residents in the same category made up 74.2% of the population as

seen below in Figure 23. The difference in scores was so small that it is insignificant to make a statement other than how there is no difference.

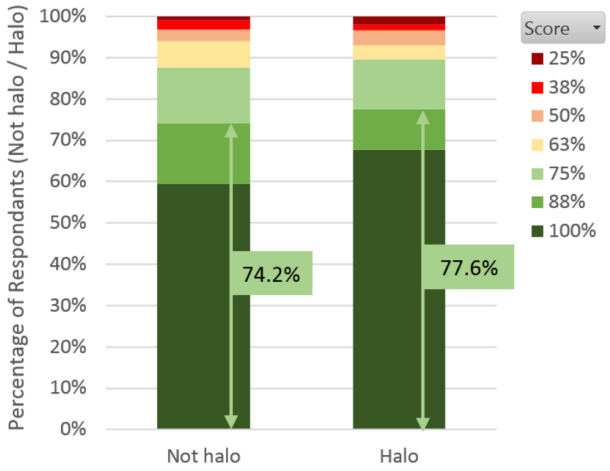

Figure 23: Halo scores vs. non-halo scores

When comparing other results against demographics, few trends were noticeable. Scores did not vary significantly between demographic groups, with the exception of education, but even then the variance was surprisingly balanced. High scorings have a clear correlation with level of education obtained but scoring of 75% or better (medium scoring) in general was uniform across each group (Figure 24).

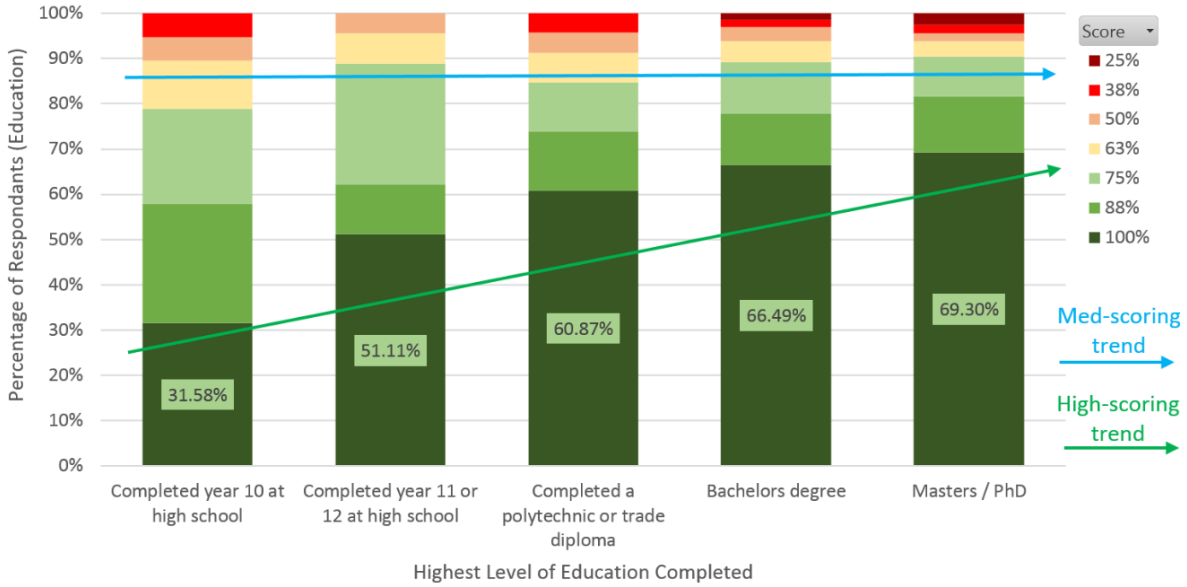

Figure 24: Education vs. score

The majority (97%) of respondents claim they do not feed kākā. Fourteen (3%) participants admit that they currently feed the parrots (Figure 25).

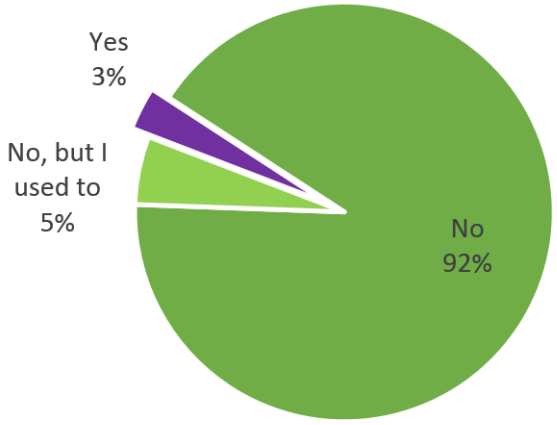

Figure 25: Residents who feed kākā (2017)

Of those who feed kākā, 9 (4%) are halo residents. The majority of residents (66%) explained they did not feed the kākā because it is bad for the birds. Another intriguing finding was that 29% of respondents did not feed the kākā because the birds have a high presence near their residence (Figure 26).

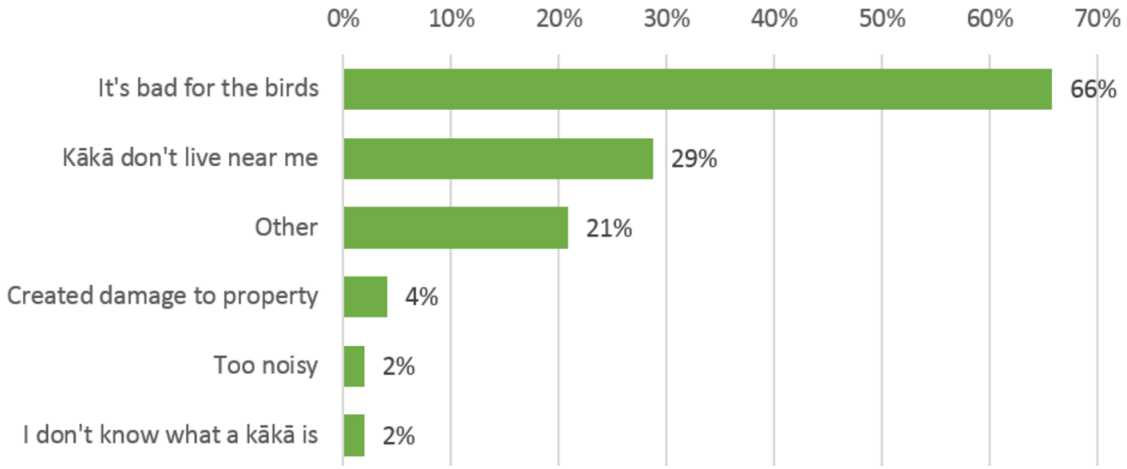

Figure 26: Reasons for not feeding kākā

Compared to the previous research team's findings, kākā feeding in the halo has declined 2013 (Figure 27), but when residents do choose to feed they are mostly using foods that are less harmful.

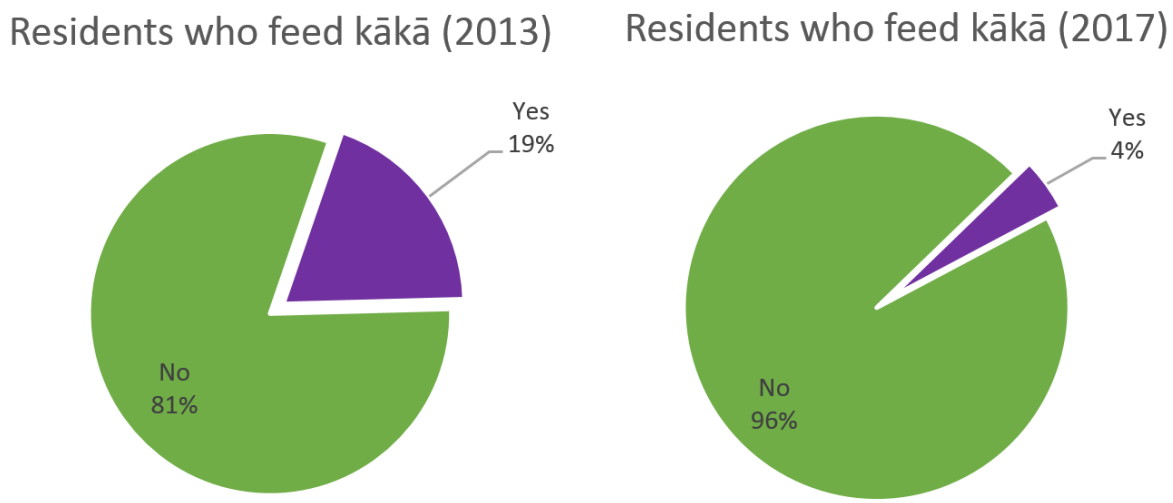

Figure 27: Four-year comparison of halo residents who feed kākā

Our reports show that the average score of participants on the NR-6 questions was four out of five, with most respondents tending to agree with questions (Figure 28). Eighty-two percent of participants scored an average of a 4 or 5 classifying themselves as connected with nature.

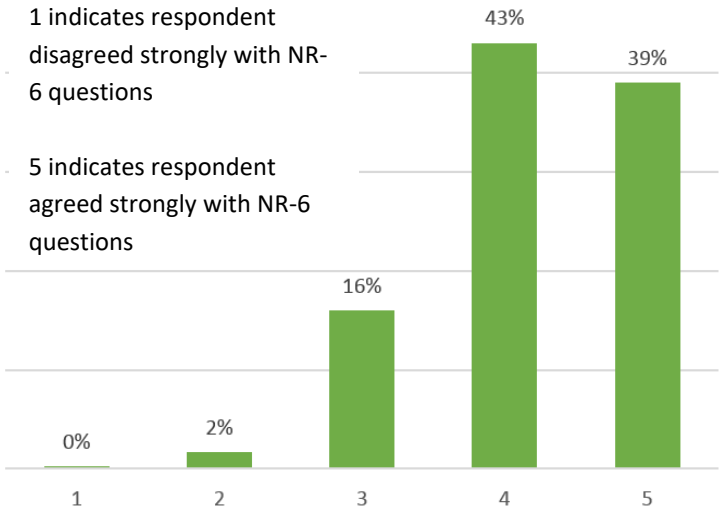

Figure 28: NR-6 average score

Comparing the NR-6 scale values to the average score participants received on the bird recognition, there appears to be a direct correlation. As values on the NR-6 scale increase the number of high scores also increases (Figure 29). This graph does not show 1 or 2 on the NR-6 scale since there were only seven respondents who identified with these averages.

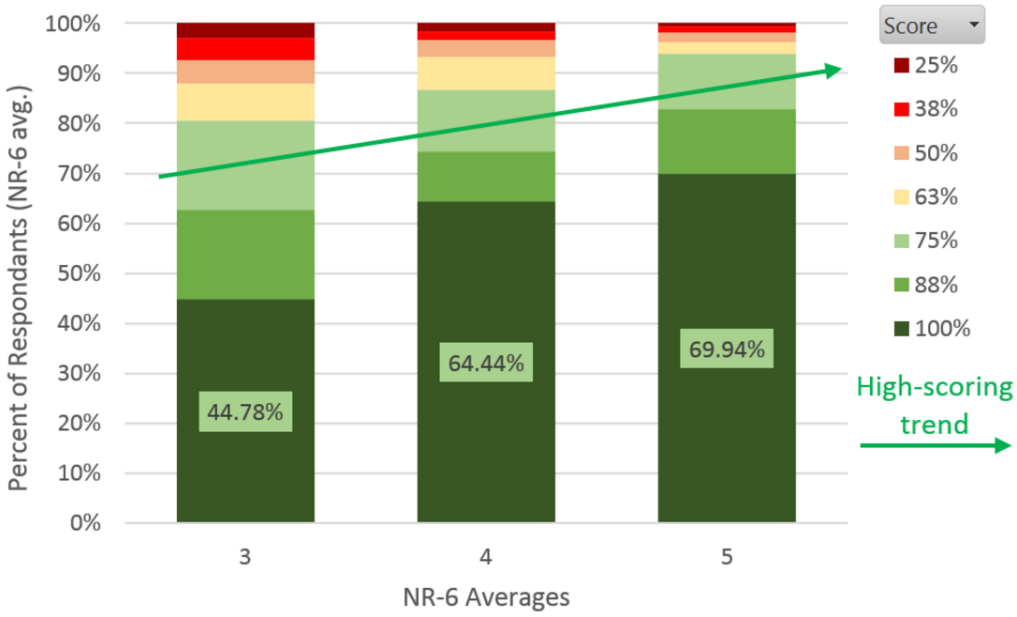

Figure 29: Resident NR-6 average vs. score

When asked to rank threats birds face from highest ("1") to lowest ("7") some threats were identified by the majority of respondents unanimously as being major threats, such as the "pests" option (Figure 30). Open response answers for threats included poison, climate change, and various human activities. We combined the highest threats (rankings 1 and 2), moderate threats (rankings 3 and 4), and low threats (rankings 5, 6, and 7) to provide a clear representation of responses.

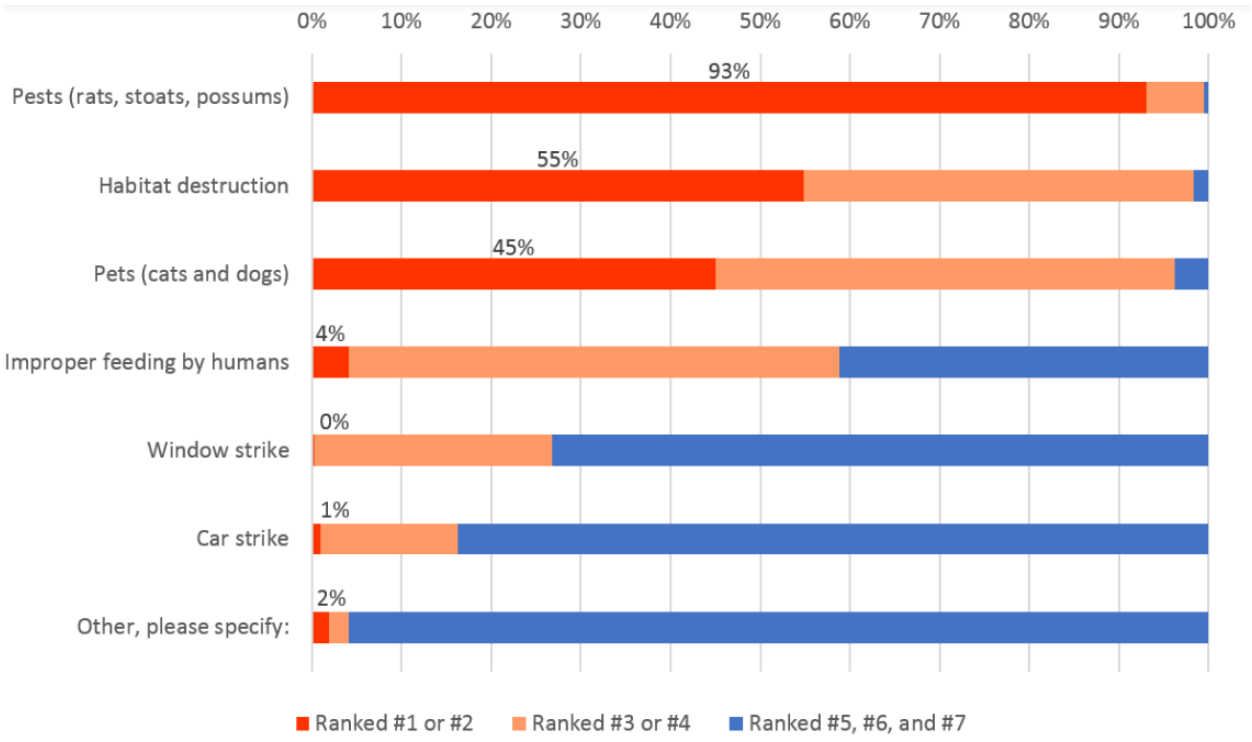

Figure 30: Ranking of highest threats to birds

The fact that participants ranked these threats in this order is interesting. Both window strike and car strike were ranked amongst the lowest of the group. This is important to note as they are still both large threats to the native birds and may need to be discussed further in the future when creating new outreach material.

The majority of respondents indicated that their three most preferred sources for news on conservation were Facebook (73% of respondents), newspaper/magazines (61%), and through word of mouth (51%) (Figure 31).

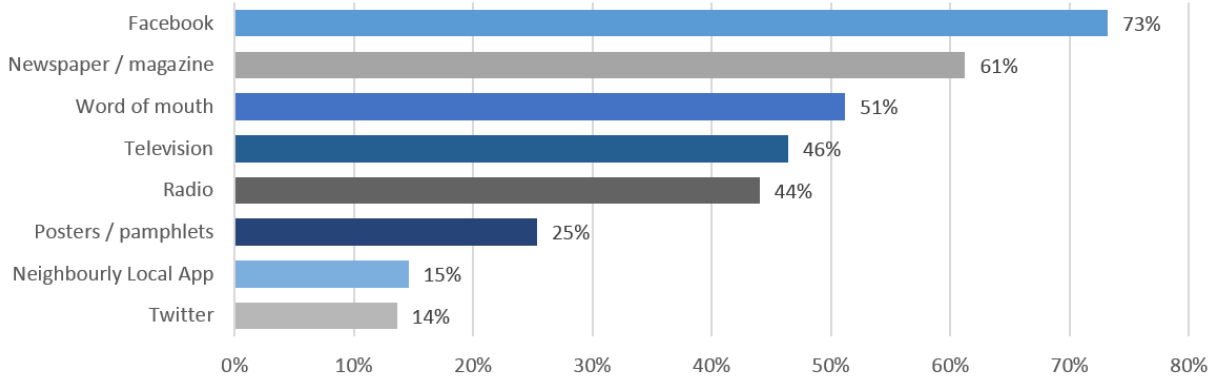

Figure 31: Sources of conservation related news among respondents

The least preferred source was Twitter (14%). The open response "other" option mostly mentioned reddit, stuff.co.nz, email, DOC, and ZEALANDIA.

4.4: Objective 4: Assessed the role of social media

Evaluating the role of social media with regards to conservation material allowed for a more qualitative understanding of the general public's attitudes on the topic. This section encompasses the themes of social media comments and reactions to a variety of posts. Both the original posts and the Facebook shares were analyzed in order to observe bird knowledge and awareness.

Comments on articles are based on the specific tone of the author. They mostly correlated with the tone of the article, with positively-themed posts generating positive responses, and negatively-themed posts generating negative and controversial responses. Responders conveyed their emotions through both text and icon or emoji usage, and were thus analyzed accordingly. Some articles such as the Wellington Bird Rehabilitation Trust's pictures on Facebook or NZ Herald's post about the transport of takahē chicks were overall very positive with comments reflecting this. Other articles that had a sad theme brought out empathetic comments such as NZ Herald's piece on rare birds that were found shot dead. Both groups of articles also had a mix of sarcastic or angry comments mixed in, though these were generally in the minority. More of these kinds of comments were found on the disheartening articles though.

Negative comments were found when the article discussed upsetting topics. One post titled "Kākā chicks at risk as people feed them fatal foods" by Matt Stewart of Stuff introduced negative responses. Users were upset with the fact that there are those who continue to feed the kākā despite the ongoing efforts to encourage citizens to stop feeding them. While sometimes this anger was directed towards others, there were also cases where articles sparked feelings of sorrow and empathy within the comments. One example is a post of an endemic bird reaching the end of its life with someone commenting, "Sorry to hear, never easy losing any bird but especially one of those special ones that come along from time to time 😔".

Other posts received comments that were both negative and positive creating controversy and arguments between users. A piece from NZ Herald regarding birds that were shot and killed written on February 1st, 2017 received comments like "[So it's] not ok to shoot them but [it's] ok to drop 1080 on them" and "Can't blame this one on the cats" referencing other conservation programs conducted in New Zealand (Figure 32). Some responses by commenters stimulated

arguments that developed over 40 more comments on the post, some of which included tagging friends. Although the comments were negative there were many likes on the post.

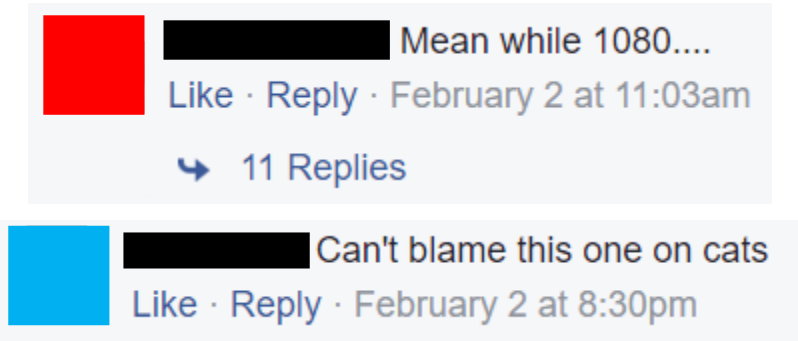

Figure 32: NZ Herald comments on Facebook (nzherald.co.nz, 2017)

The articles with a happy narrative had more positive reception. A photo of different ducks shared by the Wellington Bird Rehabilitation Trust has a caption that states "Anyone can be friends! No matter what size, shape or colour! Humanity could learn a thing or two from this lot! [<3]" and had one share and 59 likes or "loves" (Figure 33). Comments included:

- "What little honeys!"
- "What a fantastic picture…. All the lovely darlings together in a blended family."

Figure 33: Wellington Bird Rehabilitation Trust Facebook post (Wellington Bird Rehabilitation Trust, 2017)

A video post from NZ Herald about eighty pāteke being relocated received 173 likes, 8 comments and 13 shares (Figure 34). All the comments were positive, with the exception of one sarcastic commenter asking “They taste any good?”

Figure 34: NZ Herald post on pateke (nz.herald.co.nz, 2016)

Another article written by Patrice Dougan from the NZ Herald titled “Takahē chicks a ‘major milestone’” explains how the birds hatching was crucial to the survival of the species (Figure 35). The article was posted on NZ Herald’s Facebook page and received over 2,000 likes, 67 comments and 281 shares which was much more popular than the other articles. The majority of the comments were very positive and supportive with users stating:

- “Fantastic!! How lovely to hear some good news for a change,”
- “How exciting and amazing to have this happen,”
- “How cute!”

Figure 35: NZ Herald post on takahē chicks (nzherald.co.nz., 2013)

Although there was unwavering support for the hatching, there was a discrepancy regarding the picture associated with the article. Some comments included:

- "Oh look a very [rare] chick has hatched, let me pick it up, with my dirty human smelling hands, a great photo op"
- "Pest free? I see two standing pests and one got his grubby hands on such an innocent victim….. What a sham… You should be ashamed….."

Pictures and titles chosen can influence how the article is received. Certain posts had positive and encouraging content but the picture it was associated with sparked controversy. Many readers glance only at the cover picture and do not develop a full understanding of the article which increased negative feelings despite the content. If posts include significant pictures that speak with the tone of the post the article will be received successfully and with the proper intentions.

For the story regarding how kākā feeding is wrong, commenters were confused and wrote things such as "The Stuff article also [mentions] 'cake, chocolate, cheese and biscuits'. You say

‘nuts’. ZEALANDIA says ‘sunflower seeds and corn’ - both of which are fed in quantities at Mt Bruce. Can you please get your advice straight?” (Figure 36).

Figure 36: WCC Instagram post (Wellington City Council, 2017)

This commenter has found a variety of answers in different posts and is unsure of which is correct. As mentioned with our social media expert, Wellington residents do not react well to being told what to do with no clear explanation. If this approach was applied to the kākā article there may have been less discrepancies in the reactions.

Part 2: Discussion

Overall, our data pointed to some interesting trends in bird conservation perception in Wellington, some findings were good news. Currently fewer locals feed kākā, and we also found that the food provided falls under ZEALANDIA’s “Feeding Birds at Home” approved list (Appendix B). Only one respondent reported that they fed kākā nuts, where most said that they provide fruit for the bird. This leads us to conclude that current efforts to educate the public are headed in the right direction and the public is more aware of the issue that feeding kākā creates.

We also took note of the value of empathy. From our interviews, each indicated that creating emotional connections between the public and the birds was an effective method in spreading awareness. Other influential means of distributing knowledge included hands on programs related to conservation because it brought the community into direct contact with the issue at hand. Engagement within the community was considered influential as well. It was surprising to see each refer to the hands on approach as best means of increasing awareness. Paired with emotional connectivity, it was clear from our discussions that when presenting educational pieces on birds a narrative works best. When articles and posts on social media explicitly say not to do something, it is not received well and most will disregard the suggestions. Narratives creates emotions and connections between the birds and locals which helps spreading awareness further.

Our research had its share of both strong and weak approaches so we would like to address what particularly worked well in our study and what could use improvement for future studies. The community application *Neighbourly* was also used to distribute our survey to targeted suburbs within the halo. Unfortunately, due to a technical error, our survey was not easily visible to users. The e-mail list used to distribute the surveys targeted conservation groups so many of the respondents were well informed and might not represent the population. Also, testing the knowledge of only four birds had the drawback of not representing any of the other native birds in the Wellington region that may be in need of increased awareness campaigns.

However, the choice to distribute our survey online was incredibly useful, it allowed us to reach a much wider audience in a short span of time and revealed to us the hidden potential of social media platforms for community engagement and future potential research. Any study looking to understand community perceptions and awareness on any topic at hand should seriously consider social media as being an essential part of their study.

Our research also revealed how prominent social media is as a source of information for participants in our survey when it comes to conservation. We feel that further research into social media could provide a better understanding to what type of posts actually get individuals motivated to get up and make a difference. Our reddit post had a much different range of feedback where commenters were searching for more information and discussing their current conservation efforts. Reddit's alternate forum-based format allows for more content-rich discussion and conversation with individuals to gather information.

While the general structure of reddit as a forum-based website is fairly constant across all of the subreddit communities that make the site what it is, “moderators” of subreddits have special administrative tools that allow them to give each subreddit their own unique “feel”. These customizations allow the moderator to alter both the aesthetic and functionality of certain reddit features depending on their programming expertise. One such example of a post customization would be allowing users to tag their post so that it reaches the right audience (advertisement, photos, housing help, etc.) or “sticky-ing” posts so that they appear as the very first thing a user sees when visiting the subreddit. Another customizable reddit feature is that posts can be given a special “flair” if they are posted by certain individuals or that have these certain individuals contributing to discussion in the post’s comment section. A popular reddit trend is to have certain individuals take questions from the community in a format that is commonly known as AMA (ask me anything). Figure 37 outlines a few of these features with example posts (the top two originate from the /r/Wellington subreddit and the bottom two originate from the /r/2007scape gaming subreddit).

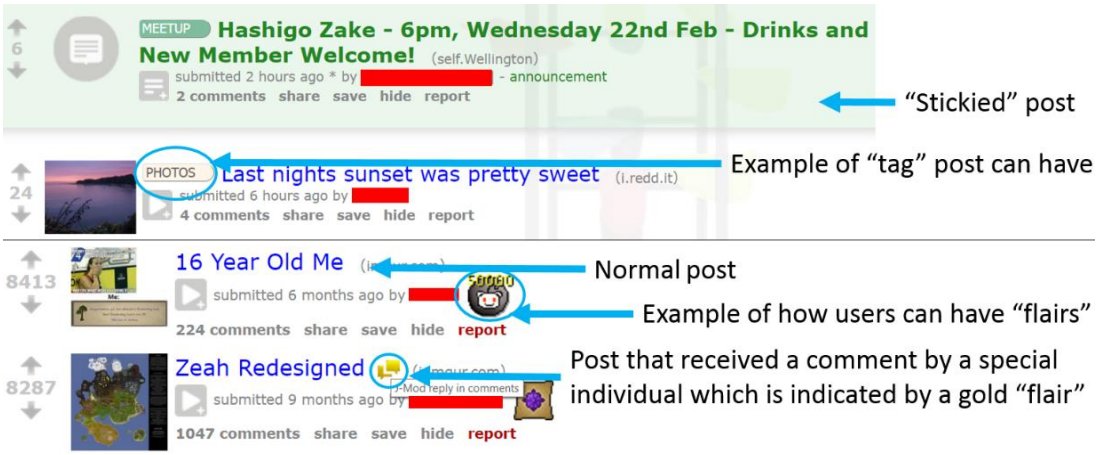

Figure 37: Examples of reddit functionalities (reddit)

The features reddit boasts as previously described are not available with the stock interface provided on Facebook but Facebook itself is a much more popular platform with a much larger active user base. For this reason, we have developed a method to bridge this gap of feedback and interaction Facebook currently lacks.

We found that it is not possible to track an individual's post and comment history for conservation topics. This would be a powerful asset as understanding what posts sparked interest

for a user and then seeing if that user continued to search for more information could be as a more useful way of gauging a post's impact. A program could be created that invites the public to have their personal conservation posts and comments analyzed. The data provided would be powerful for determining the most successful types of outreach. This could be accomplished by inviting a sample of conservationists and regular citizens to a closed Facebook group. In this group the moderators can share conservation related posts for participants to react to by commenting on the post. There exists an option for the group to approve all comments before becoming public. By enabling this option on the page comments can remain anonymous and participants to not be swayed by the opinions of other members in the group. Data could be collected and analyzed by the researcher without ever approving the comments to maintain privacy. Since the same group will keep sharing their opinions, researchers can follow the reactions of individuals and take note of the differences in their reactions, which is not normally possible on Facebook's platform.

A program like this, however, does require the participation of the public. We have developed a few ways to go about gathering a sample for this research. The first way would be to use WCC's e-mail panel to reach out. The population would be well-rounded enough to represent Wellington, and research could begin fairly quickly after getting a small sample. The other option if the e-mail panel is unavailable is to create a survey. A simple survey that asks if participants would be interested in joining a conservation research group and a few demographic questions could be distributed across Wellington. Following the methods we used to distribute our survey could prove useful as it worked well for us. From there with all of the responses that were interested in joining one can create a sample that represents the population by comparing it to the census and start the research process.

Chapter 5: Recommendations and conclusion

5.1: Recommendations

After reviewing our findings, we developed two major recommendations for the Wellington City Council and ZEALANDIA to improve their future endeavors for conservation outreach and community engagement.

1. Social media platforms

In our research, we discovered that social media can boost messages and get them to a broader audience faster. Some platforms such as reddit allow for a much more interactive information source. The Wellington City Council and ZEALANDIA can use reddit as a means to create an ongoing conversation between their organizations and the public. Given our team's background in reddit and the surprisingly enthusiastic and engaging comments we received on our survey distribution post, we are very optimistic about the possibility of the Wellington City Council and ZEALANDIA using reddit as a community engagement platform. The /r/Wellington subreddit community is especially fond of their city, so it is not too far-fetched to speculate that the community would welcome WCC and ZEALANDIA with open arms. After conversation with moderators, they indeed are keen on the idea of this proposition. They look forward to and are enthusiastic for the Council and ZEALANDIA's involvement in their forum. The format reddit provides with its forum-based structure allows for much more "intimate" conversations with individuals, and can be an effective way to receive in-depth qualitative feedback. On reddit, everyone is a "user", so WCC and ZEALANDIA would have to create reddit accounts, and would then be free to use basic reddit features (creating text and/or linked posts, commenting on posts, and being able to send and receive private messages). The upkeep on a reddit account would be simple enough for a student intern to manage part-time and report their discussions with the community to the council. ZEALANDIA would be able to utilize AMA's (ask me anything) to have researcher or expert from ZEALANDIA interact with the community on a personal note (Figure 38).

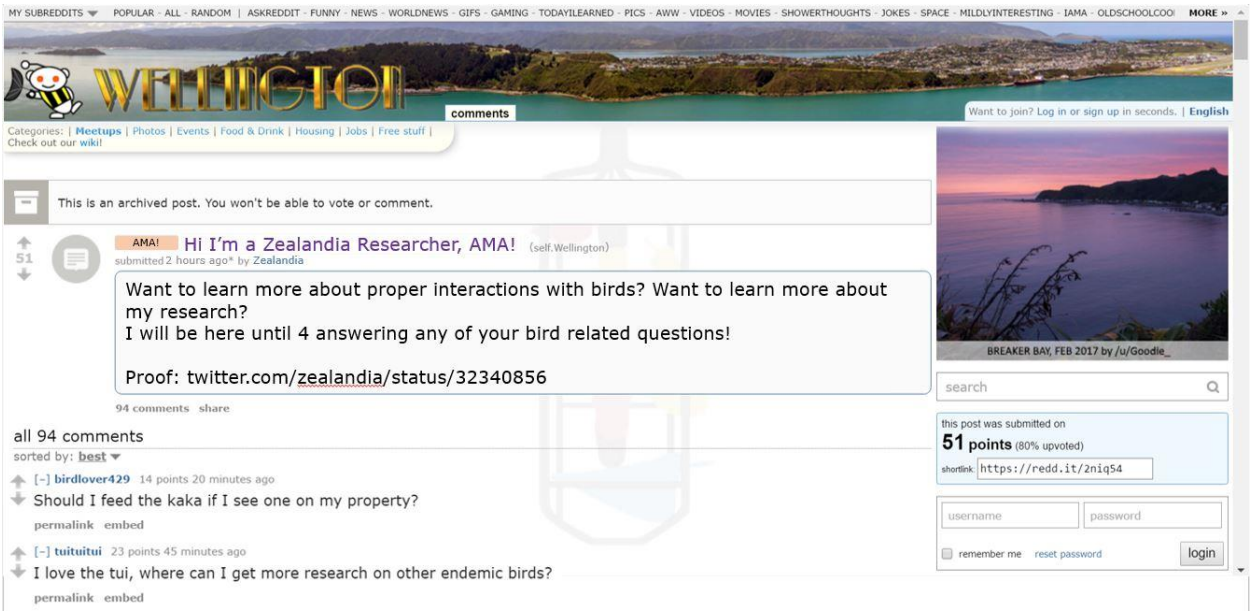

Figure 38: Reddit AMA (ask me anything) example

In addition, we also recommend both WCC and ZEALANDIA further investigate the reactions of individuals to conservation Facebook posts. As discussed, one limitation of Facebook is that tracking the trends of individual users is not currently possible. However, since Facebook was the most popular choice in our survey, when we asked participants to name their conservation news outlets we feel it is worth working around this shortcoming. Using a program similar to the one we outlined in our discussion, both organizations could get a better understanding for what reactions their posts create in the community. With this information they could better cater their posts to encourage residents to get involved rather than viewing the post and disregarding the importance the message carries.

2. Community outreach

An interesting way to encourage the public to be more mindful of native birds could involve a wristband sponsorship program. Our recommendation would be to allow individuals to contribute by sponsoring a bird in the sanctuary. Many of the birds in the sanctuary are tagged with colorful bands by researchers in order to track them. We developed an idea for creating colored silicone wristbands as part of the program to match that of the birds in the sanctuary. As discussed previously, we have found hands on experiences tend to be the most successful for raising awareness. These wristbands provide an interactive way for residents to make a

connection with some of the native birds inside the sanctuary as well as be a method of fundraising.

After some research for the logistics of a program like this, the initial startup could be done fairly inexpensively. After looking at several manufacturers of silicone wristbands, the average price tended to be about $400 NZD for 5,000 bands. These single colored bands would be about eight cents each, but for more complex designs, the cost would in turn increase. We noticed that birds tend to have several colors of bands to identify them, and so either supplying multi-colored bands or several different colored solid bands would be an accurate way to mimic official bird tags. Adding some debossed text to include “Sponsor a bird program” or however the program would be branded would be beneficial. An example with the ZEALANDIA logo is displayed below in Figure 39.

Figure 39: Variety of wristbands for sponsorship program

These more decorated wristbands would cost $0.50 to $1.00 NZD each to buy. Offering these wristbands at a minimum cost and no set price could allow for participants to contribute more at their own will. For example, wristbands could be sold at $5.00 NZD, but the price could be adjustable if the individual wished to make a larger contribution to the fundraiser. The funds raised by this program could be used to cover its own initial startup but also could be used as a standalone fundraiser for ZEALANDIA in order to maintain the sanctuary. We developed a mock-up of a social media campaign to promote this sponsor a bird program (Figure 40). The full list of social media posts can be seen in Appendix H.

Figure 40: Facebook mock-up for sponsor a bird campaign

The word clouds we created from the data in our survey responses could prove useful for future conservation outreach campaigns. The key features that many used to help identify the birds could be used by a digital artist to make designs that catch the eyes of the public. The question could also be used again for other birds we did not test in order to gather more information on how the public identifies various birds. We generated a digital art sample that utilizes this technique for the tūī and saddleback (Figure 41). Simple artwork like this could be used in a variety of awareness programs.

(a) (*b*)

Figure 41: Tūī (*a*) and saddleback (*b*) digitial art

For example, this art could be used as a pre-field trip program to ZEALANDIA where they are used as learning flashcards. After learning about the birds on the flashcards in class when students finally visit the sanctuary, they could partake in a scavenger hunt to look for the birds illustrated on the cards. If the students can find and identify the birds properly, they could receive a sticker of the bird. The sticker would serve as a reinforcement to the students for what they have learned. Other ways to reinforce bird recognition are creating street art, partnering with local businesses to incorporate designs into their products, or simple games.

In regards to community outreach, we encourage that WCC continues working with reputable groups, such as ZEALANDIA, and local schools to maintain clear consistent recommendations around bird conservation efforts. For future conservation outreach regarding birds, WCC should take a similar approach. The Wellington City Council is excellent at ensuring a consistent message between organizations during conservation campaigns, so we recommend they continue this strategy for future efforts.

5.2: Conclusion

The ZEALANDIA sanctuary's safe haven for native birds is a promising step towards restoring the populations that were destroyed through the settlement of the country. Residents abutting the sanctuary are tied to the success of this revival. Programs to educate and involve these individuals, as well as the greater Wellington community will ensure their return to the area. Our research revealed that Wellington residents identify as strongly influenced by nature and are already familiar with the native birds that share community with them. The best path forward is to catalyze this interest and build support at all levels of outreach. Upgrading the efforts to promote conservation will accelerate the progress already being made.

With the recommendations we have put forth, WCC and ZEALANDIA stand to both optimize their current outreach programs and target newer and unexplored audiences. Reaching younger demographics through social media will be the foundation of an educated society that emphasizes conservation first when making decisions that will impact the environment.

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Appendix A: Native wildlife present at ZEALANDIA

Birds	Reptiles, Frogs and Invertebrates	Plants
Saddleback	Tuatara	Kowhai
Hihi	Spotted Skink	Mamaku
Tūī	Cave Weta	Kiekie
Little Shag	Wellington Green Gecko	Ngaio
Kākā	Maud Island Frog	Ponga
Little Spotted Kiwi	Lead Veined Slug	Clematis
North Island Robin	Cook Strait Giant Weta	Supplejack
Pied Shag	Forest Gecko	Rewarewa
Little Black Shag	Tree Weta	Kawakawa
Takahē		Tree Fuchsia
Pateke		Harakeke
Kereru		Makomako
Whitehead		
Black Shag		

(ZEALANDIA, 2016)

Appendix B: Kākā factsheet from ZEALANDIA

FEEDING BIRDS AT HOME
A GUIDE FOR NATURE LOVERS

ZEALANDIA
TE MĀRA A TĀNE

If you enjoy the sights and sounds of wild, native birds in your garden, and want to contribute to their remarkable return to Wellington, this fact sheet is for you.

Beyond the safety of Zealandia's fence our native wildlife faces many challenges. Those of us with gardens can make wise choices and avoid dangerous actions that put these wild birds at risk – creating a beautiful, safe and rich habitat for birds and other fauna.


Brendon Doran
A kākā feeds on flax

YOUR QUESTIONS ANSWERED

1. How can I see more birds in my garden?
2. What are the problems with feeding birds?
3. Doesn't Zealandia feed birds?
4. Should I stop using my bird feeder?
5. How can I feed birds safely?

1. How can I see more birds in my garden?

Keep it simple – think 'natural' and 'safe'. Your garden will be a bird haven when it offers a range of native plants and when predators are kept at bay. It needn't be a jungle – clever use of water features will provide hours of bird-watching entertainment.


Bill Beale
Planting natural, native food sources

PLANT NATIVES

Birds eat a range of foods, including insects and fruit. When you plant your garden with natives, which flower and fruit at different times of the year, you provide wonderful natural resources for birds and other animals. Native plants are the foundation of New Zealand's natural environment and many are already threatened or rare – so they need a helping hand too.

Look for locally-sourced native plants. They are most adapted to local conditions, grow well and thus flower and fruit better than plants from elsewhere and require less maintenance.

For advice on planting see doc.govt.nz and the handy guide from Greater Wellington: gw.govt.nz/native-plant-guide/ or the Planting Natives brochure at www.wellington.govt.nz.


Forest & Bird
Setting a predator trap

TRAP PESTS

Create a true sanctuary in your garden by trapping mammalian predators on your property. It's a powerful way to support local and national pest control. For more information, get in touch with your nearest restoration group. See www.naturespace.org.nz.

You can purchase traps for pests (such as rats and stoats). Go to www.predatortraps.com, www.goodnature.co.nz and www.halo.org.nz. Note: it is very important to set traps properly – please make sure to get all the information you need before setting your trap.

INTRODUCE A BIRD BATH

You'll soon find out that many birds will use a bird bath, especially in summer. Watching them splash about can be very entertaining!

Make sure the area is not accessible to cats, yet still easy for you to clean and refill. Rinse and scrub it regularly to stop the build up of germs which might hurt the birds, or you.

2.What are the problems with feeding birds?

Although bird feeding is well-intentioned, you can cause a lot of problems – both for the birds and for yourself.

INAPPROPRIATE FOOD CAN CAUSE ILLNESS / DEATH

- Food can contain toxins which harm birds and their chicks.
- Toxins may develop if food goes off in the feeder or on the ground around it.
- The food may not contain the right nutrients for the bird.

Peanuts and walnuts may contain fungal toxins called afla toxins. In low doses these can affect fertility and immunity and in high doses can cause liver and kidney failure. **Sunflower seeds** can cause obesity and feather loss. **Bread** is highly processed and a bird's digestive system is not designed to digest it. It can result in impaction in the intestines, dehydration and ultimately death.

The Nest Te Kōhanga, Wellington Zoo, admits a large number of kākā each year. A common finding is that the birds have metabolic bone disease due to incorrect diet. This happens when the kākā parents are fed inappropriate food, which the parents then feed to their chicks, causing major problems such as bone and beak deformities.

A kākā chick with bone deformities was found at Trelissick Park where it appears the parents had fed predominantly on peanuts.

FEEDING INCREASES THE RISK OF PREDATION

- Congregations of birds will attract predators.
- Feeding may change a bird's behaviour, putting it at risk.

Kākā, tūī and bellbirds have been killed by cats and kākā used to being fed bread will be attracted to bread put on the ground for sparrows, increasing the risk of them getting killed by cats.

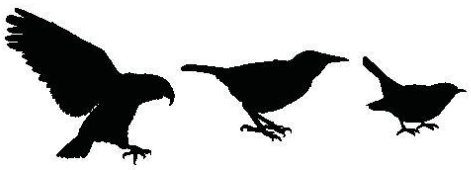
FEEDING CAN CAUSE AN INCREASED RISK OF DAMAGE TO PROPERTY AND BIRDS

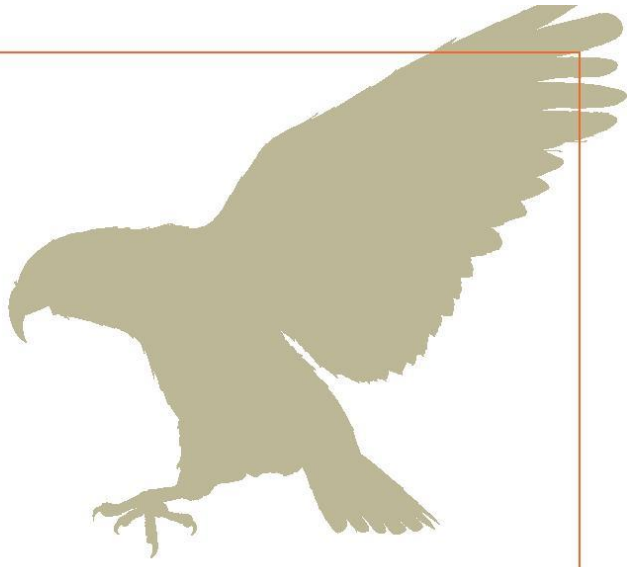
- **Kākā are curious and inclined to chew any object they might** encounter, sometimes leading to poisoning and damage.
- Birds spending more time around houses are more likely to fly in to windows, suffering injury or death.

Lead is malleable and reported to have a sweet taste attractive to parrots. Many kākā now have detectable lead in their blood, and some have already died from lead (and potentially **zinc**) poisoning. This has implications for survival if exposure is ongoing – keeping them away from houses is the best protection.

Chewing treated timber which contains **arsenic** is likely to cause health problems for the birds as well as issues for the houseowner

Kākā, kererū and tūī have been killed after flying into windows.





WHERE BIRDS CONGREGATE THERE IS AN INCREASED RISK OF DISEASE TRANSFER

- Bird congregations increase the risk of disease transfer between birds.
- Bird diseases can be transferred to humans.
- If hygiene is not maintained the disease risk is increased.

Salmonella in hihi on Tiritiri Matangi Island was probably transferred through the use of supplementary feeders; a **Chlamydia** outbreak in doves in Auckland was tracked back to a park where they gathered daily to feed on bread and **Pox virus** is a highly contagious disease proven to spread where high population density occurs at feeders.

FEEDING CAN INCREASE AGGRESSIVENESS, STRESS AND NEGATIVE INTERACTIONS

- Increased competition between birds at a feeding site can result in stress, leading to increased risk of illness and death.
- Feeding encourages birds to hang around humans. When they have all the calories they need they have lots of time to get up to mischief.
- When birds lose their fear of people, interactions can become aggressive if the expectation for food handouts is not met.

A kākā had to be transferred from Kapiti Island in 1997 because it became too confident and aggressive with visitors, and kākā in Wellington have bitten fingers when no food was offered.

Consider the kea in car parks which raid the bins, get fed by hand and then destroy the cars. Kākā are often active at night and can be noisy - leading some people to think unfavourably of them.

FEEDING CAN CAUSE AN OVER-ABUNDANCE OF UNDESIRABLE OR DOMINANT SPECIES

- Feeding birds can lead to an unnaturally large population of a species, having negative impacts.

Starlings have been responsible for the deaths of smaller birds such as bellbirds, tomtits and robins. Tūī are aggressive and have been responsible for excluding other species from food resources and causing the deaths of saddlebacks and other small birds. **Urban ducks** are often fed to a point where they breed in numbers far in excess of natural food supply and become a public nuisance.

3. Doesn't Zealandia feed birds?

At Zealandia we put out supplementary food for kākā, kākāriki, hihi, bellbird, pāteke and takahē.

The feeders encourage our endangered birds to nest inside the safety of the sanctuary valley, they provide observation hotspots to help us monitor our populations, and they make it easier for our visitors to see these remarkable species.

Zealandia feeders are safe from mammalian pests, cleaned and refilled daily by volunteers, and the supplementary food in them has been carefully researched and is a nutritious supplement to the bounty of natural food sources growing in and around the valley.

Kākā at feeder

4. Should I stop using my bird feeder?

It's up to you. This fact sheet has been provided to help you make informed choices, enabling you to get the most enjoyment from your garden by making it a safe and supportive natural environment. The birds will not starve if you stop feeding them.

5. How can I feed birds safely?

If you already feed the birds in your garden and are reluctant to stop you can reduce risk by following these guidelines.

Note: it is wise to consider the effect on your neighbours – kākā are often active at night and can be noisy!

FEEDER LOCATION

- Consider not feeding kākā if your house has lead nails or has balconies made of treated timber as these are a poison risk if chewed.
- Place any feeders in a safe place where birds can't be caught by cats, e.g. on a stand over 1.8m high.
- Place feeders away from buildings to discourage kākā from hanging out on the roof and chewing on lead flashings and nails or treated timber balconies.
- If you notice aggression between birds, consider erecting a second feeder, or discontinuing the feeding. You could provide a bird bath instead, located away from potential predators.
- Place feeders away from windows so birds don't fly into them accidentally if they get a fright.
- Consider using special films on windows to reduce the risk of bird strike. WindowAlert film alternately reflects and transmits UV light so windows appear more solid to birds. See: www.projectkereru.org.nz/preventing-window-strike.
- Awnings over large windows reduce reflection of trees. Beads and etching are also useful to reduce window impacts.

MATERIALS

- Use heavy dishes for food so they won't tip over easily. Ensure that dishes are not used for any other purpose.
- Use a dedicated brush to clean feeder stands and perches that the birds use regularly.
- Use untreated timber for feeder bases and perches if possible so there is no risk to kākā if they chew them.
- Use dry, rodent-proof containers for food and a cool, dry place to store them.
- Consider purchasing some binoculars to help view and monitor the birds.

FOODS

Use appropriate foods for the species, e.g. high quality parrot pellets or fresh fruit for kākā, fruit skewers for silvereyes and tūī.

Sugar water (1/4 - 1/2 cup of brown or raw sugar in 1L water) is a useful supplement for nectivores such as kākā, tūī and bellbirds. A nutritious food for nectivores is Wombaroo 'Lorikeet and Honeyeater Food'. Available through KarinWiley@clear.net.nz.

FOODS TO AVOID	HEALTHIER CHOICES
• Honey water • Bread • Corn • Peanuts • Sunflower seeds • Walnuts • Junk food (no chips!) • Too much of anything • Mouldy food	• Fruit and parrot pellets for kākā • Sectioned fruit for nectivores • Sugar water / nectivore food for nectivores • Seed for seed-eaters – note: these are mostly non-native species ...all with a suitable location and using hygienic procedures.

FEEDING PROCEDURE AND HYGIENE

- **Proper hygiene is essential** and shade preferable. Clean dishes daily with hot soapy water to prevent disease.
- **Replace sugar water or nectivore food daily** . Remove uneaten fruit to prevent disease and mould. Do not discard leftovers on the ground as mould can build up and pose a risk.
- **Remove food if there are no birds** , and don't leave food out overnight - to avoid consumption or contamination by rodents.
- **Clean feeder stands and perches** with a dedicated brush. With congregations of birds the risk of disease is increased.
- **Limit feeding time each day** . Feed once or twice a day at a time when you will get the most enjoyment from seeing them and when the noise will be least bothersome.
- **Watch out for dominating species** such as tui and starlings. They can become aggressive – see **Feeder location.**

RECORD BIRD SIGHTINGS

Watch for banded birds and rare species and report them to us at at www.naturewatch.org.nz.

THE INFORMATION IN THIS FACTSHEET HAS BEEN ENDORSED BY:

ZEALANDIA
TE MĀRA A TĀNE

Absolutely Positively Wellington
Me Heke Ki Pōneke
Wellington City Council

WELLINGTON Zoo

Department of Conservation
Te Papa Atawhai

Forest & Bird
GIVING NATURE A VOICE

The Ornithological Society of New Zealand

JUST MINUTES FROM TOWN YET A WORLD APART

Step into a nature lover's paradise and groundbreaking restoration project. See some of New Zealand's rarest birds, reptiles and insects living wild in their natural environment. Once on the brink of extinction, they are now recovering within our sanctuary valley. Discover our remarkable story, 80 million years in the making!

www.visitzealandia.com

Caring for our environment is at the heart of ZEALANDIA. We incorporate sustainable practices whenever we can, both in our offices and within our sanctuary valley.

FSC

Appendix C: Interview guide for experts

1. New Zealand has developed many programs to increase public education to promote conservation of birds. Where do you think these programs have been successful? Is there anything that should be improved upon?
2. Do you think there is enough information that is readily available to the public? If you have seen this, where are good examples? What would you do to get more information out to the public?
3. Do you work with any other organizations specifically? If so, how are you involved?
4. Are there any other experts you would recommend speaking with?

Appendix D: Elementary schools of interest

School	Te Aro	Mt Cook	St. Bernard's	Brooklyn School	Kelburn School	Karori School	Karori West School	Clyde Quay School
Distance (km)	1.2	2.0	2.0	1.8	0.8	0.8	2.5	2.5
Suburb	Te Aro	Te Aro	Brooklyn	Brooklyn	Kelburn	Karori	Karori	Mount Victoria
Address	360 The Terrace	160 Tory Street	40 Taft Street	58 Washington Avenue	16 Kowhai Road	Donald Street	19 Allington Road	27 Elizabeth Street

Appendix E: Survey

Intro

Hello! Thank you for taking some time out of your day to complete this survey!

We are a group of students from Worcester Polytechnic Institute in Massachusetts conducting a research project in collaboration with Zealandia and the Wellington City Council. This survey will ask you to identify birds and inquire about your nature habits. This should only take about 5 minutes of your time.

This survey is anonymous and no personal identifying information will be collected. Data collected from this survey is for research purposes only. You may stop taking the survey at any time.

Location

What suburb do you live in?

Bird 1

In this section you will be presented with the pictures of six birds. The questions that follow will be used to assess your familiarity with each bird.

Can you name this bird?

No, I am NOT familiar with it

No, but I AM familiar with it

[ ] Yes, it is a...

Do you think this bird is native to New Zealand? Please give your best guess.

Yes

No

Don't know

Have you seen this bird near your house?

Yes

No

What visual feature of this bird helped you identify it? Please answer below.

Bird 2

Can you name this bird?

No, I am NOT familiar with it

No, but I AM familiar with it

Yes, it is a...

Do you think this bird is native to New Zealand? Please give your best guess.

Yes

No

Don't know

Have you seen this bird near your house?

Yes

No

What visual feature of this bird helped you identify it? Please answer below.

Bird 3

Can you name this bird?

No, I am NOT familiar with it

No, but I AM familiar with it

Yes, it is a...

Do you think this bird is native to New Zealand? Please give your best guess.

Yes

No

Don't know

Have you seen this bird near your house?

Yes

No

What visual feature of this bird helped you identify it? Please answer below.

Bird 4

Can you name this bird?

No, I am NOT familiar with it

No, but I AM familiar with it

[ ] Yes, it is a...

Do you think this bird is native to New Zealand? Please give your best guess.

Yes

No

Don't know

Have you seen this bird near your house?

Yes

No

What visual feature of this bird helped you identify it? Please answer below.

[ ]

Kākā Questions

This section includes questions specifically about your feeding habits towards the kākā parrot.

Do you currently feed kākā?

Yes

No

No, but I used to

How and with what frequency do you feed kākā?

Via a bird feeder, continuously
By hand, several times a day
By hand, once a day
By hand, several times a week
By hand, several times a month
By hand, less than monthly

How long ago did you start feeding kākā?

In the past month
In the past 6 months
In the past 12 months
In the past 2 years
Longer than 2 years ago

What do you usually feed the kākā? Select all that apply.

☐ Nuts (please specify if you can)
Fruit
Sugar Water
Water
Bird Seed
☐ Other (please specify)

Why don't you feed kākā? Select all that apply.

It's bad for the birds
Created damage to property
Too noisy
I don't know what a kākā is
Kākā don't live near me
☐ Other (please specify)

How long ago did you stop feeding kākā?

In the past month

In the past 6 months

In the past 12 months

In the past 2 years

Longer than 2 years ago

Nature Scale

In this section you will be asked various questions about your opinions and daily habits involving nature.

Please rate the below statements based on your true thoughts regarding the topics. Please read the statements carefully.

	Strongly disagree	Disagree a little	Neither agree or disagree	Agree a little	Agree strongly
My Ideal vacation spot would be a remote, wilderness area.	○	○	○	○	○
I always think about how my actions affect the environment.	○	○	○	○	○
My connection to nature and the environment is a part of my spirituality.	○	○	○	○	○
I take notice of wildlife wherever I am.	○	○	○	○	○
My relationship to nature is an important part of who I am.	○	○	○	○	○
I feel very connected to all living things and the earth.	○	○	○	○	○

Behavior / Demographics

This section asks about your conservation-based activity and basic demographic information.

Please RANK the below threats for native birds from highest to lowest (top to bottom), with highest being the greatest threat that native birds face. Drag each option to rank.

Pets (cats and dogs)

Pests (rats, stoats possums)

Habitat destruction

Window strike

Car strike

Improper feeding by humans

Other, please specify: ☐

Where do you encounter news on nature related topics? Please select all that apply.

Facebook

Twitter

Neighbourly Local App

☐ Other internet, please specify:

Radio

Television

Newspaper / magazine

Word of mouth

Posters / pamphlets

☐ Other, please specify:

Please identify how often you engage in conservation related activities. Such activities may be a hobby, a job, or volunteer work. Examples include working with local reserves, government projects, or other activities that positively effect the environment.

Every day

One or twice a week

Once or twice a month

Not often

How would you rank yourself in knowledge of conservation issues that face birds in New Zealand? 1 indicates you have no knowledge on the subject, 5 indicates you are very knowledgeable on the subject.

	1	2	3	4	5
Knowledge	○	○	○	○	○

In what year were you born?

▼

To what gender do you identify?

Male

Female

Other

Prefer not to disclose

What is the highest level of education you have received?

Completed year 10 at high school

Completed year 11 or 12 at high school

Completed a polytechnic or trade diploma

Bachelors degree

Masters / PhD

Do you identify as Māori or Pasifika?

Yes

No

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

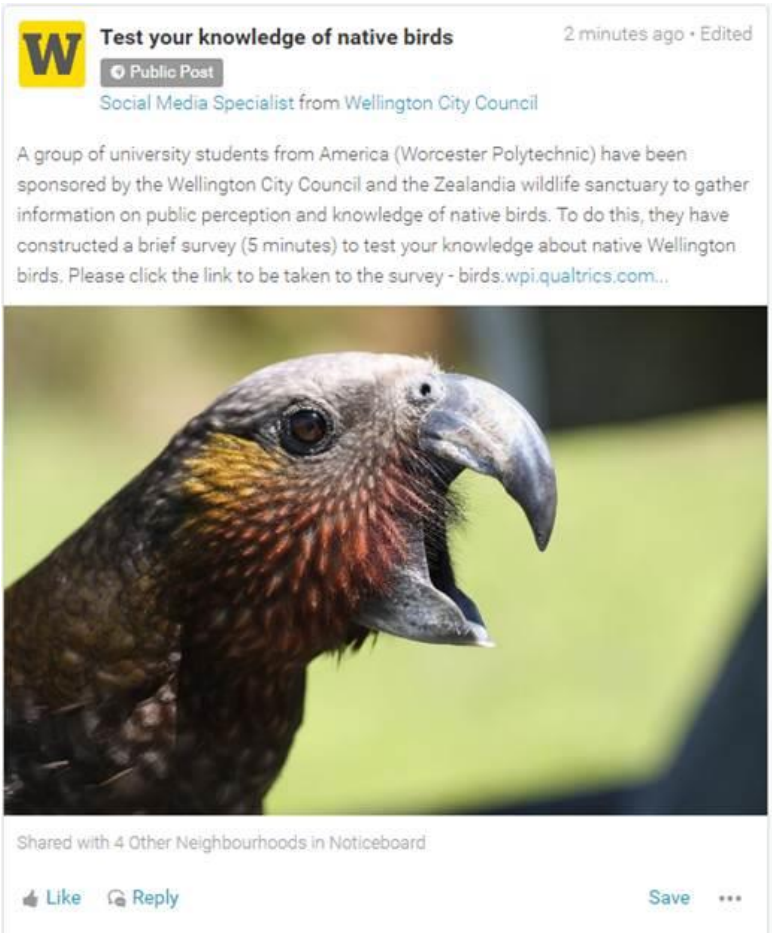
WPI

If you have any comments or questions, feel free to contact us at nzbirdawareness@wpi.edu.

Powered by Qualtrics

Appendix F: Distributed survey flyer and media

Survey distribution flyer



Neighbourly survey distribution post

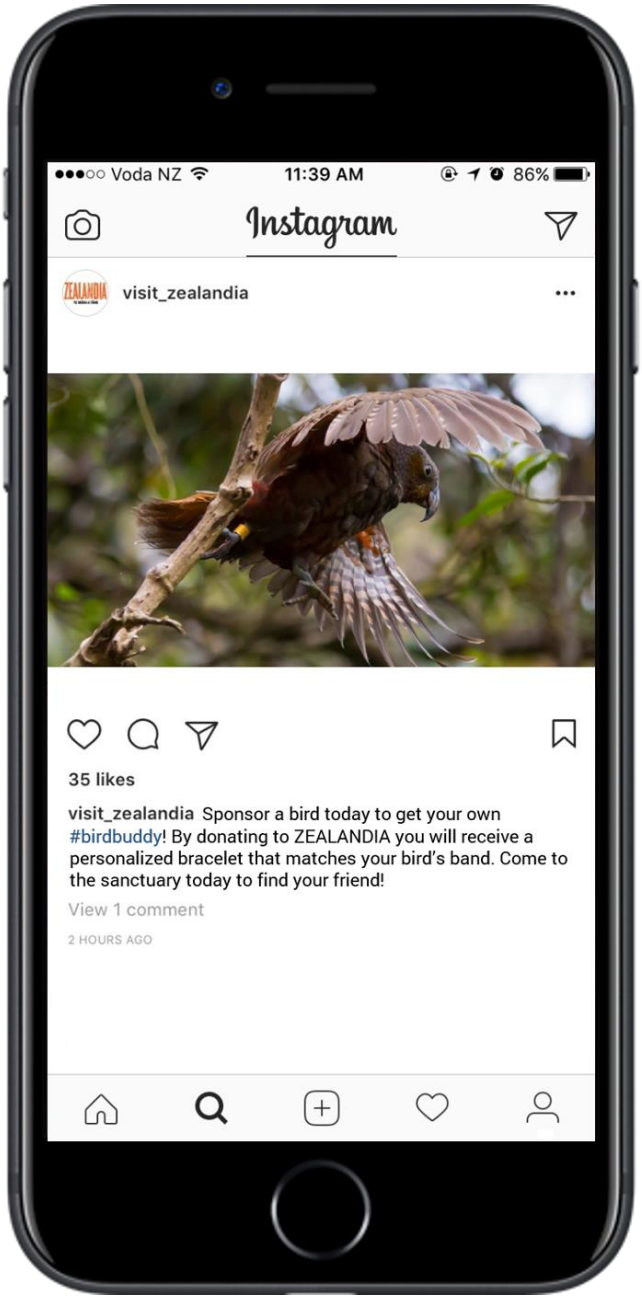
Facebook survey distribution post

reddit /r/Wellington survey distribution post

Appendix G: Survey distribution email list

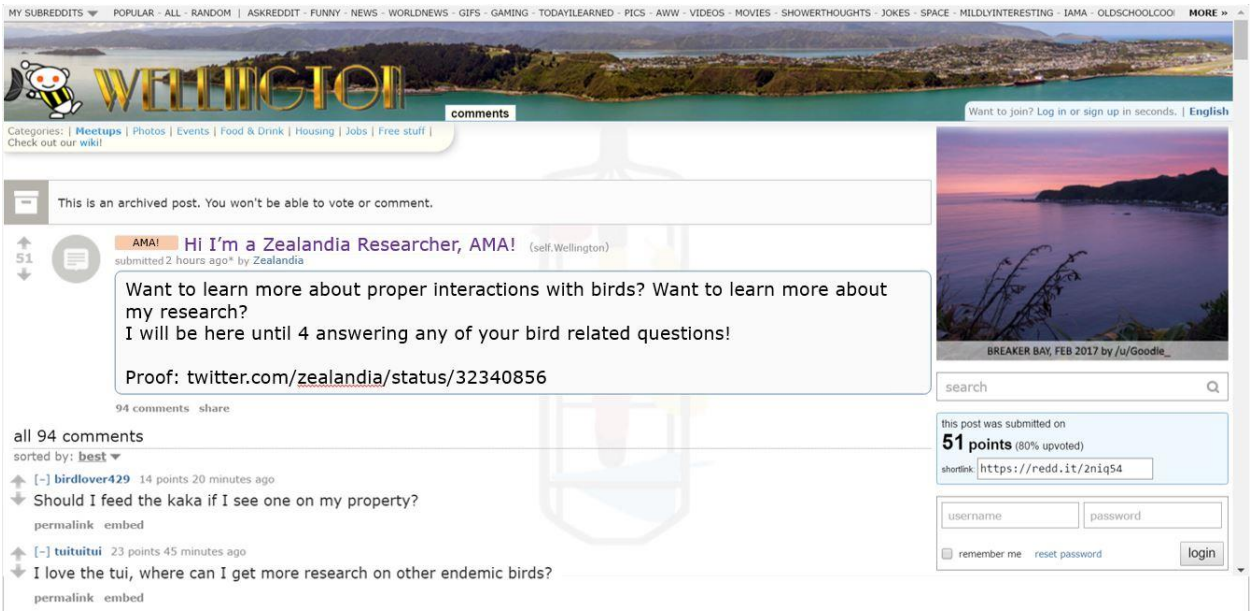
Group	Geographic Region
Polhill Protectors	Polhill Reserve
Trelissick Park Group	Trelissick Park
Waimapihi Trust	Polhill Reserve
Te Motu Kairangi	Miramar Peninsula (wide geographic distribution of members)
Makara Peak Supporters	Makara Peak and Wrights Hill
Otari-Wilton’s Bush Trust	Otari-Wilton’s Bush
Brooklyn Trail Builders	Polhill Reserve
Bells Track Group	Bells Track, Ngaio
Makaracarpas	Makara
Coolidge Street Group	Wellington Town Belt
Highland Park Progressive Association	Fort Buckley

Appendix H: Sponsor a bird program social media campaign



Instagram post example

Facebook post examples



reddit AMA (Ask Me Anything) example

Appendix I: Complete data

Gender	
Female	256
Male	160
Other	1
Prefer not to Disclose	1
Age	
under 20	14
20's	79
30's	109
40's	80
50's	70
60's	35
70's	25
80's	2
90's	1
Highest Education	
High school year 10	19
High school years 11 & 12	45
Bachelors degree	194
Polytechnic or trade diploma	46
Masters / PhD	114
Maori / Pasifika	
Yes	15
No	403

Responses	
Reddit	95
Email/Pamphlets	221
Neighbourly	2
In Person	11
Facebook	89
Total	418
Suburbs	
Halo	201
Non-halo	217

Total Scores	
0/8 (0%)	0
1/8 (12.5%)	0
2/8 (25%)	6
3/8 (37.5%)	8
4/8 (50%)	13
5/8 (62.5%)	21
6/8 (75%)	53
7/8 (87.5%)	52
8/8 (100%)	265
Average	*89.6%*

Bird Name / Recognition				
	Tui	Saddleback	Sparrow	Kaka
Unfamiliar	3	71	18	24
Recognized	4	29	38	40
Correctly Named	411	318	362	354
Bird Nativeness - "Is this bird native to NZ?"				
	Tui	Saddleback	Sparrow	Kaka
Yes	415	373	30	397
No	2	18	365	9
Don't Know	1	27	23	12
Bird Spotted near Home				
	Tui	Saddleback	Sparrow	Kaka
Yes	398	65	384	253
No	17	282	16	141

NR-6 Question Respones					
	Strongly disagree	Disagree a little	Neither agree or disagree	Agree a little	Agree strongly
My Ideal vacation spot would be a remote, wilderness area.	13	49	51	167	138
I always think about how my actions affect the environment.	6	14	25	190	183
My connection to nature and the environment is a part of my spiritual	43	35	102	104	134
I take notice of wildlife wherever I am.	3	4	14	116	281
My relationship to nature is an important part of who I am.	5	10	56	138	209
I feel very connected to all living things and the earth.	6	30	98	146	138

Kaka Feeding Y/N			
	total	halo residents	2013 study halo residents
Yes	14	9	39
No	382	192	163
No, but I used to	22	19	*na*

When did you start	
In the past month	0
In the past 6 months	2
In the past 12 months	0
In the past 2 years	4
Longer than 2 years ago	8
Kaka Feeding Frequency	
Via a bird feeder, continuously	7
By hand, several times a day	0
By hand, once a day	0
By hand, several times a week	0
By hand, several times a month	5
By hand, less than monthly	2
What people feed (check all that apply)	
Nuts (please specify if you can)	1
Fruit	8
Sugar Water	5
Water	3
Bird Seed	2
Other (please specify)	6

NR-6 Avg Score (5=strongly agreed)	
1 (often strongly disagreed)	1
2	7
3	67
4	180
5 (often strongly agreed)	163
Self Ranked Expertise (5=expert)	
1 (Amateur)	13
2	55
3	159
4	150
5 (Expert)	41
Reported Conservation Activity	
Every day	49
One or twice a week	63
Once or twice a month	87
Not often	219

Why don't you feed (check all that apply)	
It's bad for the birds	275
Kākā don't live near me	120
Other	87
Created damage to property	17
Too noisy	8
I don't know what a kākā is	8
When did you stop?	
In the past month	2
In the past 6 months	3
In the past 12 months	10
In the past 2 years	4
Longer than 2 years ago	3

What do you feed kaka? ("Other" text entries)
almonds
apples only
Fat balls from a pet store
only apple
Whatever I was eating (bread etc)
Wild Bird Seed
Wombaroo and pellets

News (check all that apply)	
Facebook	306
Twitter	57
Neighbourly Local App	61
Other internet	131
Radio	184
Television	194
Newspaper / magazine	256
Word of mouth	214
Posters / pamphlets	106
Other	58

Ranked Threats							
	#1	#2	#3	#4	#5	#6	#7
Pets (cats and dogs)	9%	36%	44%	7%	2%	2%	0%
Pests (rats, stoats, possums)	63%	30%	6%	0%	0%	0%	0%
Habitat destruction	26%	29%	34%	9%	1%	0%	0%
Window strike	0%	0%	2%	24%	44%	28%	1%
Car strike	0%	1%	2%	13%	38%	43%	3%
Improper feeding by humans	1%	3%	11%	44%	14%	26%	1%
Other, please specify:	1%	1%	1%	1%	1%	1%	94%

Suburbs	
Alicetown	1
Aotea	1
Aro Valley	22
Berhampore	3
Broadmeadows	3
Brooklyn	27
Christchurch	1
Churton park	3
Crofton Downs	4
Ebdentown	1
Evans bay	1
fairfield	1
Hataitai	4
Highbury	31
Horokiwi	1
Island bay	4
Johnsonville	5
Karaka Bays	1
Karori	102
Kelburn	9
Khandallah	10
Kilbirnie	2
Kingston	6
Korokoro	1
Lyall Bay	2
mangaroa	1
miramar	7
Mornington	1
Mount Victoria	2
Mt cook	4
Mt victoria	2
Naenae	2
Newlands	4
Newtown	9
Ngaio	26
North Dunedin	2
Northland	10
Papamoa Beach	1
Paraparaumu	1
paremata	1
Pauatahanui	1
Petone	4
Pinehaven	1
Porirua	1
Psraparaumu	1
roseneath	2
seatoun	3
Southgate	1
Stewart Island	1
Stratford	1
Strathmore Park	2
Sunnyvale	1
Tawa	10
Te Aro	12
The Aro	1
Thorndon	7
Vogeltown	1
Wadestown	6
Wainuiomata	3
Waiwhetu	2
Waterloo	2
wellington cbd	5
Whangaparaoa	1
Wilton	6
Woodridge	1

Why people don’t feed kaka ("Other" text entries)

Affects the integrity of the eggs
Because we can't see them around our place
Birds should find their own food
Can increase risk of metabolic bone disease in chicks
City dweller no garden
Creates dependancy on humans
depending on food and whether I had access to "better" food
Didn't know I could or what to feed it
Didn't know you could feed them
Do not roost at my house
Does not know what it is
doesn't come to house
Don't come close enough to the property anyway, just see them overhead
Don't get close enough to feed
Don't know want to feed them
Don't want to encourage them as we don't want it visiting and trashing our trees or house
feed by growing native plants
Have been advised not to - although the advice on this is contradictory depending on which ornithologist you talk to.
Have not seen before
Have only seen them flying at a distance, not at my house
Haven't seen one close to our property also wouldn't know what to put out for them
Haven't seen them around
Haven't thought about u doing it
I don't feed any birds
I don't feed birds
I don't feel any bird. It's not specific to kaka.
I don't know whaat Kaka eat
I don't know what they eat/have never felt a need to feed them
I don't like feeding birds
I don't like to go outside much.
I don't own a property
I don't tend to feed any birds really
I just leave them to it
I live in an area with lots of Kowhai and flowering tress they like to eat, I htink it's better to grow bird friendly trees
I put out sugar water for Tui's and if the KÃ• kÃ• discovered it I'm sure they'd feed but they haven't. I know about the issues with nuts and KÃ• kÃ• young becoming malformed as a result & a would never feed those to birds just in case.
I put sugar water out for Tui but no kaka visit the feeder - I wouldn't feed kaka solids per risk of calcium deficiency
I see them fly over but i've not seen them sit and eat from people in mt vic
I think the best approach to supporting native birds in general is to have food trees on the property
I was always told not to
I'm aware that feeding the kaka is bad for them - esp for their young as it tends to mean they end up being deficient in the nutrients they need for development. The kaka also doesn't tend to come close by (it is usually up in the trees quite far from our house), and they are quite a big bird so they are a bit intimidating up close. I think I would be a bit scared of them being attracted to food near me.
I'm lazy
it can make them sick
it is bad for them
It'd take my finger off
I've only seen them fly past not in our garden
I've only seen/heard them in the big macrocarpa near our house and only in summer
Kaka are uncommon around my property.
kaka feed for themseles in our garden/mini forest
might put in a sugar water station at some point - bad for birds is selective (eg things like nuts). Also they enjoy feeding on various trees in the area
Never seen one in person
Only seen once single bird flying over property
Only seen them once or twice
Possibility of it damaging house
See them rarely. Planted a karaka tree in our garden
Some became too reliant and came around consistently.
The wrong food is bad for them plus there are too many cats nearby
there is suffient natural food avilable for them that theyshould be eatingg
They also don't land near us just fly high overhead
They are always foraging in the Botanical Gardens, so prefer to watch and leave be.
They are wild and find their own food
They can find their own food
They currently only do the odd "scout" flight over newlands. I've never seen them land here
They dont come close enough to eat (they mainly fly over my house)
they don't come into the garden, just fly over
they don't need supplementary feeding
They don't visit, but possibly also because I don't try to feed them.
They feed on the trees around us, no need to feed them extra
They fly over my house but don't stop there
They fly over our property but don't land
They get plenty of food from our fruit trees and garden as they need it
They have food already
they haven't liked what I've left out (fruit, nuts). I've since learned it would be better not to feed them.
They never come begging although I have seen one calling at a neighbour's house. Have no idea what it got.
They only fly above. Never land
They still help themselves to our apple trees
They've never asked.
to expensive
Too scared will feed it the wrong thing, never hang around enough!!
Unsure what to feed them
Usually don't come down to yard
Wasn't sure what to give them. They do eat the apples straight from our tree though
We have enough native bush around us for them (and other birds) to feed themselves!
We never had treats on hand and they'd always fly over our property
worried that bird feed brings rats

Threats ("Other" text entries)

Note: some repeated terms removed

In Wellington pets are probably a bigger threat than habitat destruction, but that isn't true nationally
1080 drops
Agriculture
Climate Change
Competition for food from introduced species
Competition with introduced species
Disease
global warming
Humans killing for sport
Ignorance of our native birds and why they're so important
Inbreeding due to low populations.
Indifference by policy makers
lack of awareness by most people
off leash dogs
other pests: feral cats, weasels, deer etc (food competition) wasps (esp v nectar feeders)
peoplesignorance -
Plastics, lead, other toxins in urban areas
Poisons
Pollution
Selfishness of humans
Terrible government policy
the birds eat lead off our window edges and gutters
Toxins like lead

News sources ("Other" text entries)

Note: some repeated terms removed

Academic publications
active involvement in conservation, work in the field too
articles, international news, relevant websites
At work
BBC website
Birdingnz.net
Birds NZ magazines, science hjournals , workplace
Blogs and newsletters
Books
City Council enews
Community volunteering groups
Conservation volunteering
Daughter subscribes to forest and bird magazine
David Attenborough DVDs
Dedicated NGO sites
Direct email from Zealandia
Display panels when out walking
DOC sites
DOC website
DOC website, BirdsNZ, NZ birds online
DOC website, Zealandia website, WCC website
Dom post
E newsletters
Email groups
Email local conservation groups
Email newsletter from a family member
email, websites
Emailed newsletter
Emails
emails from interest groups with website links
Emails from interested community groups
E-Newsletters e.g. Zealandia
Extinction countdown
F & B magazines from a friend
Forest and bird
Forest and Bird magazine
Forest and bird website, Wikipedia
Forest and bird, Discovery, National Geographic
Friends
from conservation organisations I belong to by email
from Zealandia
Google
Google queries
Highbury news group
I read specific books on bird Conservation in NZ
instagram
Instagram (follow me @jennamumford)
Local e-group
media online
Member of Forest & Bird, also Zealandia
My daughter's Kids Conservation Club magazine
My father who works in biosecurity
Nature Space eletter
Nature watch
nature.com (and subs)
Naturespace, NZPCN
Netflix
News
news and wildlife sites
news from zealandia
news sites
News websites
Newsletters
Newsletters from Nature groups
Newsletters/publication in post, eg OSNZ, Friends of Mana Island
Nil
NZ Geographic
Nz herald environment section
NZ news websites
observation
online news
Online news eg stuff nzherald
Other social medias like Instagram
Pest trap NZ
predatorfreenz.org
r/newzealand
Radio NZ
Radionz bird calls. love these
Radionz website
Random
Reading websites / blogs.
Reddit
Reddit (usually /r/newzealand)
Science and nature sites
Scientific journals
scientific journals
Scientific research; training / education as Zealandia guide
Specialist sites
specialist websites, eg zealandia, DOC
Stuff
Stuff and NZ Herald
Stuff app
Stuff, environmental websites (Halo, Pest Free etc)
Stuff, Guardian
Stuff. Co. Nz
Stuff.co.nz
Stuff.co.nz, instagram
Talking to intelligent people
Tertiary education
This survey
Trelissick Park Group website
Trelissick park newsletter
various conservation websites, eg Kea Conservation Trust
Various email subscriptions
various newsletters
Via emails from organisations I have obtain email news letters from
Visit Zealandia often
vist to Zealandia, Otari, Trellisick park newsletter