DEVELOPING A KIWI SAFETY PLAN FOR UPPER HUTT, AOTEAROA

Authors: William Brownell, Seth Frank, Domenic Sena, Paige Sommers

Advisors: Professor Leslie Dodson, Professor Kenneth Stafford
Sponsor: Pest Free Upper Hutt

Developing a Kiwi Safety Plan for Upper Hutt, Aotearoa

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: William Brownell, Seth Frank, Domenic Sena, Paige Sommers

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Report Submitted to: Pest Free Upper Hutt

Professors Leslie Dodson and Kenneth Stafford
Worcester Polytechnic Institute

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Abstract

The reintroduced kiwi population is expanding from Lower Hutt into increasingly populated areas near Upper Hutt, New Zealand. Our goal was to assess the local support of this expansion and develop a Kiwi Safety Plan for Pest Free Upper Hutt. We interviewed key stakeholders in conservation organizations and surveyed the public to gauge their willingness to help keep kiwi safe. We created our Kiwi Safety Plan suggesting action items for residents, Upper Hutt City Council, and Pest Free Upper Hutt.

Executive Summary

Background

The kiwi is a national icon for New Zealand. However, the kiwi population is only about a fraction of what it once was before humans inhabited New Zealand. To combat the decline of the kiwi population, organizations throughout the country are working to revitalize the populations of kiwi and maintain their habitats. Our sponsor, Pest Free Upper Hutt (PFUH), takes part in conservation efforts by removing invasive predators from the area to allow native species, like the kiwi, to thrive.

In 2006, the Remutaka Conservation Trust (RCT) released six brown kiwi into the Turere Valley near Wainuiomata and another 20 in 2009. Since then, the kiwi population has been growing and expanding towards Whiteman's Valley in Upper Hutt (Figure 1). As they move closer to residential areas, new threats such as human interactions, domestic pets, and traffic may hinder their survival.

Figure 1: Map showing expansion of kiwi into Upper Hutt (Google Maps, 2024).

Goal and Objectives

As kiwi move into Upper Hutt, PFUH wants to better understand threats to kiwi in the area and evaluate the willingness of residents in Upper Hutt to help protect kiwi. Therefore, our project was to assess how supportive Upper Hutt residents are towards the arrival of kiwi and develop a pilot Kiwi Safety Plan to be deployed in Upper Hutt. To achieve our goal, we identified the following objectives:

1. Investigate kiwi expansion into Whiteman's Valley including threats in Upper Hutt and surrounding areas.
2. Understand conservation goals and efforts of wildlife protection organizations to inform the Kiwi Safety Plan.
3. Evaluate the willingness of Upper Hutt residents, especially dog owners, to help protect kiwi.
4. Develop public awareness materials as part of the Kiwi Safety Plan.

Methods

To accomplish our goal, we employed a variety of methods. We performed a site assessment of Whiteman's Valley and the surrounding suburbs and parks in Upper Hutt since this is where the kiwi will migrate to first. We examined the geographic conditions in Upper Hutt and talked with a property owner who heard kiwi at night.

We interviewed key conservation groups to understand their efforts and accomplishments in kiwi conservation. We learned about the initial release of the kiwi into Remutaka Forest Park and why they are thought to be migrating into Upper Hutt. We talked with key conservation experts from Zealandia, Capital Kiwi, Ngā Manu Nature Reserve, and Remutaka Conservation Trust who shared their opinions on the kiwi migration, threats to the kiwi as they move into Upper Hutt, and how we can keep them safe. We also interviewed a kiwi aversion trainer and gained insight into the Kiwi Aversion Training (KAT) process and how effective it is (Figure 2).

Figure 2: Interviewing Willy Marsh, kiwi aversion trainer.

Figure 3: Domenic conducting an in-person survey.

With all this information gathered from the site assessment and interviews, we created a survey to deploy to Upper Hutt residents to gauge how willing they are to help protect kiwi in Upper Hutt. We conducted 271 online surveys and 15 in-person surveys. (Figure 3).

We met with members of the marketing and communications team at Upper Hutt City Council (UHCC) to learn about marketing strategies. We worked with the marketing team to post a video on their social media platforms that announced our project objectives and survey. We also spread the word about our project at the Upper Hutt City Council meeting. In addition to this, we met with a journalist who posted an article about our project in New Zealand's *The Post*. One team member was also interviewed on a local radio program (*TheHuttZone*) to speak about our team and project.

We created additional public awareness materials to spread the word about our findings and Kiwi Safety Plan. We created a two-minute video for PFUH that detailed specific actions residents can take to help keep kiwi safe. We also created an informational pamphlet which explains the migration of the kiwi into Upper Hutt, the threats to kiwi, and what residents can do to keep them safe. Our final Kiwi Safety Plan was summarized in a one-page document that includes specific action items for Pest Free Upper Hutt, Upper Hutt residents, and the Upper Hutt City Council.

Findings

Overall, we found from our online and in-person surveys that there is high excitement among residents for the arrival of kiwi. We found that most people saw the arrival of kiwi as a sign of environmental well-being, showing that its reemergence has a deeper significance in relation to the health of New Zealand's ecosystems.

In addition to this general excitement, we found that residents supported the proposed guidelines to help protect kiwi in Upper Hutt. We had a high percentage of respondents in our online survey who support the addition of road signage to indicate kiwi habitat. Many respondents also agreed with implementing interaction guidelines on private property. This support was also apparent for people living in more rural areas near kiwi habitat, where we found that 73% of people would allow access to their land for conservation and/or monitoring as well as 69% would provide kiwi habitat on their land.

Figure 4: Scott Nicholls, Whiteman's Valley property and dog owner who is in support of sensible guidelines.

We also looked more specifically at dog owners and what guidelines they would support to help protect kiwi (Figure 4). Respondents approved many suggested guidelines, especially ones pertaining to lead use in kiwi habitat areas. There were many people already following many of our proposed guidelines, with 80% keeping their dogs inside at night and 94% using leads when in public areas.

Figure 5: Sign advertising KAT.

With KAT being an important strategy for protecting kiwi, we looked more into how it is conducted and ways that it is advertised to the public (Figure 5). We found that while most people heard about KAT through word-of-mouth, there is an opportunity for more publicity through enhanced social media presence. We also found a large variety in how individual trainers do their training sessions. We found that many trainers overutilize electric shock, causing the dogs to develop a fear of the electric collar rather than the kiwi itself.

Kiwi Safety Plan

As part of our Kiwi Safety Plan, we came up with many recommendations and action steps tailored towards specific audiences, including Upper Hutt residents, Pest Free Upper Hutt, and the city council.

Figure 6: Dog owner participating in KAT.

Create a uniform kiwi aversion training procedure to be taught.

Since there are many different ways KAT is executed, there needs to be more uniformity in the training procedures. Vibration should be prioritized over electric shock as it is a milder method and dog owners feel more positive about it. There should also be more training sessions hosted in Upper Hutt. Setting up a schedule of at least two monthly training sessions that make it easy for dog owners to register is key (Figure 6).

Publicize kiwi hot spots.

As the kiwi migrate further into Upper Hutt, the kiwi habitat boundaries should be updated accordingly. These hot spots should be advertised in local announcements and social media so that the public can stay informed and be appropriately cautious.

Create guidelines for dogs near kiwi habitat.

There should be a requirement for dogs trained to hunt and dogs living near kiwi habitat to go through KAT. Also, KAT should be included in dog obedience classes to make it more accessible for dog owners. Dogs near kiwi habitat should be kept inside at night, or least on leads or in fenced-in areas. Finally, any parks near kiwi habitat should be "lead only" to ensure the kiwi are protected.

Figure 7: Kiwi road sign in Lower Hutt.

Implement safety measures in kiwi hot spots.

The council should add road signage to indicate the presence of kiwi habitat (Figure 7). Informational guides should also be placed around Upper Hutt parks to indicate the pending arrival of kiwi and what residents can do to ensure their protection. PFUH should start to trap feral cats since they are a growing concern towards kiwi survival.

Utilize materials to increase public awareness of kiwi and kiwi aversion training.

Social media use should be increased to advertise KAT, how it works, and when sessions are. Social media should also be used by PFUH to advertise volunteer opportunities and current initiatives. This will help get the word out about PFUH and encourage participation from residents to help protect the kiwi. Also, informational sessions should be held explaining more about kiwi and the action items residents can take to keep them safe.

Acknowledgements

Throughout our time in New Zealand, we met many individuals which provided countless information and insightful thoughts regarding our project. We would first like to thank our wonderful sponsors: Pat van Berkel from Pest Free Upper Hutt, Paul Lambert from Pest Free Upper Hutt, and Ocean Mercier from Victoria University. Their contributions to our project were so valuable and enabled us to have such a successful project. We would also like to thank our advisors, Professor Leslie Dodson and Professor Ken Stafford, for their advice and insight throughout the IQP process, especially in the process of writing this report.

We would also like to thank all the countless individuals we met throughout the entire project; Mel Peterson and Louise Martin from Upper Hutt City Council for their help on advertising our survey; Winifred Long, Susan Ellis, Gerry Brackenbury, and Rosemary Thompson from Remutaka Conservation Trust for their insightful knowledge on kiwi conservation; Willy Marsh for allowing us to attend one of his kiwi avoidance trainings; Sam Irwin from Zealandia; Bosan and Ngā Manu Reserve for providing insightful information on kiwi; Jeff Hall from Capital Kiwi; and everyone else we met along the way throughout our time in New Zealand.

Meet the Team

William Brownell

My name is William Brownell and I am a chemical engineering major from Somerset, MA. Within and outside of my studies, I am very passionate about the environment and its security. Working on this project has allowed me to gain an appreciation for the value that the people of New Zealand hold in their native species and the extensive efforts being made to protect them. As an avid animal lover, working to help protect such a cherished and unique species has been an incredible experience.

Seth Frank

My name is Seth Frank and I'm a computer science major at WPI. I am from Farmington, Connecticut and have been very grateful for the opportunity to explore what New Zealand has to offer and immerse myself into the beautiful culture. Being able to work with the kiwi bird and learn more about the importance of the environment here has been amazing and I'm so grateful for the opportunities that have been provided while here.

Domenic Sena

My name is Domenic Sena, and I am an electrical engineering major from Worcester, MA. I have a fascination for photography and the outdoors, and New Zealand offers the perfect combination of both beautiful landscapes and extensive outdoor activities. This project has provided the best opportunity for collaborating with new people and understanding the importance of the environment. I look forward to more chances to work on environmental projects in the future.

Paige Sommers

My name is Paige Sommers, and I am a biomedical engineering major from Rochester, MA. I've always loved to be outside, so I've loved hiking, swimming, and exploring all the beautiful scenery that New Zealand has to offer. I have loved working on this project because I love nature and wildlife. This has been such a great experience because I've been able to learn about how conservation groups supported the reemergence of a national icon.

Authorship

Chapter/Section	Primary Author(s)	Secondary Author(s)	Editor(s)
Abstract	Seth, Domenic	Paige, William	ALL
Executive Summary	Paige, Domenic	Seth, William	ALL
Introduction	Domenic, Paige	Seth, William	ALL
Background	Seth, William	Paige, Domenic	ALL
Methods	Paige, Seth	William, Domenic	ALL
Findings	William, Paige	Domenic, Seth	ALL
Recommendations	Domenic, William	Paige, Seth	ALL
Conclusion	Paige, Domenic	Seth, William	ALL

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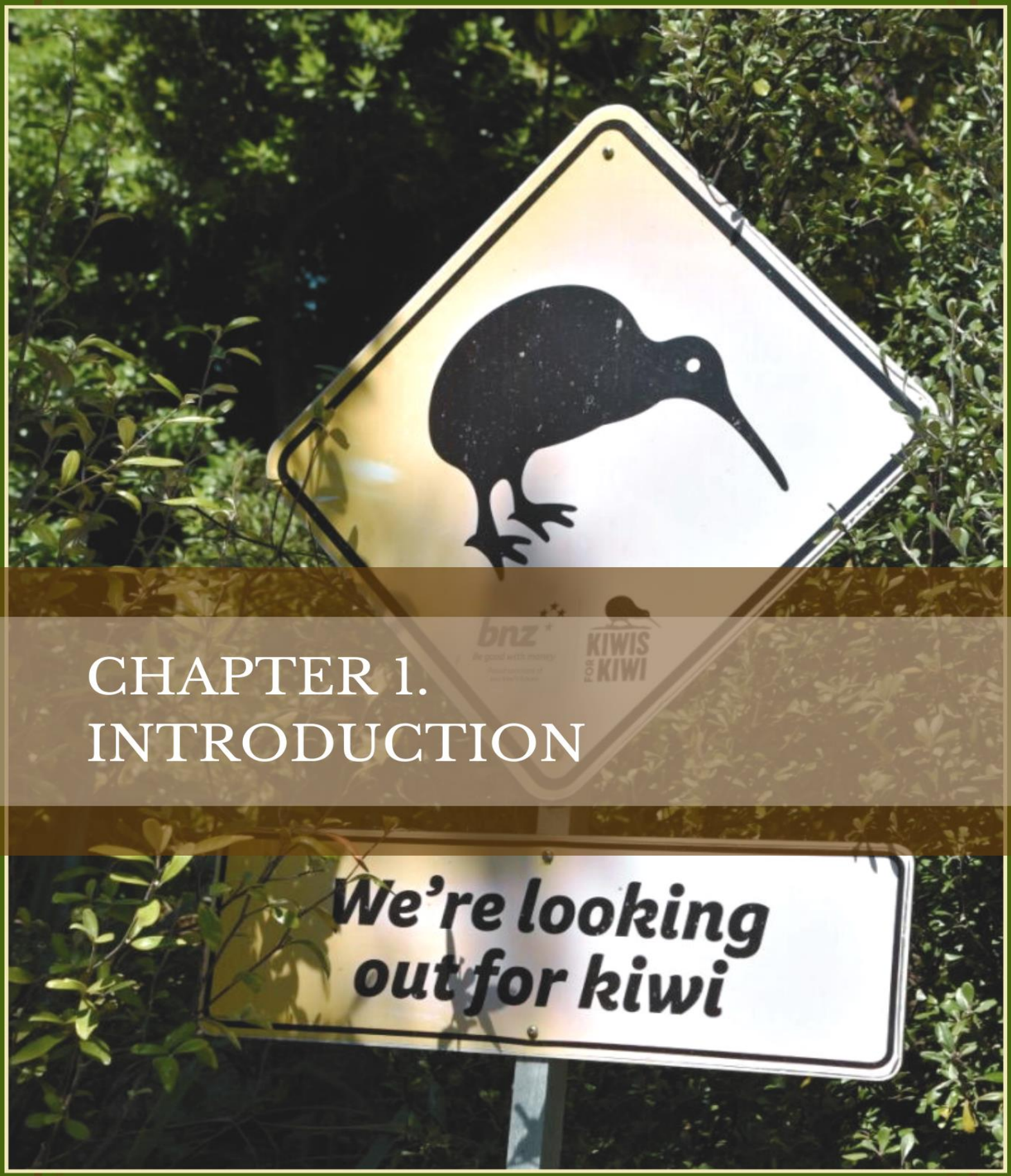
Glossary of Acronyms

KAT	Kiwi Aversion/Avoidance Training
RCT	Remutaka Conservation Trust
DOC	Department of Conservation
UHCC	Upper Hutt City Council
PFUH	Pest Free Upper Hutt



CHAPTER 1. INTRODUCTION

Figure 8: Stuffed brown kiwi chick.

The kiwi is the national and iconic symbol of New Zealand. This flightless native bird is adored by residents, but it is vulnerable to attacks from predators and domestic pets (Figure 8). Establishing a consistent method of conservation has required effort from a range of organizations invested in the protection of these birds. In fact, in 2016, the government of New Zealand introduced a plan called "Predator Free 2050." This plan was to remove the "big three" predators: possums, stoats, and rats from New Zealand by 2050 (*Predator Free 2050 Limited Annual Report*, 2023). The plan prioritizes the effort to make Aotearoa a safe and nurturing ecosystem where native species, like kiwi, can thrive.

Originally, 26 kiwi were released in Turere Valley, a large area in Lower Hutt, in 2006-2009 to help their species grow (Ellis & Remutaka Conservation Trust, 2023). Since then, the kiwi population has been steadily growing over time to over 200, which has led to the expansion of the kiwi into new locations further north. Recently, there have been sightings of these nocturnal birds along with reports of their acoustics at night near Whiteman's Valley, located at the southern border of Upper Hutt (Figure 9) (W. Long, personal communication, January 15, 2024). However, this also brings concern since they are appearing in areas that hold more potential threats, especially from people and animals. Since kiwi are most often found in scrub, pine regions, and mature forests, residents in this region are not used to seeing the birds in developed or urban areas (S. Ellis, personal communication, January 24, 2024). Given the growth of the kiwi population, steps need to be taken to conserve them.

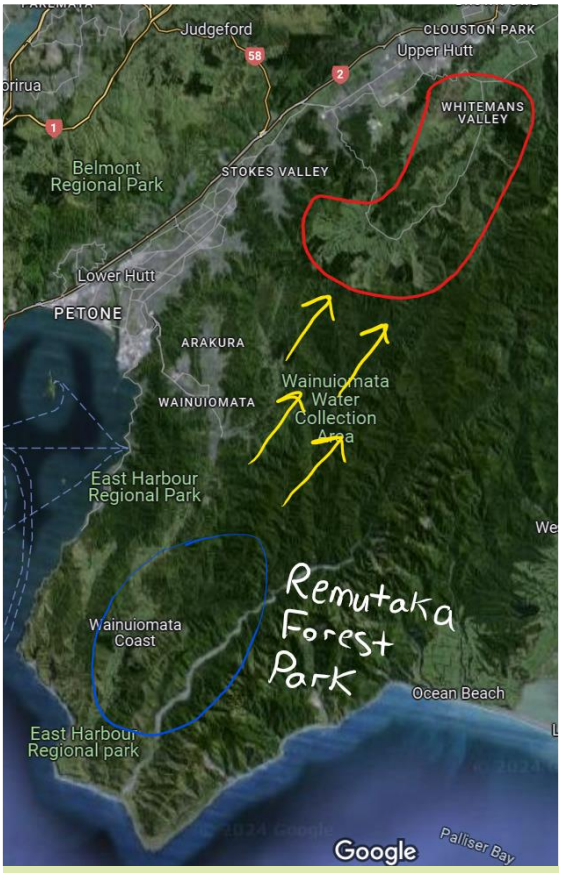
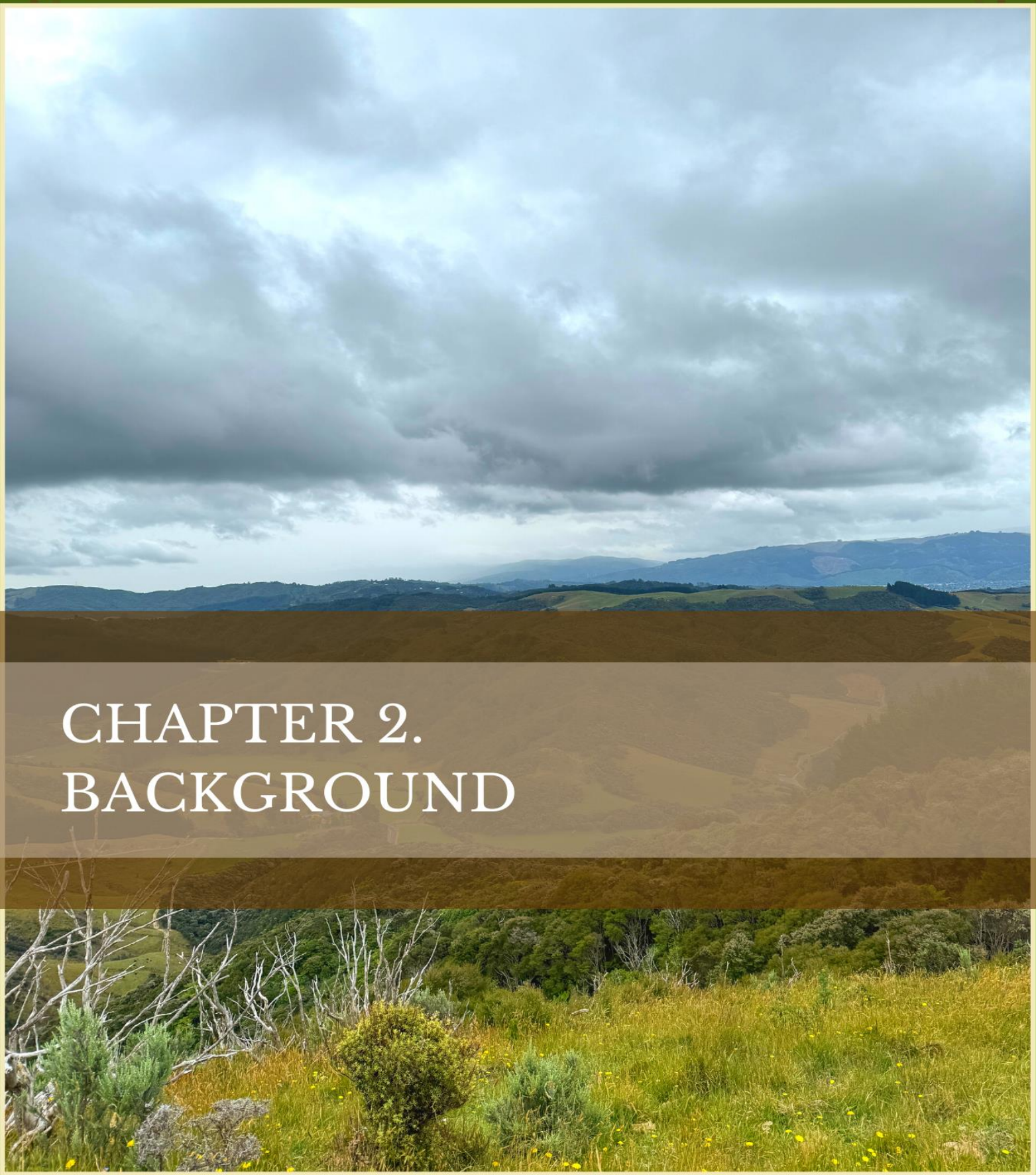


Figure 9: Map showing expansion of kiwi into Upper Hutt (Google Maps, 2024).

As kiwi expand into Upper Hutt communities, the public's response will be key to their survival. Pest Free Upper Hutt, a small local organization that supports the Predator Free 2050 initiative, has done extensive trapping of mustelids and other pests in the Upper Hutt region to ensure the safety of all native species, especially kiwi. For kiwi migration towards residential areas to be achievable, Pest Free Upper Hutt will need the assistance of Upper Hutt residents in trapping efforts and dog control. Therefore, the goal of this project is to assess how supportive Upper Hutt residents are towards the arrival of kiwi and develop a pilot Kiwi Safety Plan. To support this goal, we have identified four objectives:

1. Investigate kiwi expansion into Whiteman's Valley including threats in Upper Hutt and surrounding areas.
2. Understand conservation goals and efforts of wildlife protection organizations to inform the Kiwi Safety Plan.
3. Evaluate the willingness of Upper Hutt residents, especially dog owners, to help protect kiwi.
4. Develop public awareness materials as part of the Kiwi Safety Plan.

By completing the objectives above, we hope to get a clear vision of the public's perspective on kiwi conservation and improve public engagement. We will compile all our research and fieldwork to create our Kiwi Safety Plan to make Upper Hutt a habitable place for them to thrive.



CHAPTER 2. BACKGROUND

This chapter explains the vulnerabilities of the kiwi, the success of their repopulation, and the context of kiwis migrating from the unpopulated areas of Lower Hutt into the more urban setting of Upper Hutt. We also discuss how different organizations and members of the public are important to kiwi conservation efforts.

2.1 Geography and Kiwi Environment

Kiwi Habitat

Kiwi are an incredibly versatile species and can survive in geographical environments ranging from coastal scrub to mountain tops (J. , personal communication, February 18, 2024). However, the primary natural habitats of native kiwi are forested areas, but they can also be found in scrub and swamps (Jamieson et al., 2016). During the day, the nocturnal birds spend most of their time in the burrows they create for themselves, which provide some protection from predators and inclement weather (Figure 10). During the night, however, these flightless birds leave their burrow to forage for worms, making loud "sniffing" sounds which can alert predators of their presence (*Kiwi Facts*, n.d.; Sales, 2005). Traditional habitats are rural, but the brown kiwi originally placed in Lower Hutt are migrating closer to Upper Hutt and into more populated areas.

Figure 10: Kiwi in its burrow (The Landing, 2024).

Lower Hutt

To better understand why the kiwi are migrating into Upper Hutt, it is important to understand the conditions in the Remutaka Forest region of Lower Hutt and kiwi behavior. This forest has many steep hills and engulfs the Remutaka mountain ranges as well as the Ōrongorongo River. The forest also contains many fern valleys and freshwater streams (*Remutaka Conservation Trust Home Page*, n.d.).

Figure 11 shows the mountain ranges starting from the bottom of the Remutaka Forest Park and going up towards Upper Hutt, with the Ōrongorongo River running between. These mountain ranges have provided the kiwi with sufficient habitation. However, the physical barriers of these mountain

ranges and the Ōrongorongo River have guided their movement around Lower Hutt and in the direction of Upper Hutt (*How Kiwi Evolved - Save the Kiwi*, n.d.).

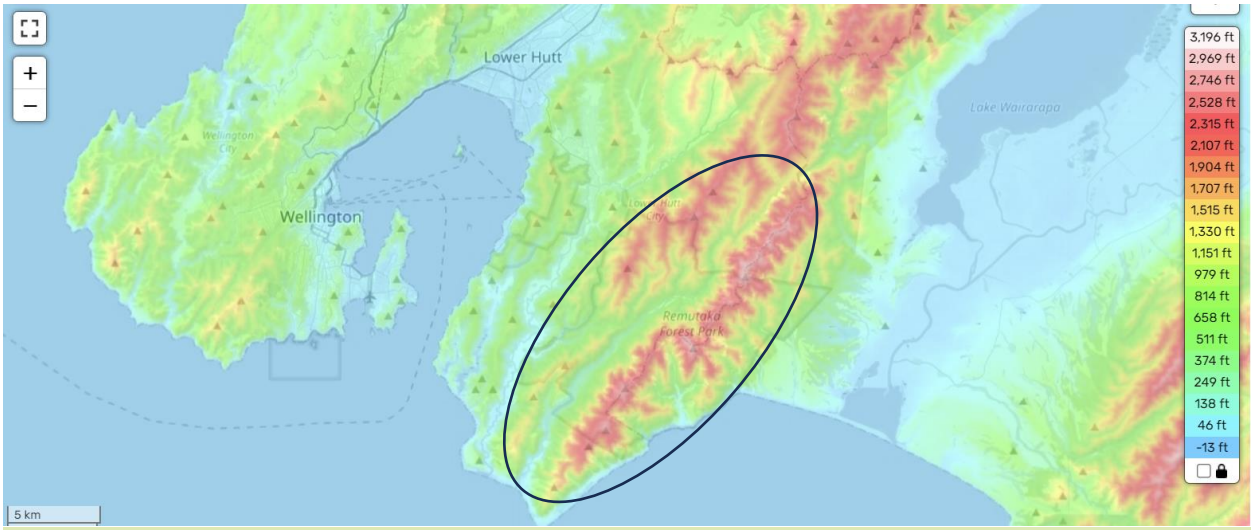


Figure 11: Topographical map of Remutaka Forest Park (Upper Hutt Topographic Map, n.d.).

History and Geography of Upper Hutt City

The geography of Upper Hutt will be crucial in helping to identify areas where kiwi may be migrating to. Upper Hutt is a city in the Wellington region with a population of around 44,000 people (Figure 12) (*Population | Upper Hutt City*, 2018). Before European settlement, much of the area was covered in dense forests, rivers, and steep inclines. However, settlers cleared many of those forests for farm use and created pathways for roads and railways. After the Second World War, much of the main valley saw an increase in housing construction, which led to Upper Hutt becoming a city in 1966 (Maclean, n.d.). Whiteman's Valley (Figure 13), however, is still characterized by the farming lifestyle brought by the Europeans.

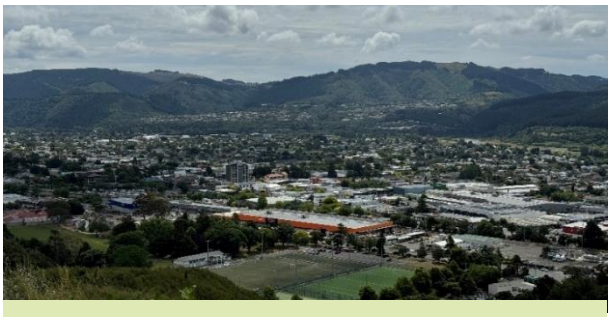


Figure 12: Aerial view of Upper Hutt City.

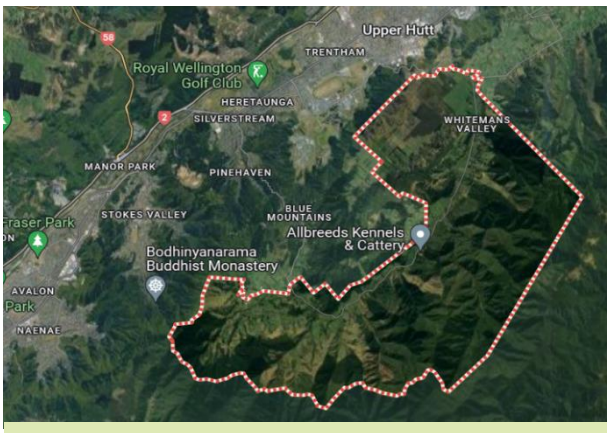


Figure 13: Whiteman's Valley outlined in red (Google Maps, 2024).

Much of Whiteman's Valley is made up of rural areas, containing farms and larger, spaced-out properties (Figure 14) (Maclean, n.d.). This region is also bordered by the large Remutaka Forest in Lower Hutt where kiwi are currently living. Experts expect kiwi to move into Whiteman's Valley in the coming years with their eventual spread into more forested areas of Upper Hutt (P. van Berkel, personal communication, November 2, 2023).

Figure 14: Valleys and farms of Whiteman's Valley.

2.2 Threats and Concerns

Invasive Species

Since European settlers arrived in New Zealand in 1642, there have been a series of non-native species introductions that devastated the balance of the island ecosystem (*Invasive Species • Environment Guide*, n.d.). Rabbit plagues lasting from the 1870s to the late 1980s had dramatic impacts on the land, including the destruction of sheep pasture.

Figure 15: A stoat, one of the pests brought from settlers.

To control the rabbit population, stoats (Figure 15), a member of the mustelid family, were brought in from Europe and Asia (Taonga, n.d.). Unfortunately, this new invasive predator caused kiwi bird numbers to quickly plummet. Before this, the northern brown kiwi originally had no natural predators, however, the introduction of mustelids, possums, and rats to New Zealand has made the kiwi much more vulnerable.

Domestic Dogs

Figure 16: Kiwi skeleton showing its powerful legs.

If the kiwi reaches adulthood, it may be large enough to defend itself against smaller predators using its powerful legs (Figure 16). But even with their legs and speed, the largest concern to adult kiwi is domestic dogs. Dogs are attracted to the distinctive, strong scent that the kiwi gives off, which makes the kiwi easily discoverable by the dogs. Once the kiwi are found, the dog can easily break the kiwi's fragile breastbone using their large jaws. The kiwi has no natural defenses towards dogs, so any encounter with a dog will likely result in the kiwi's death (S. Ellis, personal communication, January 24, 2024). Unfortunately, there have been a few reported incidents of kiwi deaths due to dogs in the more rural suburbs of Upper Hutt within the last decade (T. Chad, personal communication, January 30, 2024).

Human Interaction

With kiwi moving into Upper Hutt, another concern that presents itself is the people that inhabit this urban area. Allowing wildlife space to adapt and flourish in their environment is an important aspect of human-wildlife interaction. Since kiwi are very sensitive, touching or handling these birds could result in their injury or even fatality. Even approaching or crowding them could cause immense stress, potentially leading to these events as well (Department of Conservation, 2018). Residents might be enticed to interact with or hold the kiwi considering the excitement of them being such an iconic bird for New Zealanders. However, for their safety, it is very ill-advised. Another aspect of human interaction is the threat that is posed by cars. As kiwis come from an entirely forested environment, this is a completely new threat that they will face. The biggest concern comes at night when kiwi are most active, and the limited visibility of drivers at night increases the likelihood of an incident occurring.

2.3 Kiwi Repopulation and Migration

Breeding in Captivity

Due to the presence of invasive predators, less than 5% of kiwi chicks survive in the wild, emphasizing how important breeding in captivity is to the survival of the population (*Kiwi Facts*, n.d.). Organizations like the Remutaka Conservation Trust (RCT), a group of volunteers dedicated to protecting the native species of New Zealand, work to reestablish the wild kiwi population. They partnered with Operation Nest Egg (ONE), an organization responsible for raising chicks in captivity, to help protect the kiwi eggs until they were big enough to defend themselves against predators. The RCT took kiwi chicks from their nests and gave them to ONE, where they were raised until they reached 1 kg. At this point, they are strong enough to defend themselves from most predators (Figure 17) (W. Long, personal communication, January 15, 2024). Programs like ONE were crucial in the increased growth of the kiwi and conservation of the kiwi population (Bassett, 2012).

Figure 17: Kiwi egg ready for removal for incubation (Remutaka Conservation Trust, 2024).

Similar to the RCT, Capital Kiwi worked on kiwi conservation efforts in Mākara, a forested suburb west of Wellington central. They have established trap lines extending across the Wellington region that have supported the brown kiwi introduction to this area. Other sanctuaries are also available to help with the captive breeding of kiwi, such as Zealandia, the Ngā Manu Nature reserve and the Whangārei Kiwi Sanctuary (*Our Work with Kiwi: New Zealand Native Land Birds*, n.d.). Once the kiwi grow past their vulnerable stage in the sanctuaries, organizations like Capital Kiwi are responsible for kiwi relocation.

Initial Release of Kiwi in Remutaka Forest Park

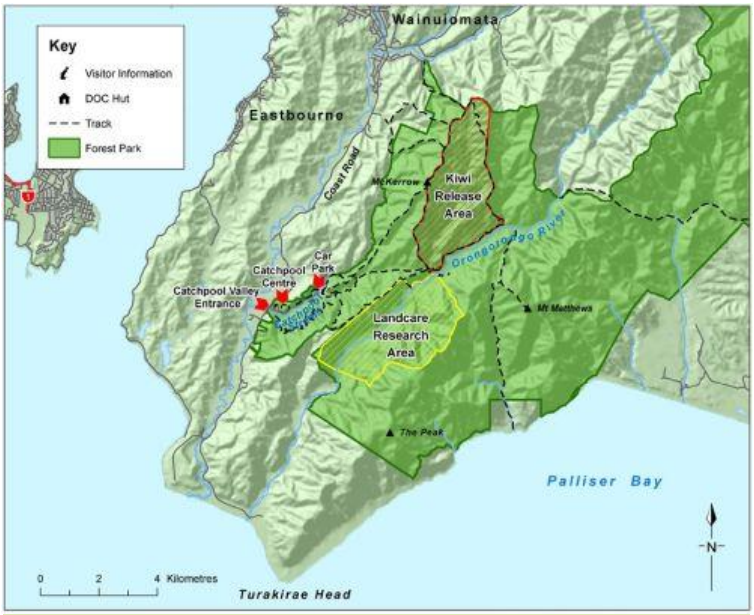


Figure 18: A map of the Remutaka Forest Park (Remutaka Conservation Trust, 2024).

The first six brown kiwi were originally released from captivity into Turere Valley near Wainuiomata in 2006 by the RCT (Figure 18) (S. Ellis, personal communication, January 24, 2024; *Remutaka Conservation Trust Home Page*, n.d.). Prior to releasing the kiwi, this group performed extensive stoat trapping across Remutaka Forest Park in efforts to make it a habitable place for the kiwi. In 2009, the RCT was able to release 20 additional kiwi into the area after successfully launching a catching expedition, which took place on Little Barrier Island (Ellis & Remutaka Conservation Trust, 2023). The absence of predators on Little Barrier Island provided sanctuary for kiwi chicks to thrive and grow to adulthood.

Population Tracking

The reintroduced kiwi population has steadily risen to now over 200, leading to the expansion of the original kiwi boundary region (W. Long, personal communication, January 15, 2024). Their movement was tracked using acoustic recorders placed in approximately 100 various regions in Remutaka Forest Park. The sound recording features of acoustic recorders allow scientists to assess kiwi calls to make estimations on their locations and potential movement patterns (W. Long, personal communication, January 15, 2024). The kiwi boundary expansion has been on an upward trend since monitoring started in 2011. The kiwi population is shown to be moving farther north over time, approaching Upper Hutt (Figure 19).

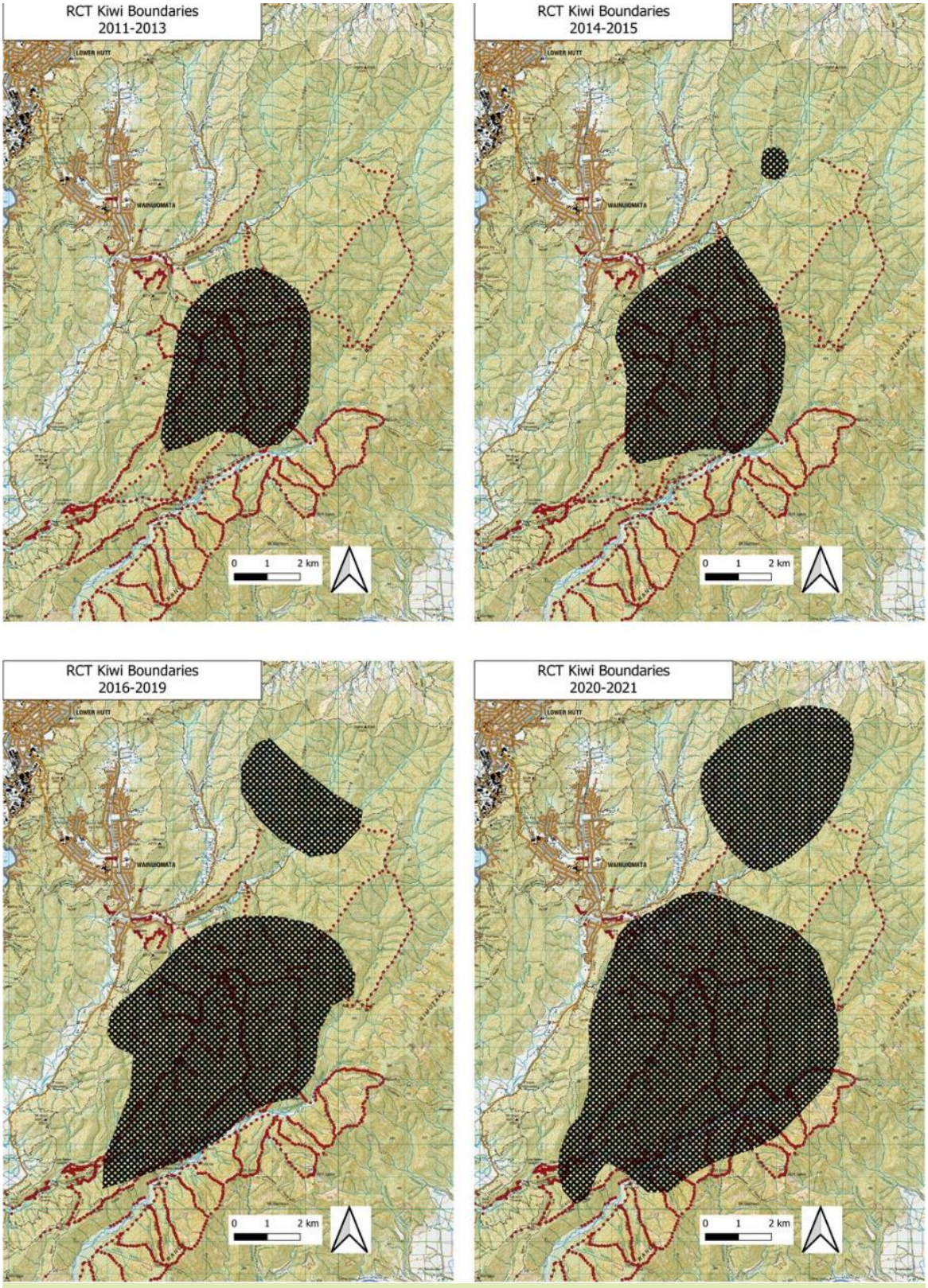


Figure 19: A mapping of the kiwi migration over time in Remutaka Forest Park (Remutaka Conservation Trust, 2021).

2.4 Key Partners and Stakeholders in the Conservation of Kiwi

Forest and Bird and Pest Free Upper Hutt

Forest and Bird is an organization committed to defending nature. They have many branches across the country that work towards specific conservation projects (*Land | Forest and Bird*, n.d.). Pest Free Upper Hutt is a program under Forest and Bird that supports Predator Free 2050 in the Upper Hutt Valley region. The program is funded by the Upper Hutt City Council (UHCC) and supported by Department of Conservation (DOC) (P. van Berkel, personal communication, January 14, 2024). This means that it must rely on community support to help eradicate rats, stoats and possums in local areas. The hope is that residents will get excited about the possibility of being able to see native birds and lizards outside their homes, creating a sense of passion and dedication to the project.

Residents and Dog Owners

New Zealand residents, especially those that own dogs, have an important role in kiwi conservation efforts. Roughly 64% of households in New Zealand have pets, most of which are dogs (Figure 20) (Forrest et al., 2023). Taking notice of this, governmental officials implemented a Dog Control Act in 1996 (*Dogs*, n.d.). This act outlines responsibilities for dog owners to maintain stricter control over their pets. With kiwi now coming into Upper Hutt, more guidelines for dog owners may be necessary. The intention of these guidelines would be solely the protection of the native species and limiting the potential for any accidental interactions between them and dogs. In addition to dog owner responsibilities, kiwi safety as they move into Upper Hutt would require support from all residents. Avoiding physical interaction and cautious driving at night will help keep kiwi safe in this urban environment.

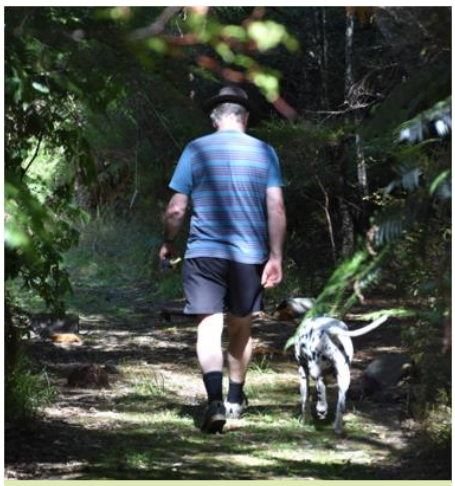


Figure 20: Dog and their owner.

Māori

The western and Māori frameworks that govern the region place great significance in the protection and conservation of these native birds. The presence of kiwi is immensely important for national identity; these birds are both a national and native icon. The bird itself is also a treasure to the Māori

people, who have strong cultural, spiritual, and historical connections to the kiwi. With the National Bioheritage Challenge and Predator Free 2050 goal, landscape project developments took place for the placement of predator traps in forested areas. Out of the 17 landscape projects that are developed, three of these are iwi led (*Aotearoa New Zealand's Predator Free 2050 Goal Five Years on - a Progress Report*, 2022; *Biological Heritage NZ*, n.d.). There is currently a national charity in New Zealand called Save the Kiwi, that helps to raise and provide funds to kiwi conservation projects throughout the country. The organization is committed to supporting Māori leadership, and making sure that they have an important role in the efforts for kiwi restoration ("Hapū and Iwi Engagement," n.d.). These co-governance models can bring a more effective approach to conservation goals and conversations.

2.5 Responses and Actions

Regulations

The Upper Hutt City Council (UHCC) has established many dog regulations. They have around 6000-7000 registered dogs in Upper Hutt, but there are still around 3000 that are unregistered (M. Baker, personal communication, January 11, 2024). There are also regulations regarding leads within the city. While only two parks (Birchville Park and Te Haukaretu Park) require leads, dogs must be on leads on all the residential streets. The city also requires muzzles in public for dogs that have attacked any wildlife, human, or domestic (M. Baker, personal communication, January 11, 2024). This helps owners control their dogs and can help prevent dogs from attacking kiwi in the event they encounter one.

Kiwi Aversion/Avoidance Training

One of the more useful strategies launched to manage dog-wildlife conflict has been Kiwi Aversion/Avoidance Training (KAT) (Figure 21). KAT works by presenting a dog to kiwi stimuli, often in the form of frozen dead kiwi, stuffed kiwi, or feces of kiwi. Once the dog makes contact with the kiwi stimuli, the trainer gives the dog a vibration to deter it from getting close to the kiwi (Dale et al., 2013; W. Marsh, personal communication, February 18, 2024).

Figure 21: A sign for an upcoming kiwi avoidance training session.

If the dog is persistent despite the vibration, an electric shock will then be used to correct its behavior. According to studies regarding effectiveness of KAT, most dogs have aversion responses to kiwi for at least year after training (Dale et al., 2013). Although there were initial concerns about KAT affecting the welfare of dogs, it has gained acceptance over the years. Now, the KAT classes are often booked to capacity and there has been an increased demand for more trainers (Figure 20) (G. Brackenbury & R. Thompson, personal communication, January 16, 2024).

CHAPTER 3. METHODS

The goal of this project was to assess how supportive Upper Hutt residents are towards the arrival of kiwi and develop a pilot Kiwi Safety Plan. To support this goal, we have identified four objectives:

1. Investigate kiwi expansion into Whiteman's Valley including threats in Upper Hutt and surrounding areas.
2. Understand conservation goals and efforts of wildlife protection organizations to inform the Kiwi Safety Plan.
3. Evaluate the willingness of Upper Hutt residents, especially dog owners, to help protect kiwi.
4. Develop public awareness materials as part of the Kiwi Safety Plan.

Objective 1: Investigate Kiwi Expansion and Threats

To accomplish this objective, we completed a key informant interview with a resident of Upper Hutt, a site assessment of Whiteman's Valley including photography of this area, and key literature research to gain background information on kiwi and how they live.

Key Informant Interview

During our initial site assessment, we performed a key informant interview with Scott Nicholls, a property owner in Whiteman's Valley who reported hearing kiwi at night around his property (Figure 22). In this semi-structured interview, we asked open-ended questions regarding his thoughts on kiwi entering his property, and other general questions about his property, living habits, and dogs. By interviewing him on his property, we were able to get a firsthand look at the geography of the area to better understand where kiwi are heading.

Figure 22: Scott Nicholls and his dogs.

Site Assessment

Figure 23: A farm in Whiteman's Valley.

We performed a site assessment with our sponsors, Pat van Berkel and Paul Lambert, to better understand Upper Hutt and the current threats being faced by kiwi in the nearby areas. We asked about different areas, like Upper Hutt dog parks, to conduct in-person surveys. We visited some of these parks and asked questions to better understand what the parks are used for and what threats could be apparent to kiwi. We also drove around Whiteman's Valley, checking out farms and properties in the area to investigate potential threats to kiwi (Figure 23).

Photography

During our site assessment of Upper Hutt, we took photos documenting areas of interest as well as possible kiwi threats and habitats (Figure 24). This included taking photographs of the Remutaka Forest to show where kiwi were first relocated. S. Nicholls' property was also photographed which helped us understand where kiwi may start to appear. Additionally, we took photos of moments to help document our processes, better recall certain events, and utilize them in our report. The photographs enhance our report by giving the reader a more substantial understanding of the area's geography and our work environment.

Figure 24: Dog digging in burrow.

Key Literature Research

We did extensive literature research to get an initial understanding of the project and then later to gain more detailed information on specific topics. This involved looking into information about the kiwi bird and understanding their habitat, how they live, and what the largest threats are for them. We researched the Remutaka Forest Park, where kiwi were released in the initial stages of the kiwi reintroduction on the North Island. Exploring strategies that helped with kiwi survival like Operation

Nest Egg and predator free areas, allowed us to better understand the success in their repopulation. Our research also involved looking into conservation groups and their goals that have helped with kiwi preservation like DOC, Forest and Bird, and Predator Free 2050.

Objective 2: Understand Conservation Goals and Efforts

We used key informant interviews to help us gain expert information about the current conservation organizations, steps they have taken to help protect kiwi, and their organizational goals.

Interview: Conservation Organizations

Some key conservation organizations we talked with included the RCT, Capital Kiwi, Zealandia, and Ngā Manu Reserve (Figure 25). We conducted key informant interviews with these organizations where we asked open-ended questions, encouraging conversation about the topic. Our goal for these was to gain a better understanding of previous conservation efforts and any difficulties or challenges associated with them. These interviews also helped solidify information we discovered during our research process.

Figure 25: Interview with Jeff Hall from Capital Kiwi.

Participant Observation: Kiwi Avoidance Trainer

A key effort that is currently helping the conservation of kiwi in the Remutaka Forest Park is KAT. We attended a kiwi aversion training with the lead trainer, Willy Marsh, to learn more about this program and how the public have responded to it so far (Figure 26). We were also able to watch the process firsthand and see how effective it was.

Figure 26: Attending the KAT session.

By learning about the success of the KAT and the public's response to it, we were able to make informed decisions about how willing the residents of Upper Hutt would be to complete this training if we advertised it. We were also able to apply the current advertising strategies used by the trainers to get even more interest.

Objective 3: Evaluate Willingness of Upper Hutt Residents

We conducted both online and in-person surveys to evaluate the willingness of Upper Hutt residents to take protective measures to keep kiwi safe.

Surveying Residents of Upper Hutt

We used surveys to learn the extent of public awareness of kiwi migration into both Lower and Upper Hutt. These surveys also asked what measures Upper Hutt residents were willing to take to help conservation efforts, gauge current awareness, and build public cooperation. Questions included prompts about awareness and sources of information, pet ownership, and responsibility of dog behavior. We used Qualtrics to conduct our survey, which provided an accessible platform that we could both post online and give to people in person via the links and QR code on flyers (Figure 27). This enabled us to get a total of 271 responses. A sample of survey questions can be found in Appendix A. We used both randomized and selective surveying for our project. To gain information from the

Figure 27: Flyers and handouts for our survey.

general public, we used a survey of convenience to get a representation of the perspectives of people in Upper Hutt. To specifically target dog owners in Upper Hutt, we identified strategic sites, such as dog parks and trails. A large portion of our surveys were distributed online to the residents of Upper Hutt. To complete this, we worked with the Upper Hutt City Council to advertise our survey to public residents through a quick video.

In-Person Surveys with the Upper Hutt Residents

Figure 28: Domenic conducting an in-person survey.

In addition to our online surveying, we conducted in-person surveys with Upper Hutt residents. We went to public places in Upper Hutt such as the library and popular parks and asked residents if they could speak with us for a few minutes regarding our project (Figure 28). We explained the goal of our project and asked them a series of questions regarding their views on kiwi and how willing they would be to take measures to help protect them. The use of in-person surveys allowed us to ask open-ended questions where the interviewee could elaborate on their views, permitting us to gather a significant amount of information in a short amount of time.

From these surveys, we gauged the residents' support of the arrival of kiwi and their expected efforts to keep them safe. Aside from getting the opinions of the public, this was also a great opportunity for us to introduce them to the current situation and challenges regarding kiwi. These interviews assessed their awareness of the kiwi's population growth as they approached Whiteman's Valley. Informing those unaware of this allowed us to obtain another way of spreading public awareness, as well as physically see their reaction to this new development and determine whether it was a positive or negative.

Objective 4: Develop a Public Awareness Campaign

Our fourth objective involved compiling the results of our surveys and interviews to create public awareness material to encourage the residents of Upper Hutt to coexist with kiwi.

Learning about Media Production

We hosted a meeting with members of the social media team of the UHCC, including Mel Peterson, the Senior Marketing and Promotions Advisor, and Louise Martin, the Communications and Engagement Advisor (Figure 29) to learn about successful advertising campaigns and how to grab the viewer's attention. This was a free-flowing conversation about other successful marketing campaigns the city council had in the past to generate ideas for us to distribute to the public. Therefore, we applied these ideas to our own informational materials to distribute to the Upper Hutt residents.

Figure 29: Mel Peterson and Louise Martin.

Attending City Council Meetings

We also attended a city council meeting where we presented our project to city councilors and Upper Hutt residents (Figure 30). This was a great opportunity to share more about our project with the council and explain what actions we recommend they take towards kiwi conservation in Upper Hutt. This enabled the council to be more aware of the situation and help emphasize more focus on kiwi conservation in the future.

Figure 30: Attending the city council meeting.

Figure 31: Filming with Louise Martin.

Media Production

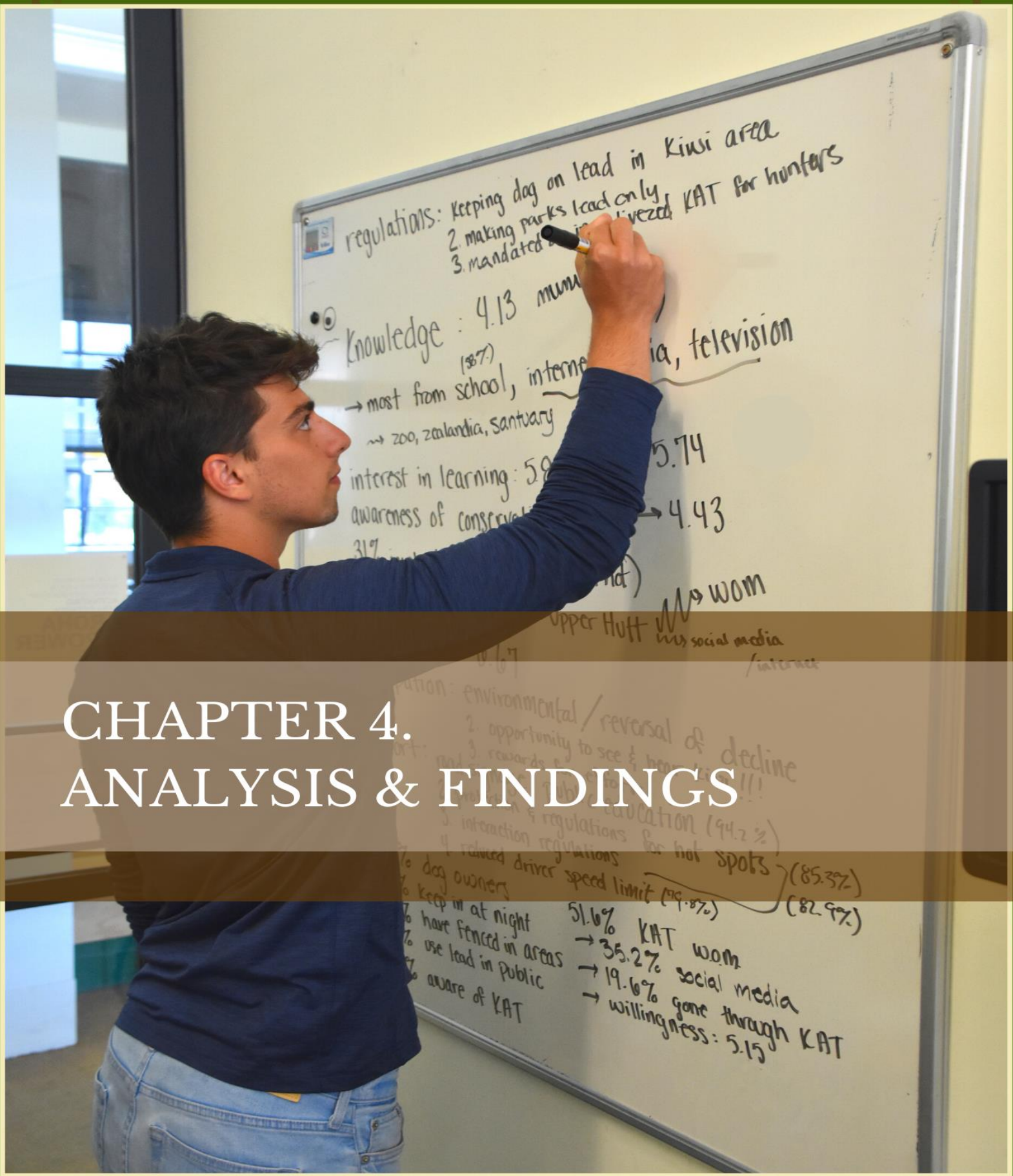
After meeting with M. Peterson and L. Martin, they offered to aid us in spreading public awareness of our project and survey. We met with them a few days later to record a quick video of our team explaining the background of the migration of kiwi into Upper Hutt (Figure 31). They edited the video a week later and posted it to the social media pages they operate. This video was viewed by residents from Upper Hutt and spread awareness to the residents of the kiwi arrival and our survey. A couple weeks later, they posted a blooper video of the original which allowed for more participants of the survey.

Through the support of Pat van Berkel and Paul Lambert, members of different public communications reached out to us. A journalist and radio broadcaster were intrigued by our project and efforts. They each wanted to hear more about what we were doing and the current situation of the kiwi. Seth spoke with journalist, Nicholas Boyack over the telephone, which led us to be featured in New Zealand's *The Post*. This feature described our project and the kiwi's migration into Upper Hutt. Will was recorded on the phone with John Macdonald from *TheHuttZone* and spoke on behalf of WPI's global projects and our specific kiwi project.

Public Awareness Material

By using data collected from the previous objectives, we created public awareness material to better inform Upper Hutt residents on how to share the ecosystem with kiwi. This included a pamphlet that has information about kiwi, the threats to them, and what residents can do to keep them safe. We created a one-page document that simplified the action items from our Kiwi Safety Plan. We also developed a two-minute video that highlighted findings from our Kiwi Safety Plan and explained how residents can get involved (Figure 32).

Figure 32: Filming our two-minute video.



CHAPTER 4. ANALYSIS & FINDINGS

In this chapter, we examine the findings from our data including our 271 online survey responses, 13 key informant interviews, 15 in-person surveys, and participant observation of KAT. We drew from this data to make key conclusions relating to the safety of the kiwi in Upper Hutt.

Finding 1: Upper Hutt Residents See Kiwi as a Symbol of Environmental Well-being

Most residents see the return of kiwi as a symbol of environmental well-being for the Upper Hutt community. In the in-person surveys we conducted with residents, we found that most were excited for the arrival of kiwi. One resident mentioned he was “absolutely” excited about kiwi moving into Upper Hutt. In another survey, a resident mentioned that there is lots of excitement in his neighborhood for the arrival of kiwi as well. In our key informant interviews, all interviewees expressed excitement for the expansion of kiwi into Upper Hutt. Remutaka Conservation Trust members were especially excited since their efforts in initializing the kiwi population in the Hutt Valley region had finally come to fruition in Upper Hutt.

Excitement for kiwi moving into Upper Hutt was high in our online survey as well. When residents were asked to rank how excited they are for the arrival of kiwi into Upper Hutt, the average response was a 6.6 out of 7. There were also common reasons for residents’ excitement for kiwi arrival. When online survey respondents were asked to select what they anticipate when kiwi arrive at Upper Hutt, 84% of them selected kiwi acting as a sign of environmental well-being/reversal of decline (Figure 33). One respondent mentioned the kiwi arrival as an “opportunity to share with my grandchildren what I experienced as a child,” suggesting that the kiwi symbolizes the revitalization of the ecosystem.

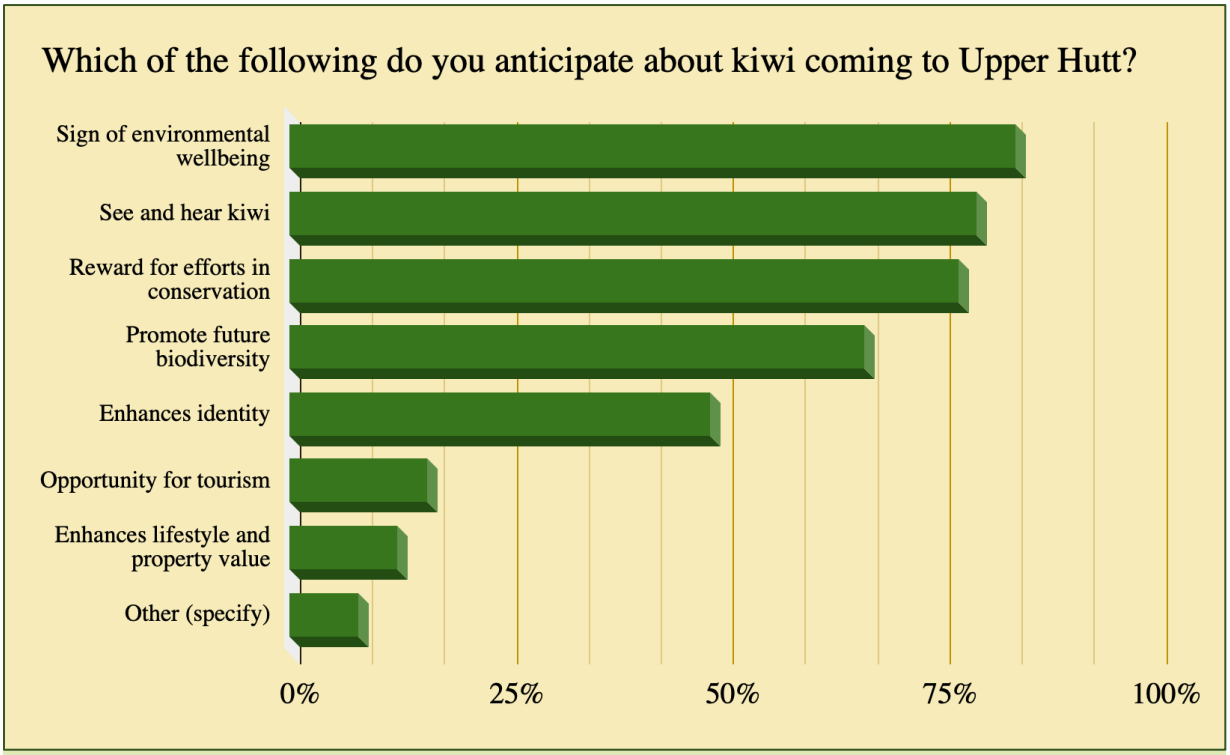


Figure 33: Qualtrics question asking, "Which of the following do you anticipate about kiwi coming to Upper Hutt?"

Finding 2: Upper Hutt Landowners Will Allow Access to Their Land for Conservation

We found that Upper Hutt residents living in rural areas are willing to help protect kiwi on their land and allow access for kiwi conservation. We filtered our survey results to isolate respondents strictly from Whiteman's Valley, Blue Mountains, Mangaroa, and Pinehaven, since these are areas we expect the kiwi to migrate to first. When asking respondents to select which actions they would be willing to take to help protect the kiwi, we found that 73% of 45 total respondents from the four rural areas would be willing to allow access to their land for conservation, monitoring, etc. (Figure 34). We also found that 69% would provide kiwi habitat on their land. There were also positive responses from individuals in our in-person surveys. One resident, Scott Nicholls from Whiteman's Valley, expressed interest in allowing acoustic recordings on his property to aid kiwi tracking. He also mentioned that many other people in the area are excited for the arrival of kiwi and would help track them.

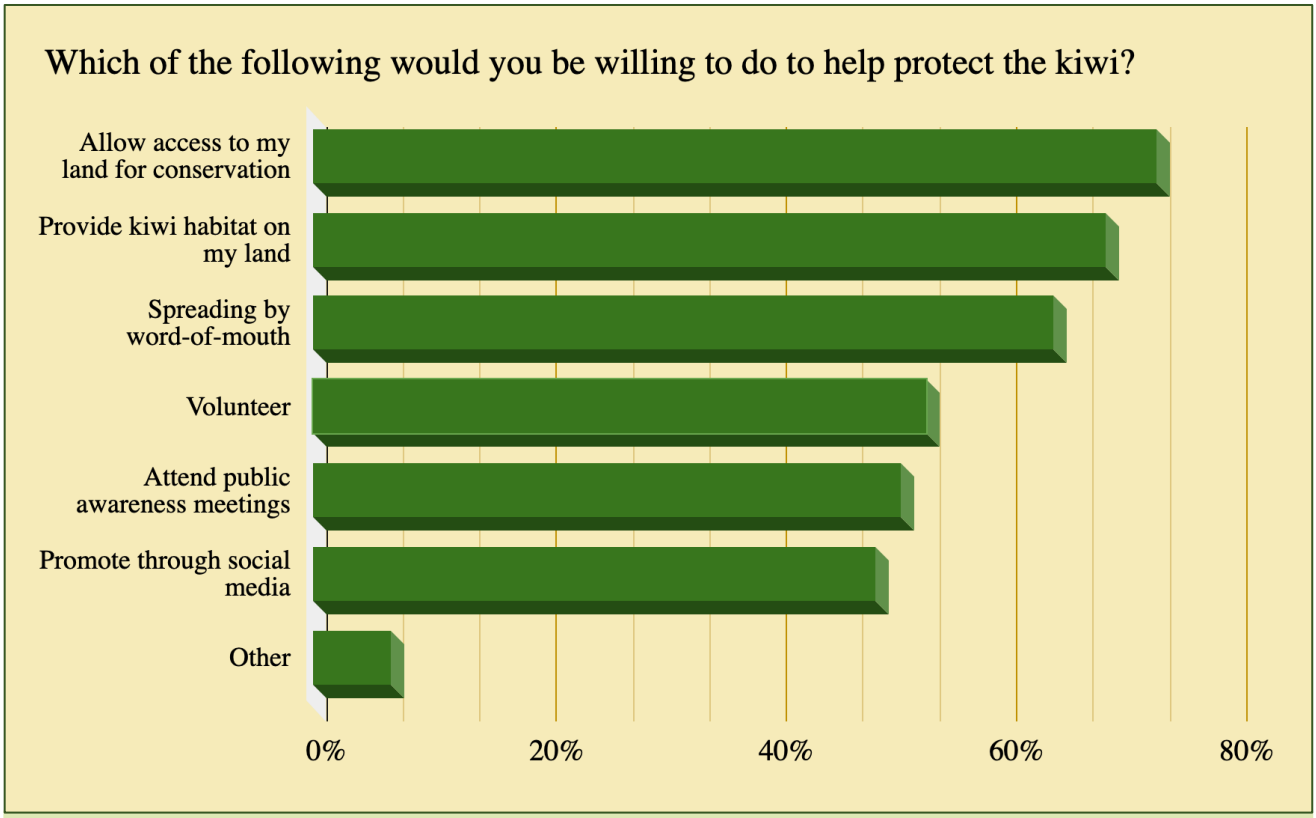


Figure 34: Qualtrics question asking "Which of the following would you be willing to do to help protect the kiwi?"

Finding 3: Residents of Upper Hutt Support Guidelines in Kiwi Areas

We found that residents of Upper Hutt are very supportive of proposed guidelines in kiwi hot spots. In the online survey, each of the proposed guidelines had support from over 50% of the respondents. We proposed seven different guidelines (Figure 35), with the most popular being, “added road signage indicating the presence of kiwi” and “public education of kiwi for residents in Upper Hutt.” An astounding 92% of respondents supported adding road signage and 91% supported public education of kiwi for residents. Results also show that 77% of respondents supported reducing the speed limits at night-time in designated kiwi habitat.

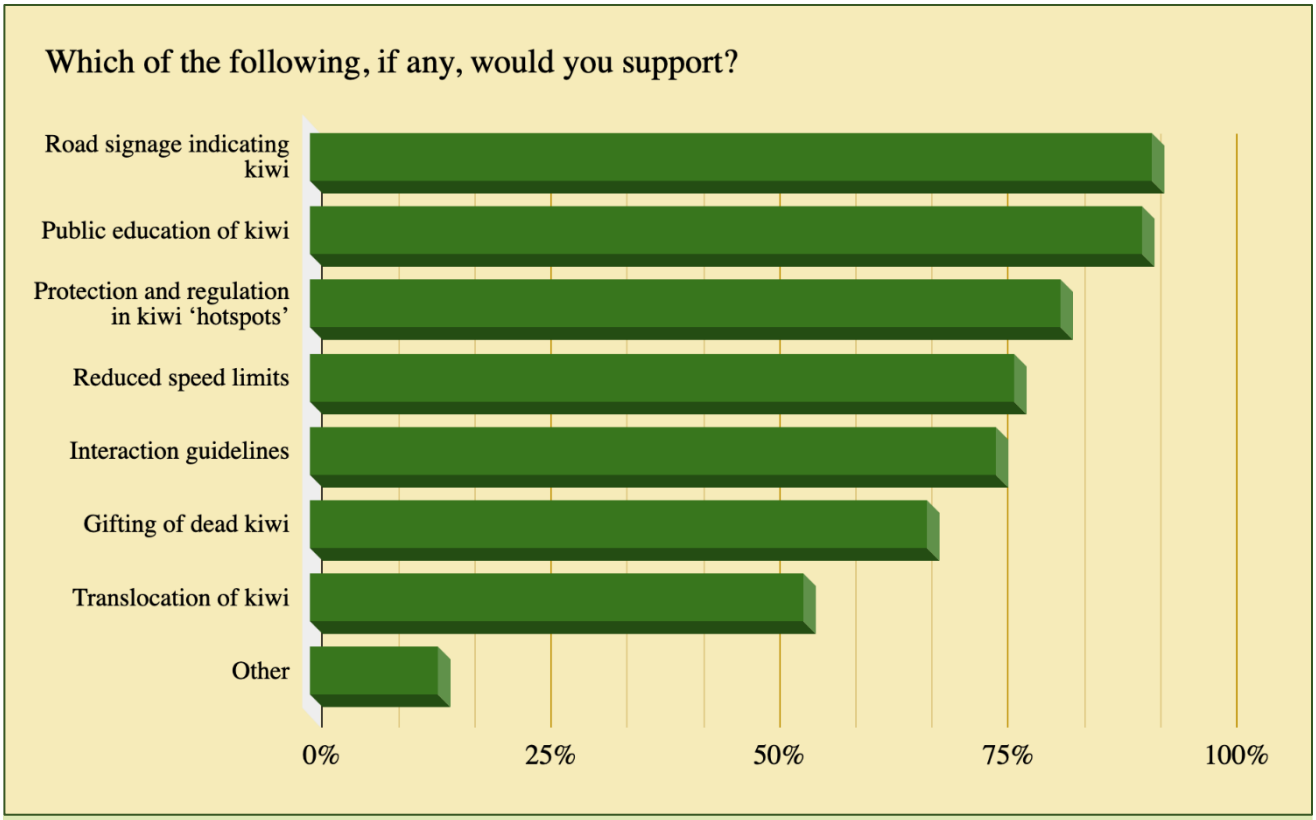


Figure 35: Qualtrics question asking "Which of the following, if any, would you support?"

There was also strong support for protection and regulation in areas that may become kiwi hotspots. Eighty-two percent of the respondents supported adding protection and regulations in these areas, showing that people support the idea of protecting kiwi habitat. Similarly, 75% of respondents supported implementing regulations over how to interact with kiwi that enter private property. A key informant interviewee from RCT emphasized the need for interaction rules, stating that there is an issue of kiwi being disturbed by humans since people might want to handle the kiwi.

We found that 91% of respondents support public education of kiwi for residents in Upper Hutt as well. A key informant interviewee from RCT emphasized that giving the public information about how to protect kiwi will be key to their survival. Support for public education is important because it shows that people care about the safety of the kiwi and are interested in learning more about them.

Finding 4: Upper Hutt Residents are Responsible Dog Owners

We found most Upper Hutt residents are responsible dog owners. This is shown in our survey results, where we saw that most dog owners in Upper Hutt are already doing what would be potentially implemented as kiwi safety measures. From our survey, 80% of dog owners reported that they keep dogs indoors at night (Figure 36). Those who do keep their dogs outside keep them controlled in one way or another, with other responses including 4% keeping their dogs outdoors on lead and 12% keeping their dogs outdoors in kennel or fenced in areas. Most hunting dog owners are also responsible, since 64% of hunters reported that their dog has already participated in KAT.

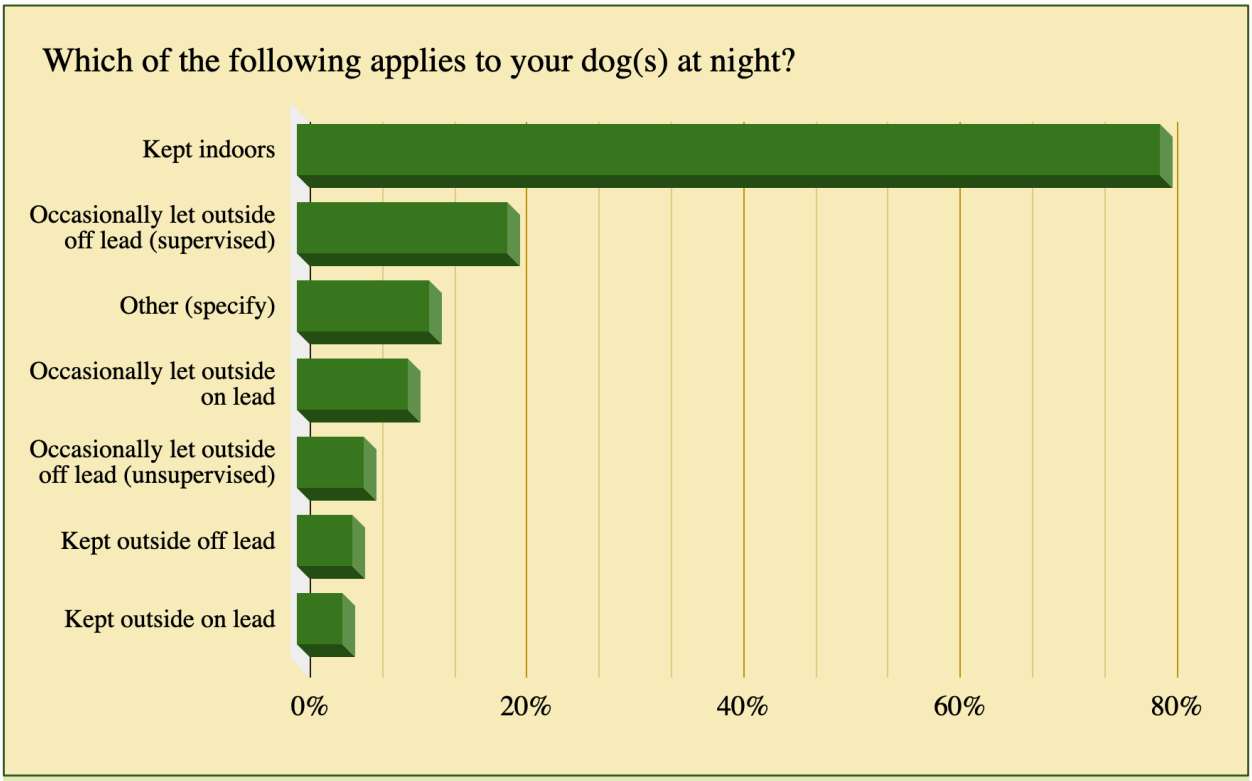


Figure 36: Qualtrics question asking "Which of the following applies to your dog(s) at night?"

Despite kiwi being active at night, it was still important to make sure that they would be safe in their burrows during the day. When asked, "Which of the following do you use with your dog(s) at home?", responses showed that 81% of dog owners use a fenced-in area for their dogs when letting them outside at home (Figure 37). Responses also showed that 26% of dog owners still use a lead when letting them outside on private property. When asked "Which of the following do you use with your dog(s) when in public?", responses showed that 94% of dog owners use a lead for their dogs when taking them into public areas (Figure 38).

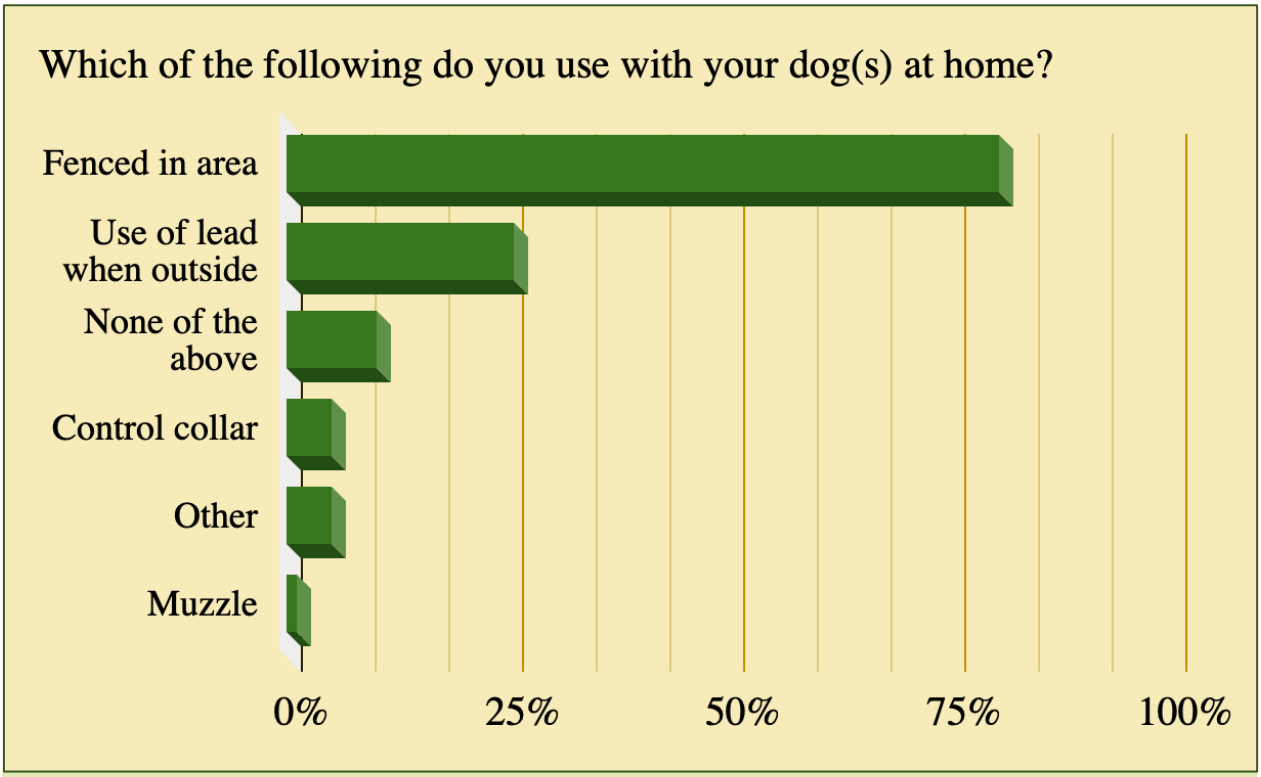


Figure 37: Qualtrics question asking "Which of the following do you use with your dog(s) at home?"

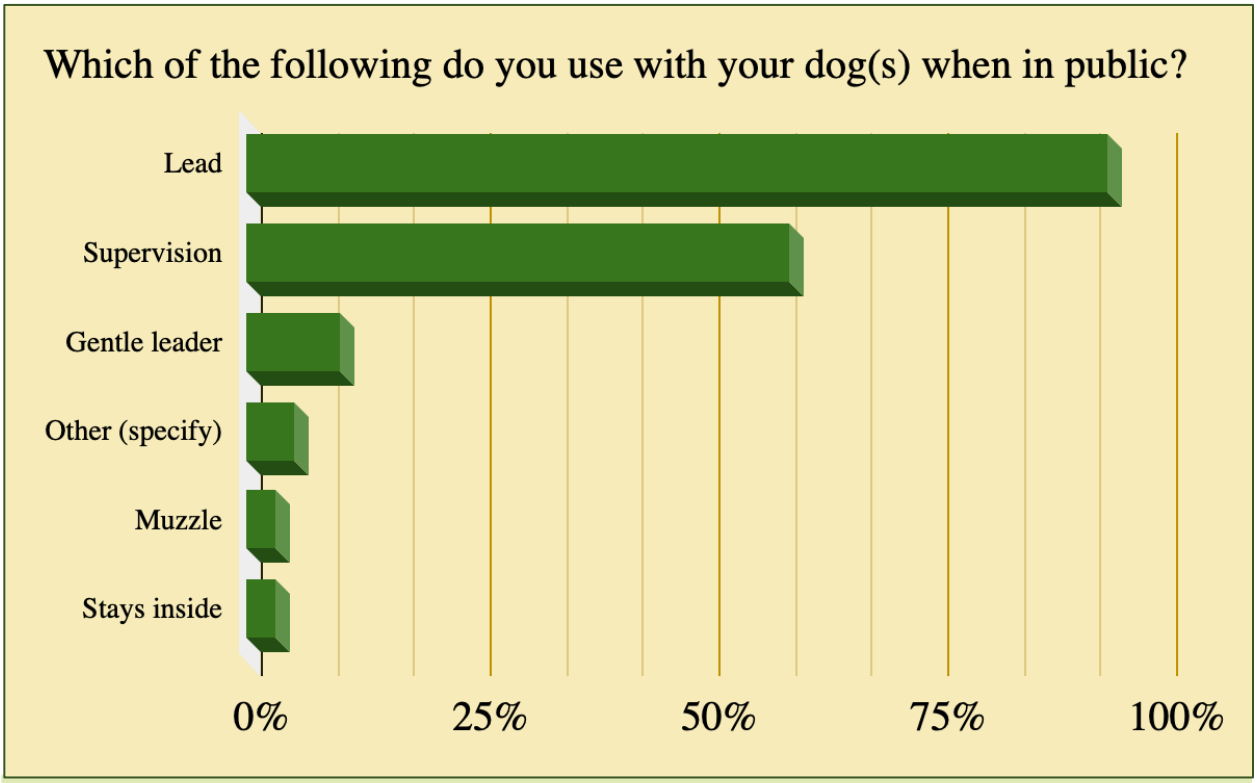


Figure 38: Qualtrics question asking "Which of the following do you use with your dog(s) when in public?"

Finding 5: KAT is Largely Communicated through Word-of-mouth

We found that the most common way people hear about KAT is through word-of mouth. Figure 39 shows the response distribution when survey respondents who have heard of kiwi aversion training were asked the question, “Where have you heard about it?” (Figure 39).

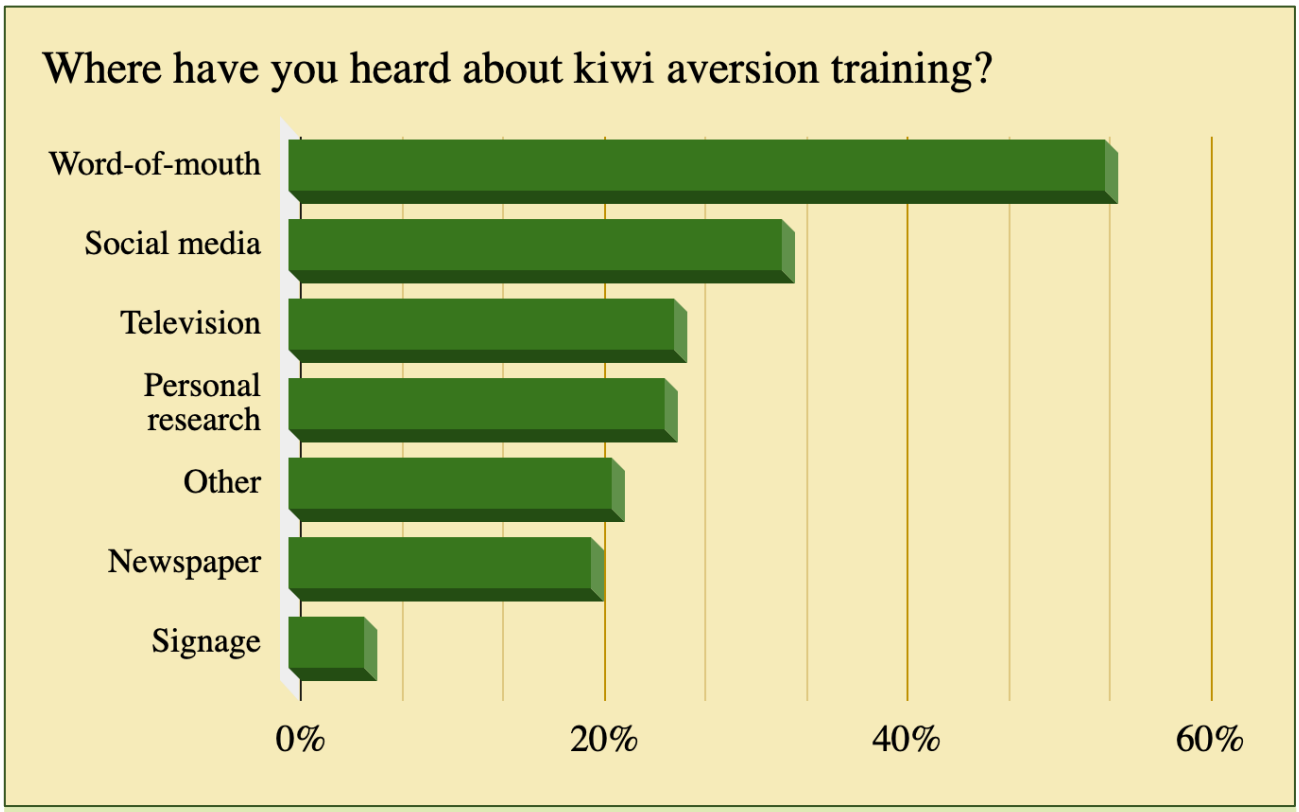


Figure 39: Qualtrics question asking "Where have you heard about kiwi aversion training?"

It showed that 54% of respondents who knew about KAT heard about it through word-of-mouth. However, 33% heard of KAT through social media. One key informant who helps in Predator Free 2050 efforts through coordinating trapping in Whiteman’s Valley, stated that, “people here have a sense of community.” Within this community, word-of-mouth remains an important source of shared information.

We also looked into the demographic of those who have not heard of KAT, which was 30% of respondents. We filtered our survey results to analyze those who were unaware of the training and were able to see where this group gets their information from. A comparison was drawn through filtered results to the question, “Where have you learned about kiwi?” that was asked earlier in the survey. Figure 40 showed that 57% of this group get their information from social media while only

35% get their information through word-of-mouth (Figure 40). With the highest number of people who are unaware of KAT reporting that they get most of their information through social media, this shows that there is the possibility for more social media development and advertisement to reach this demographic.

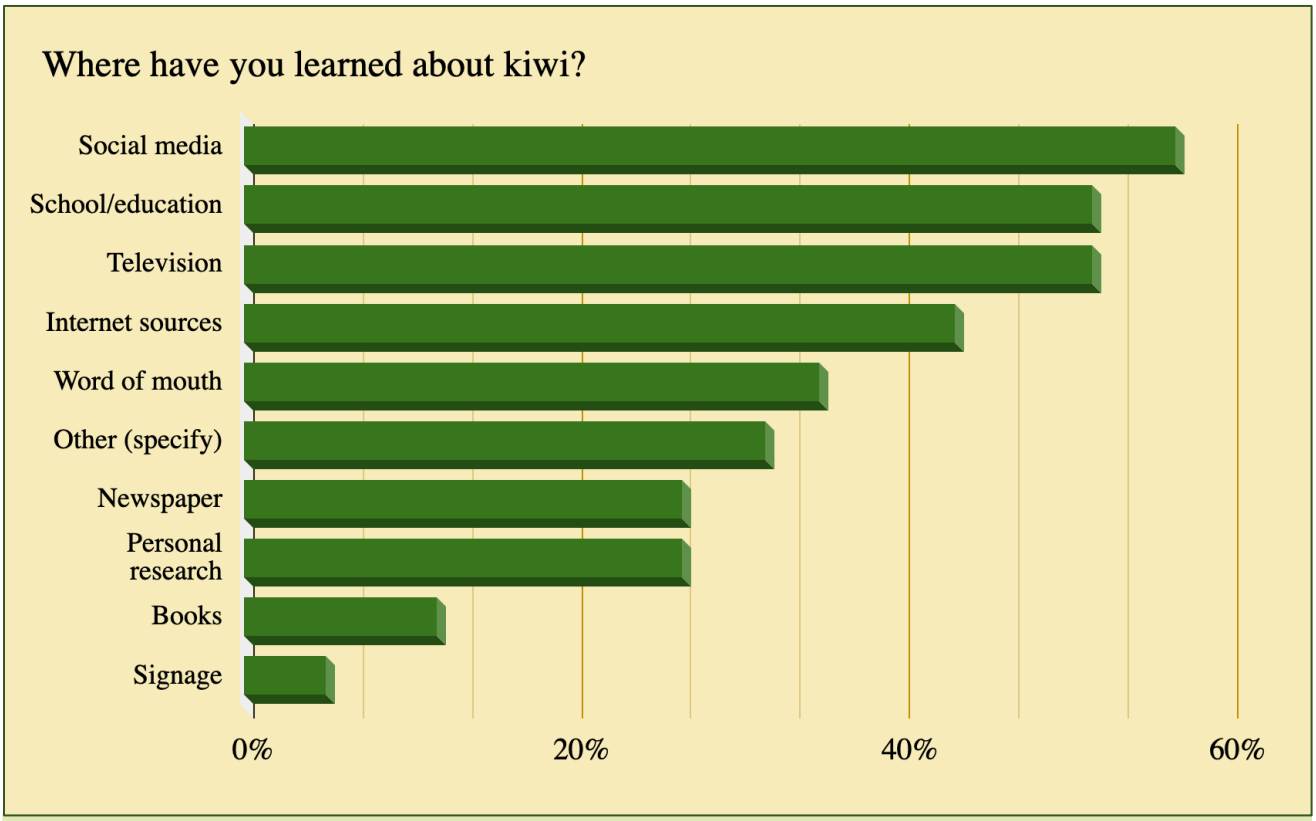


Figure 40: Qualtrics question asking "Where have you learned about kiwi?"

Finding 6: Upper Hutt Residents Support Safety Measures for Dogs

We found that residents across areas in Upper Hutt supported certain dog guidelines to protect the kiwi (Figure 41). Out of 202 respondents, 49% of them were dog owners, who would be affected by the proposed regulations. We asked in our survey, “What additional dog regulations, if any, would you support to protect kiwi?” The highest supported regulation at 89% was “Keeping your dogs on a lead if in an area close to kiwi.”. The next supported regulation at 85% of respondents was “Making parks ‘lead only’ if they are in an area close to kiwi.” We also had the phrase “sensible regulations” brought up many times during our in-person interviews, with one individual mentioned they’d be in support of any regulations “as long as they are sensible.”

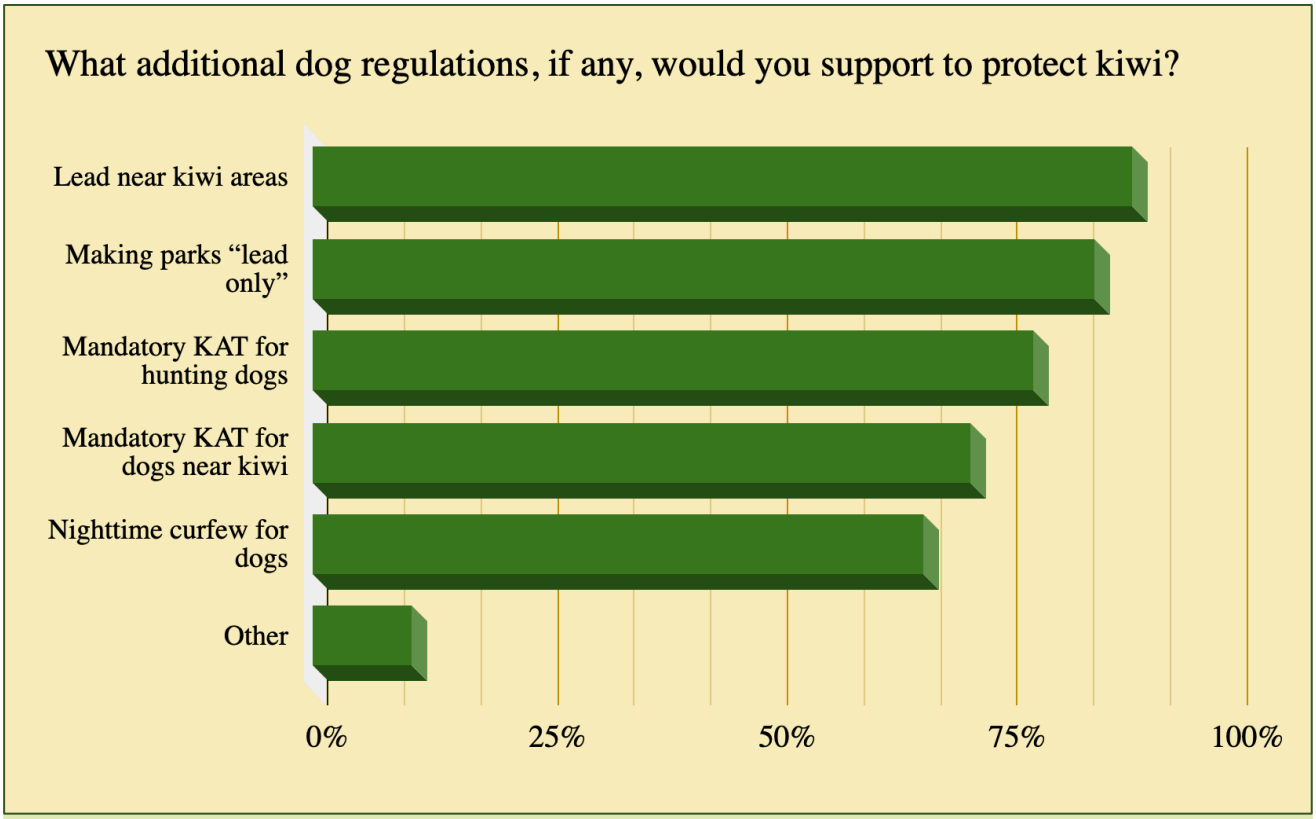


Figure 41: Qualtrics question asking, "What additional dog regulations, if any, would you support to protect kiwi?"

The survey showed that only 28% of respondents have put their dog through the training. However, when asked if dog owners would be willing to put their dogs through KAT, on a scale from 1 to 7, the average respondence was 4.9. Respondents also supported two proposed regulations surrounding KAT. The regulation "Mandatory or incentivized KAT for hunting dogs" was supported by 78%. While slightly lower, the regulation "Mandatory or incentivized KAT for dogs living close to areas where kiwis are expected to migrate to" was supported by 72%.

Finding 7: KAT Procedures Vary Between Trainers

We found that training procedures vary greatly among KAT trainers across New Zealand. According to Willy Marsh, trainers in northern regions of the North Island overutilize electric shock during KAT. He mentioned that when dog owners come to his sessions for retraining, their dog may be traumatized because of the electric collar. The dogs shudder and yelp at his sessions, showing extreme fear of the electric collar. There is meant to be a negative stimulus created when the dogs absorb the kiwi scent in their nose (Figure 42). A small vibration is enough to register the stimulus

Figure 42: Dog sniffing kiwi scent in KAT.

after the scent is established. However, certain kiwi aversion trainers are using a shock so strong that the dog develops a fear of the electric shock collar instead of the kiwi.

Willy Marsh also explained that other trainers acquire their knowledge through theoretic abstraction rather than from working with dogs in the field. "[These trainers] compensate for not knowing how dogs think by using this [an electric shock collar]." Willy Marsh's experience has all been from training different dogs for various purposes such as hunting and farming. "There's info from the field that you don't get otherwise."

Many people assume that KAT is only done with electric shock collars and are reluctant to put their dogs through it. However, people aren't as aware of the milder approach that Willy Marsh uses during his training. During our in-person surveys, we explained the milder procedure that Willy Marsh has reassessed multiple times. When they were reassured that there are more ethical ways of training, they were more open to putting their dog through KAT.

Finding 8: There is a Disconnect Between Conservation Organizations and Local Iwi

In general, we found that conservation organizations often have a disconnect with local iwi due to contrasting viewpoints on conservation. For example, the Māori conservationist stated that many of the conservation groups have this "idea of preservation as a 'lock it up and leave it be' strategy, whereas Māori believe that we are a part of nature and nature is a part of us." Since the Māori want to coexist with wildlife instead of fencing it off to protect it, the Māori don't always agree with the way typical conservation groups attempt to protect New Zealand's wildlife.

We asked the interviewees, "How do local iwi feel about kiwi moving into these areas?" We wanted to get a bigger picture on the perspectives local iwi had on kiwi migration into Upper Hutt. One of the Māori interviewees explained that the iwi are still working through their priorities, and at this time it may or may not be kiwi. It was important for us to get this perspective to learn that the local iwi might not have the time or capability to be involved in kiwi conservation efforts.

Finding 9: Upper Hutt Residents Voiced Concerns Over Domestic and Feral Cats

There are Upper Hutt residents that support feral cat trapping and domestic cat regulations. Since dogs are the primary concern to kiwi, our survey did not ask about regulations for cats. Many interviewees brought up cats and stated that there should be regulations for them since there are currently none across New Zealand. One respondent stated that they support, “Encouraging cat owners to play their part and keep them inside at night.” Another respondent suggested that cat registration be mandated by the city council.

Similarly, in our survey many people brought up feral cats in the short answer portions. When asked the question, “Would you be willing to do any of the following to help protect kiwi,” one respondent answered in the “other” category with “shoot cats (if it was legal).” Another respondent expressed a similar view, stating “Happy to comply as my dog wouldn’t even chase a chook. On the other hand I have a cat, he could be a problem.” There was also support for trapping feral cats within our survey with one respondent suggesting that cat traps were necessary.

CHAPTER 5.
OUR KIWI SAFETY PLAN: RECOMENDATIONS FOR UPPER HUTT

The overall purpose of our project was to develop a Kiwi Safety Plan that can be deployed and used for Upper Hutt. This plan includes many recommendations that are focused towards the residents of Upper Hutt as well as specific groups of people including Pest Free Upper Hutt, Upper Hutt City Council, dog owners, and more. Table 1 summarizes our plan, the following paragraphs covered these action items in more detail.

Group to Implement	Kiwi Safety Plan Action Items
Upper Hutt Residents	1. Enroll dogs in KAT. 2. Practice responsible dog ownership. 3. Aid in predator trapping efforts on property. 4. Volunteer with conservation organizations.
Pest Free Upper Hutt	1. Increase the availability of KAT. 2. Create a uniform, more mild KAT procedure. 3. Increase the presence of their conservation efforts on social media. 4. Host informational sessions to help residents get involved in conservation efforts. 5. Conduct feral cat trapping. 6. Host educational programs at Upper Hutt schools. 7. Create a shared system of communication for conservation organizations. 8. Publicize kiwi hot spots through local announcements and social media.
Upper Hutt City Council	1. Make Upper Hutt parks in kiwi habitat “lead only”. 2. Mandate KAT for dogs trained to hunt and recommend for all other dogs. 3. Implement regulations for cats. 4. Implement road signs near kiwi habitat. 5. Place kiwi informational guides in public places.

Table 1: Summary of action items for Kiwi Safety Plan.

Action Items for Upper Hutt Residents:

Figure 43: A dog participating in KAT.

Enroll Dogs in KAT

Residents should put their dogs through KAT since this is the most effective way of lowering the threat of dogs to kiwi (Figure 43). This is especially important for residents near the bush in more rural areas like Whiteman's Valley, Pinehaven, Mangaroa, and the Blue Mountains as these areas will be closest to kiwi habitat. KAT will also be pivotal for hunting dogs since these dogs spend more time in the bush and will be more likely to come across kiwi.

Responsible Dog Ownership

Residents should practice responsible dog ownership to help keep kiwi safe. They should keep their dogs inside at night if they live near kiwi hot spots and keep their dogs on a lead when walking in the bush. This will be most applicable for dog owners in the more rural suburbs. With kiwi being most active at night, making sure dogs are inside or at least supervised if outside will be important in better protecting the kiwi. If dog owners must leave dogs outside, ensuring they are on a lead or in a fenced-off area will also bring better protection.

Aid in Trapping Efforts

Residents should aid in predator trapping efforts to ensure kiwi are safe in Upper Hutt (Figure 44). The more people that set up traps in their backyards, the greater chance of eradicating invasive predators that could harm the kiwi. Even smaller scale trapping done individually can play a big role in helping to make Upper Hutt a safe place for kiwi. Residents could also get involved in larger scale trapping volunteering with Pest Free Upper Hutt if they wish to do even more to help the kiwi.

Figure 44: Residents resetting a trap.

Volunteer with Conservation Organizations

Residents of Upper Hutt should volunteer with conservation organizations to help aid kiwi protection efforts. The conservation organizations are limited by how much they can do because they are mostly composed of volunteers. Therefore, the more help these organizations have, the bigger impact they can make on kiwi safety. Residents could assist with trapping in Upper Hutt through these conservation groups and help eradicate threats to kiwi.

Action Items for Pest Free Upper Hutt:

Increase the Availability of KAT

Figure 45: Props used in KAT.

Pest Free Upper Hutt (PFUH) should work with trainers to increase the frequency and accessibility of KAT (Figure 45). PFUH should sponsor at least two KAT events each month in Upper Hutt parks like Moehau Park or Trentham Park. Frequent sessions in accessible locations for residents will increase participation of KAT.

PFUH should also work alongside dog trainers like the Upper Hutt Dog Training Club to create combined dog obedience classes and KAT. Hosting kiwi aversion trainings in collaboration with these clubs would bring in a larger audience and consolidate training into one place, making dog owners more likely to get their dogs kiwi aversion trained.

Create a Uniform, More Mild KAT Training Procedure

PFUH should work with trainers like Willy Marsh to come up with a training procedure that can be used among all trainers in Upper Hutt. This program should prioritize the use of vibration instead of electric shock. This will ensure that KAT is done ethically and effectively, enabling more dog owners to feel positive about KAT. Eventually, these programs can be expanded further with the help of other conservation organizations outside of Upper Hutt to help make a common procedure in New Zealand.

Increase Social Media Use

Previously, PFUH has not had high visibility in social media. Increasing the social media use to promote PFUH conservation efforts will help reach a larger audience. PFUH should utilize various social media platforms such as Facebook, Instagram, and LinkedIn to reach as many different demographics as possible. They should post fun infographics and visuals, teaching people about their initiatives and how to get involved. They should also make a "meet the team" post, introducing the head coordinators in the organization and their responsibilities. This would allow people to make a connection with the organization and have specific contacts in their region to reach out to if they want to be involved. They could also post informational videos detailing how they interpret acoustic recorders, explaining the migration of the kiwi, and general kiwi facts to educate the public. This could boost interest in the public and encourage people to get involved.

PFUH can also use social media to promote general information about KAT and when training sessions occur. These social media posts could be visual-oriented to give people an idea of what KAT looks like. They can also frequently post about upcoming KAT sessions and how to sign up for them. Since most people have been hearing about KAT through word-of-mouth, increasing the advertisement on social media will help reach a new demographic of people.

Host Informational Sessions

Community information sessions are great ways to get more people involved in conservation work. These sessions can talk about what PFUH has done and how residents can be involved. Hosting specific sessions about trapping would also be beneficial. These sessions would teach residents the benefit of trapping, what pests to target, and how to trap them. Then they can further explain ways to help with trapping outside of their own property, such as assisting with traplines. The organizations should also educate people on how to conduct trapping on their own properties. If people want to get involved in trapping but don't know how, educational materials on how to get started with trapping could help people get involved in conservation. These informational materials could be video tutorials on how to set up traps and information most effectively on the best type of traps to purchase. This could help boost interest in trapping as well, and it could encourage people who may have not thought about trapping before to get involved to save the kiwi.

The conservation organizations should also hold educational sessions in public places such as schools, town hall meetings, or public forums. These sessions should include information on how to

get involved in trapping but also general information on kiwi. Conservation organizations should inform the public about kiwi moving into Upper Hutt and teach them what they can do to help keep kiwi safe. They should explain volunteer opportunities within the organization and how the public can get involved in conservation efforts. This will help organizations gain volunteers by boosting the awareness of the public.

Trap Feral Cats

PFUH can implement trapping of feral cats in areas of kiwi habitat. Since these cats are becoming a larger concern regarding adult kiwi, reducing this threat to kiwi will be beneficial.

Host Educational Programs

PFUH should host educational programs at schools in Upper Hutt to inform students about kiwi, the threats to them, and how they can help keep them safe. These sessions could help inform youth that kiwi are coming to Upper Hutt and what this means for them. This will help raise awareness and excitement regarding the migration of the kiwi population into Upper Hutt. The sessions can also include explanations on how they listen to the acoustic recordings. A potential example of this educational session could include a public meeting at the library where experts can talk to residents about kiwi and how to keep them safe.

Create a System of Communication for Conservation Organizations

As kiwi presence in the North Island begins to expand, it is important for organizations affecting kiwi conservation to collaborate for maximum efficiency. When organizations possess similar goals but don’t collaborate, it can lead to overlapping data. Repeated data of other organizations wastes time and effort. To prevent this from occurring, a shared database across all organizations should be created. A database could be as simple as a Google Drive where weekly updates from each organization can be added. There could also be a forum where each organization can post about their activity. Organizations responsible for the relocation of kiwi could benefit from the knowledge of where successful trapping has been. Similarly, organizations that locate the kiwi through acoustic recorders could provide useful data for kiwi relocation.

Publicize kiwi hot spots through local announcements and social media.

Kiwi hot spots need to be continuously updated as the kiwi migrate further into Upper Hutt. As the kiwi are tracked using acoustic recorders, the expansion information should be publicized on social media and through local news sources. This way, residents will know which areas to be cautious of when walking their dogs or driving.

Action Items for Upper Hutt City Council and Regional Council:

Make Upper Hutt Parks in Kiwi Habitat "Lead Only"

The council should look into making parks that include kiwi habitat "lead only" parks. This would be only for parks that currently have kiwi habitat and could be re-evaluated yearly to determine whether kiwi have moved into the parks. Currently, none of the Upper Hutt parks fall into this category but it will be an important strategy once the kiwi move further into Upper Hutt.

Mandate KAT for Dogs Trained to Hunt and Recommend for All Other Dogs

With hunting dogs interacting in the bush more often, KAT should be mandatory for dogs that are trained to hunt. This will help ensure that dogs will not be attracted to kiwis' scent while they are hunting in the bush, bringing better protection towards kiwi. For dogs that are not hunting dogs, they should also go through KAT, especially if they are ever in areas near kiwi habitat.

Implement Regulations for Cats in Upper Hutt

The council should create a registration requirement for domestic cats. This would encourage cat owners to take more responsibility for their cats and help identify cats that are problematic. Registration of cats would also allow for easier identification of population numbers.

Place Road Signs Near Kiwi Habitat

Figure 46: Kiwi road sign in Lower Hutt.

With kiwi more likely to appear across the Whiteman's valley region, it is important for people to know where kiwi hotspots are located and what to do if they see a kiwi. Road signs should be placed in locations near kiwi habitat to help reduce the threat that motor vehicles pose to kiwi (Figure 46). These road signs would indicate a kiwi crossing area in a range of meters or kilometers. If residents are informed of kiwi presence via road signage, they will be more inclined to slow down in kiwi areas and be on the lookout. These signs should be placed along any public road that goes into declared kiwi habitat.

Create Kiwi Informational Guides

Kiwi informational guides will help spread more awareness about kiwi. These informational guides can include the history of the bird and reintroduction process to the region. It could mention how the kiwi flourished in the North Island until the invasive predatorial species reduced the kiwi population vastly. Then it could elaborate on the extensive efforts the conservation organizations have accomplished to reintroduce the kiwi and grow its population. After providing context, it could mention the threats to kiwi and the trapping that can be done to remove those threats. Then it could mention PFUH's efforts to reduce the pests across Upper Hutt. Lastly, the guide could provide information on what to do when a kiwi has been spotted. This could include urging residents to keep their dogs away from that area, to not make direct contact with the bird, and to inform an organization that a kiwi has been spotted for data.

Conclusions

Our Kiwi Safety Plan in Upper Hutt will allow kiwi and people to coexist in harmony. As kiwi are migrating into more urban areas, they will need the support of the public to help them survive. With the involvement of the public to help make their town a safe place for kiwi, the people of Upper Hutt can be a model for other regions living alongside endangered species. By making the survival of kiwi a priority, the people of Upper Hutt will emphasize the importance of ecosystems and native species to the well-being of our nations.

Upper Hutt is a very interconnected community with a combined passion for the environment and native wildlife. Residents of Upper Hutt feel deeply about the health of the ecosystem and see the reemergence of the kiwi as a symbol of environmental well-being. They are very willing to take protective measures to protect these iconic birds because of what they represent for New Zealand (Figure 47).

Figure 47: The team with Rimu the kiwi.

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Appendix A: Online Survey Questions

Informed Consent Agreement for Participation in a Research Study

Kiwi Protection in Upper Hutt

Investigators and contact information:

Kiwi Protection Team (gr-NZ-24-Kiwis@wpi.edu)

- Will Brownell (wjbrownell@wpi.edu)
- Seth Frank (sbfrank@wpi.edu)
- Domenic Sena (drsena@wpi.edu)
- Paige Sommers (pesommers@wpi.edu)

Purpose: The purpose of this study is to understand the threats to kiwi in the Upper Hutt area and to propose steps to protect them in the area. This survey will ask you to reflect on your experiences and knowledge of kiwi and your interest in helping protect it.

Your participation in this research is voluntary. Your responses will come to us as anonymous entries. We may have a sense about who completed it but cannot tie the data back to participants.

Any publication or presentation of the data will not identify you unless you agree to be identified.

For more information about this research, contact the investigators (email addresses are at the top of this document). You can see the final project by emailing a request the investigators (listed above) or by using keywords in the search at https://digitalcommons.wpi.edu/iqp/

Title: Welcoming Kiwi into Upper Hutt

Kia Ora!

Recently, residents in Whiteman's Valley on the border of Upper Hutt have been hearing kiwi calls at night, providing evidence that the kiwi are moving closer to Upper Hutt. Kiwi live in native forest, regenerating scrub, and in plantation forest. They sleep in burrows in the daytime and feed during the night. Their peak calling time is during the night in their mating season in May and June. The Wildlife Act 1953 protects kiwi on both conservation land and private land. However, kiwi are still very susceptible to dog attacks, and their chicks are susceptible to rat and stoat attacks. In 2006, the RCT released a small population of kiwi into the Remutaka Forest Park near Wainuiomata. Since then, the kiwi population has been steadily increasing, leading the kiwi to expand their habitat towards Upper Hutt.

We are a group of students studying at Worcester Polytechnic Institute in the United States of America. We are in Upper Hutt working with Pest Free Upper Hutt (pestfreeupperhutt@gmail.com) to help prepare residents of Upper Hutt for the arrival of kiwi. To ensure the kiwi's safety in Whiteman's Valley and Upper Hutt, we are surveying the public to gauge their interest in the kiwi's survival, and to understand the willingness of residents to take measures to help protect these unique birds.

This survey will be completely anonymous, but you're invited to leave your contact information at the end if you're interested in having a follow-up conversation with us about kiwi.

Thank you for your time, ngā mihi!

Section 1: General Information

1. Choose your age range. (circle below)

   Under 18 18-29 30-44 45-59 60-74 Over 75

2. Where do you live (specify city and suburb)?

   _____

Section 2: Kiwi Awareness

1. On a scale of 1-7, with 1 being no knowledge at all and 7 being very knowledgeable, how knowledgeable are you about kiwi? (circle below)

   1 2 3 4 5 6 7

2. On a scale of 1-7, with 1 being not interested and 7 being very interested, how interested are you in learning more about kiwi? (circle below)

   1 2 3 4 5 6 7

3. On a scale of 1-7, with 1 being not aware and 7 being very aware, how aware are you of current conservation efforts and organizations? (This includes organizations such as Pest Free Upper Hutt, Forest and Bird, Capital Kiwi, Remutaka Conservation Trust, Department of Conservation, Predator Free NZ 2050) (circle below)

   1 2 3 4 5 6 7

4. Where have you learned about kiwi? (Circle all that apply)

   Social media Newspaper Television Word of mouth Personal research

   School/education Signage Books Internet sources

   Other (specify) _____

   None of the above

5. Are you involved in volunteer conservation? If yes, how are you involved?

Section 3: Kiwi in Upper Hutt

1. Before this survey, were you aware that kiwi are moving towards Upper Hutt?
   - ❑ Yes
   - ❑ No

   If yes, how did you hear about kiwi moving towards Upper Hutt?

   _____

2. On a scale of 1-7, with 1 being very negative and 7 being very positive, how do you view kiwi coming into Upper Hutt? (circle below)

   1 2 3 4 5 6 7

3. Which of the following do you anticipate about kiwi coming to Upper Hutt?
   - ❑ Opportunity to see and hear kiwi
   - ❑ A sign of environmental wellbeing / reversal of decline
   - ❑ Will promote future biodiversity
   - ❑ Enhances our identity and self-perception
   - ❑ An opportunity for tourism
   - ❑ Enhances lifestyle and property value
   - ❑ Reward for efforts in conservation and collaboration
   - ❑ Other (specify) _____
   - ❑ If none of the above, please feel free to discuss any concerns (specify)

     _____

4. Would you support any of the following?
   - ❑ Added road signage indicating presence of kiwi
   - ❑ Reduced driver speed limits at night-time in areas where kiwi dwell
   - ❑ Regulations for approaching kiwi who enter private property
   - ❑ Gifting of dead kiwi to korowai weavers, taxidermists, etc.
   - ❑ Protection and regulation in areas that become kiwi ‘hotspots’
   - ❑ Translocation of kiwi to other parts of Upper Hutt
   - ❑ Public education of kiwi for residents in Upper Hutt
   - ❑ Other (specify) _____
   - ❑ If none of the above, please feel free to discuss any concerns (specify)

5. If you have had a kiwi encounter in Upper Hutt, please describe it here (heard, seen, found footprints or scat, acoustic recorded, night camera recorded, etc.)

Section 4: Dog Owners

1. Are you a dog owner?
   - ❑ Yes
   - ❑ No (skip to questions 8, 10 and 11)
2. How many dogs do you own? (circle below)

   1 2 3 4 or more
3. Do you use your dog(s) for hunting?
   - ❑ Yes
   - ❑ No

   If yes, what does your dog(s) hunt? (Circle all that apply)

   Possum Rats Rabbits Deer Stoat

   Other (specify) _____
4. Which of the following applies to your dog(s) at night?
   - ❑ Kept indoors
   - ❑ Occasionally let outside on lead
   - ❑ Occasionally let outside off lead (supervised)
   - ❑ Occasionally let outside off lead (unsupervised)
   - ❑ Kept outside on lead
   - ❑ Kept outside off lead
   - ❑ Other (specify) _____
5. Which of the following do you use with your dog(s) at home?
   - ❑ Use of lead when outside
   - ❑ Fenced in area
   - ❑ Control collar
   - ❑ Muzzle
   - ❑ Other (specify) _____
   - ❑ None of the above

6. Which of the following do you use with your dog(s) when in public?
    - ❑ Lead
    - ❑ Muzzle
    - ❑ Gentle leader
    - ❑ Supervision
    - ❑ Stays inside
    - ❑ Other (specify) _____
    - ❑ None of the above
7. Do you let your dog(s) off lead in any of these areas?
    - ❑ Private Property
    - ❑ Park
    - ❑ Trail
    - ❑ Beach
    - ❑ Forested area
    - ❑ Other (specify) _____
    - ❑ None of the above
8. Are you aware of kiwi aversion training for dogs?

Description: Dogs are known to be attracted to the scent of kiwi. Therefore, many dogs go through kiwi aversion training to avoid kiwi in the wild. This includes using stuffed kiwi, frozen kiwi, and kiwi feces with the use of vibration and/or electric shock that pairs the kiwi to this negative stimulus. On average, dogs are required to get recertified 1 year after the training and again 2-3 years later.

- ❑ Yes
- ❑ No

    If yes, where have you heard about it?

    - ❑ Social media
    - ❑ Newspaper
    - ❑ Television
    - ❑ Word of mouth
    - ❑ Personal research
    - ❑ Signage
    - ❑ Other (specify) _____

9. Has your dog(s) participated in kiwi aversion training?

- ❑ Yes
- ❑ No

If no, on a scale from 1-7, with 1 being not willing and 7 being very willing, how willing would you be to put your dog through kiwi aversion training to help keep kiwi safe in Upper Hutt? (circle below)

1 2 3 4 5 6 7

10. What additional dog regulations, if any, would you support to protect kiwi

- ❑ Nighttime curfew for dogs that have not had kiwi aversion training (i.e., bring dogs inside at night)
- ❑ Mandatory or incentivized kiwi aversion training for hunting dogs
- ❑ Mandatory or incentivized kiwi aversion training for dogs living close to the areas where kiwi are expected to migrate to
- ❑ Keeping your dogs on a lead if in an area close to kiwi
- ❑ Making parks "lead only" if they are in an area close to kiwi
- ❑ Other (specify) _____
- ❑ None of the above

11. What incentives would you be in support of?

- ❑ Reduced registration fees for dogs that have kiwi aversion training
- ❑ Reduced rates for landowners with land that have kiwi habitat
- ❑ Financial assistance to landowners that convert land to native bush suitable as kiwi habitat
- ❑ Other (specify) _____
- ❑ None of the above

Additional Information

1. Which of the following would you be willing to do to help protect the kiwi? (Select all that apply)
    - ❑ Volunteer in conservation efforts
    - ❑ Attend public awareness meetings
    - ❑ Raise awareness through social media
    - ❑ Allow access to my land for conservation, monitoring, etc.
    - ❑ Provide kiwi habitat on my land
    - ❑ Spreading by word of mouth
    - ❑ Other (specify) _____
    - ❑ None of the above

Section 6: Contact Information

1. Your responses to this survey are anonymous, but we invite you to provide your contact information (name, email address, and/or phone number) if you would like us to contact you for a follow-up conversation about kiwi in Upper Hutt.

2. You have reached the end of the survey. Please feel free to use this space for any questions or comments.

Appendix B: In-Person Survey Questions

Kiwi Excitement/Knowledge:

1. Were you aware that the kiwi are migrating towards Upper Hutt?
2. How do you feel about the idea of kiwi moving towards Upper Hutt? Why?
3. What types of sources do you gain information from? (social media, newspaper)
4. Are you interested in learning more about kiwi?
5. Have you ever had an encounter with kiwi before?
6. Would you be willing to take protective measures to help keep the kiwi safe? Such as: Volunteer in conservation efforts, attend public awareness meetings, raise awareness through social media, donate to conservation organizations, and allow access to my land for conservation, monitoring, etc.

Experience with Conservation Work:

1. Are you involved in any volunteer conservation work? If so, what?
2. Would you be interested in doing kiwi protection volunteering?

Regulations:

1. Would you support driving precautions such us added road signage indicating presence of kiwi or reduced driver speed limits at night-time in areas where kiwi dwell?
2. Would you support any further regulations for dogs to help protect kiwi such as implementing a nighttime curfew for dogs or keeping dogs on leads in kiwi confirmed areas?

Dog Owners:

1. Are you a dog owner?
2. Do you let your dogs out at night?
3. Does your dog hunt?
4. How often do you let your dog off its lead? Where do you let your dog off its lead?
5. Have you heard about kiwi aversion training for dogs?
    a. If yes, where have you heard about it?
6. Would you be willing to putting your dog through kiwi aversion training to help keep kiwi safe in Upper Hutt?

Dogs are known to be attracted to the scent of kiwi. Therefore, many dogs go through kiwi aversion training to avoid kiwi in the wild. This includes using stuffed kiwi, frozen kiwi, and kiwi faeces with the use of vibration that pairs the kiwi to this negative stimulus. This costs around $15. Dogs must come back after a year to get recertified and then again 2-3 years later.

Appendix C: Survey Flyer

Appendix D: Pamphlet

Appendix E: One-Page Summary of Kiwi Safety Plan

Kiwi Safety Plan for Upper Hutt

PestFreeUpperHutt@gmail.com

Action Steps for Residents

- Put dogs through kiwi aversion training, especially dogs that go in the bush often or live near kiwi habitat areas.
- Keep dogs on a lead if they are walking in the bush near kiwi habitat. Keep dogs inside at night if your property is in or near kiwi habitat. If they must be left outside at night, ensure dogs are on a lead or fenced in.
- Increase individual trapping on private properties to eliminate predators like stoats and possums.
- Get involved in volunteer opportunities with conservation organizations like Pest Free Upper Hutt.

Action Steps for Pest Free Upper Hutt

- Provide kiwi aversion training sessions in Upper Hutt and advertise these sessions to residents through social media, including working with Upper Hutt Dog Training Club.
- Work with kiwi aversion trainers like Willy Marsh to create a uniform kiwi aversion training procedure.
- Increase the social media presence of Pest Free Upper Hutt.
- Host informational sessions on kiwi and how to get involved in conservation efforts, including specific sessions on getting started with trapping.
- Hold educational sessions at nearby schools to educate students about kiwi.
- Declare areas as kiwi habitat through local announcements and social media.
- Trap feral cats.
- Create a system of communication for conservation organizations.

Action Steps for City Council and Regional Council

- Add road signage indicating the presence of kiwi in applicable areas.
- Make Upper Hutt parks “lead only” for ones that are near kiwi habitat.
- Create a requirement for dogs trained to hunt to go through kiwi aversion training.
- Place informational guides about kiwi and how to keep them safe in common areas like parks.
- Implement registration for domestic cats.

Designed by Worcester Polytechnic Institute students:
William Brownell, Seth Frank, Domenic Sena, Paige Sommers

Appendix F: Social Media Material

Kiwi Aversion Training

- Use of vibration collars to create a negative association to kiwi (electric shock only used if necessary)
- Involves scent, sight, and sound with kiwi props to teach the dog to think for itself
- 15-minute sessions with a year-long certificate
- Effective and safe for your dog

To schedule a session, email PestFreeUpperHutt@gmail.com

Appendix G: Links to Media

- Promotional Video: https://youtu.be/YFKQLdFlRRs
- Newspaper Article: https://www.thepost.co.nz/nz-news/350178992/kiwi-are-now-calling-upper-hutt-home
- *TheHuttZone* Radio Broadcast: download.accessradio.org/StationFolder/war/20240222 Hutt Zone.mp3
- Upper Hutt City Council video post: https://www.upperhuttcity.com/News/Kiwi-making-an-appearance-in-Upper-Hutt