The Role of Wetlands in the Ruamahanga Catchment

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Abstract

A majority of the wetlands in the Ruamahanga catchment are degraded from efforts to control flooding and create farmland. We collected perceptions of wetlands to the Wairarapa community from key stakeholders. We found strong connections to the wetlands and a wish for the same opportunities for generations to come. We also found that wetland restoration suffers from a lack of collaboration and incentives between community groups. We propose opportunities for collaboration, increasing education, and expanding incentives for restoration.

Executive Summary

Introduction and Background

The Ruamahanga catchment, including Wairarapa Moana, is now home to approximately 40,000 New Zealanders including farmers, fishers, business owners, and other rural and urban residents (Barlow, 2018; Schrader, 2020). Since European settlement, 97% of the wetlands in the Wairarapa Moana region have been eradicated as a part of the Lower Wairarapa Valley Development Scheme, in an effort to control flooding and create farmland (Fuller, 2019; R. Smith, personal communication, 2020). As shown below in Figure E-1, the majority of the remaining wetlands are concentrated in Wairarapa Moana. To facilitate wetland restoration, our team assessed the perceptions of the economic, environmental, cultural, and social importance of wetlands to the Wairarapa community.

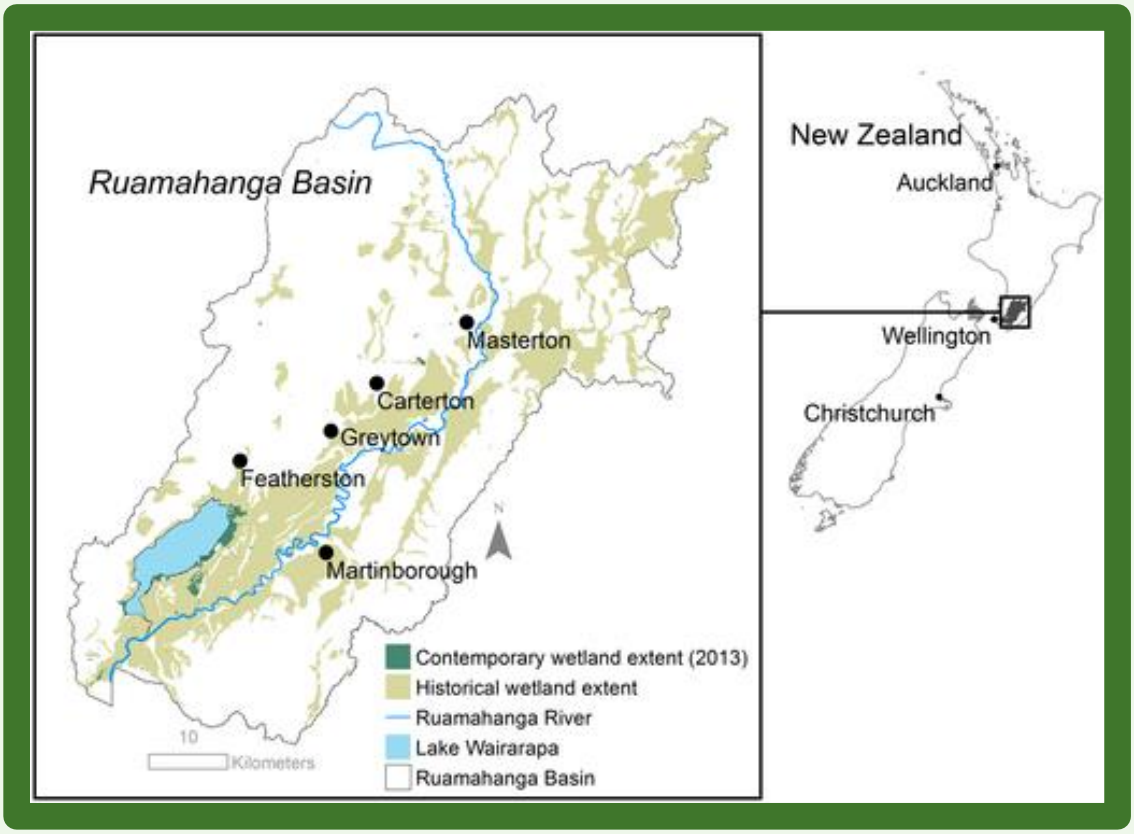

Figure E-1. "The Ruamahanga Basin" by Stephanie Tomscha et al. is licensed under CC BY 3.0.

Wetlands are integral to the ecosystem, providing water storage, coastline protection, pollution filtration, oxygen, and more. While they are understood to have an environmental significance, the wetlands within the Wairarapa Moana specifically have taonga [treasure], which can be interpreted as cultural and spiritual value, to Māori (Wetlands., 2018). This region was among the first sites settled by Māori after Kupe, a Polynesian navigator, discovered

Aotearoa [New Zealand] (A Brief History of New Zealand., n.d.). Māori communities have relied on these waterways for centuries. Prior to the arrival of European settlers, there was an abundance of native species residing in the Wairarapa Moana such as tuna [freshwater eel], kākahi [freshwater mussels], and mānuka. Māori residents also used regional plant species to make clothes, food, medicine, and dyes (Wetland Action Plan., 2003). Māori values today continue to connect all things, living and non-living, as the descendants of Papatūānuku [the Earth Mother], Ranginui [the Sky Father], and their children. They are deeply tied to the Earth and value its biodiversity in ways that are measured by interconnectivity (Māori and Biodiversity, n.d.).

Figure E-2. Wetland on Kaiwaiwai Farm (Brassel V., 2021).

Britain's colonization of New Zealand disrupted traditional practices through treaties and a narrow interpretation of the value of the land. In 1840s, the Crown and over 500 Māori chiefs signed the Treaty of Waitangi. This treaty contained three articles that were intended to make Māori feel like their rights were being respected while the Crown declared sovereignty over New Zealand. The Crown sought to gain control over Māori land through purchase, confiscation, and acquisition (Fyers, 2018). A little more than a hundred years later, the Lower Valley Development Scheme started to cut off the connection between the Ruamahanga River and Lake Wairarapa and redirected it to connect to Lake Onoke (Barlow, 2018). This disrupted the natural flooding of the wetlands. As a result, Māori residents found it harder to fish. Furthermore, land

was converted to farmland (R. Smith. Personal communication, November 2021). The landscape of the Wairarapa Moana began to change; wetlands were drained for farming, livestock, forestry, urban settlement, and roads (Wetland Action Plan., 2003). The degradation of the wetlands has been particularly difficult for Māori communities who share this landscape. In the recent decade, more members of the Ruamahanga community are recognizing the ecosystem services and economic values of wetlands.

The wetlands are currently managed through a partnership of federal and central governments with local territorial agencies with interests in various components of regional management, including but not limited to the Department of Conservation (DOC), the Greater Wellington Regional Council (GWRC) and the South Wairarapa District Council (SWDC). Together, there have been efforts to restore habitat, protect the environment, and improve the quality of wetlands along with the Ruamahanga catchment community.

Therefore, the goal of this project was to collect perceptions of the economic, environmental, cultural, and social importance of wetlands to the Ruamahanga catchment community. In order to achieve this goal, our team outlined the following objectives:

1. Document how the wetlands within the Ruamahanga catchment are currently used, managed, and defined.
2. Identify and record the Ruamahanga community's perspective on wetlands and ecosystem stewardship.
3. Understand how economic value is determined for wetlands in the Ruamahanga catchment.

Approach

For data collection, our team made observations about the ecosystem of the Ruamahanga catchment, conducted content analysis, issued surveys, and held interviews with key stakeholders including Māori, legislators, scholars, and landowners. Our team familiarized ourselves with the environmental, economic, and cultural value of wetlands through observation and content analysis. Then, the team issued a baseline survey on people's use of wetlands, perception of wetlands, and perception on current legislations. Semi-structured interviews were conducted with key stakeholders, where each stakeholder group had unique interview questions designed. The survey participant breakdown is shown in Figure E-3.

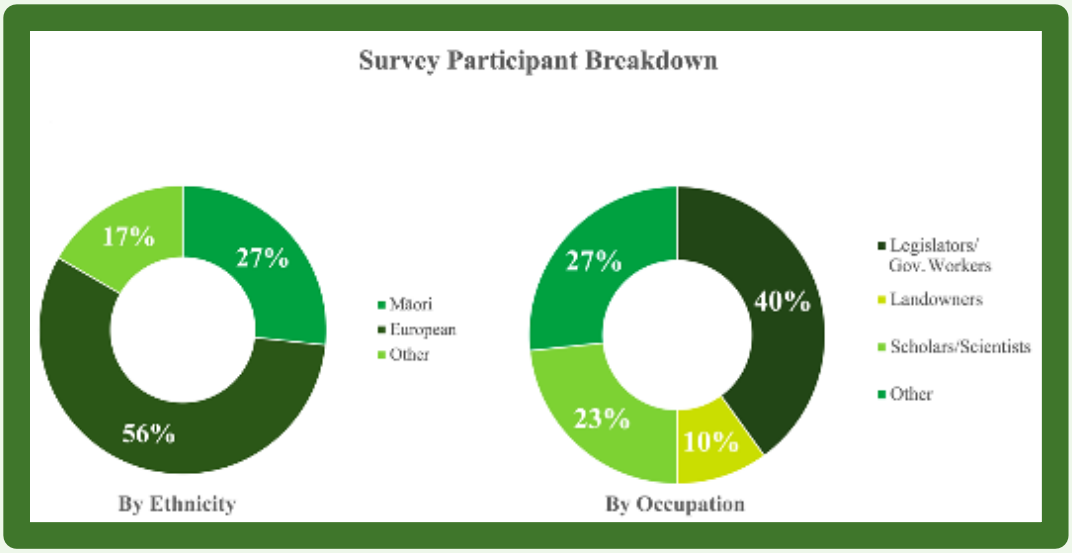

Figure E-3. Survey Participant Breakdown (n=30).

Results

Our data and analysis highlighted the following themes: a broad commitment to the land, cross-generational thinking, the impact of regulations, lack of understanding between community sectors, and need for collaboration. Most of the community members had a positive perception of wetlands with an understanding of their environmental and economic value as shown in Figures E-4 and E-5.

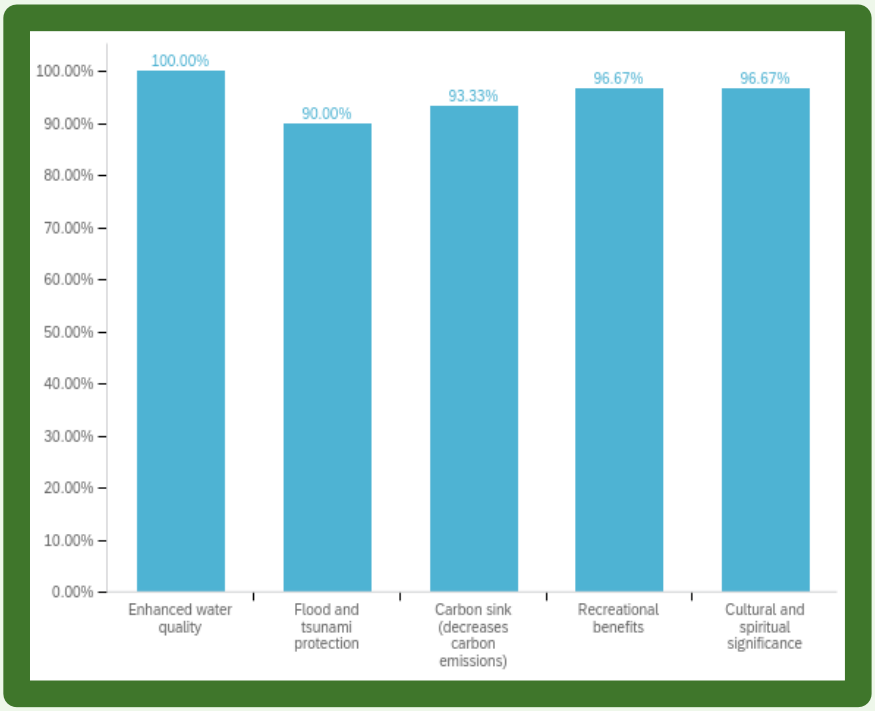

Figure E-4 Survey responses regarding previous knowledge of wetland benefits (n=30).

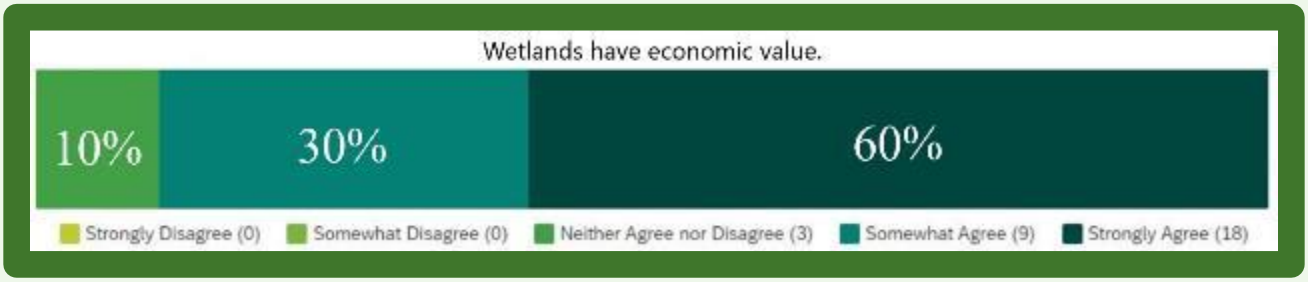

Figure E-5. Survey responses on wetland economic value (n=30).

Additionally, survey results revealed that most community members also encourage the allocation of resources towards wetland restoration as shown in Figure E-6.

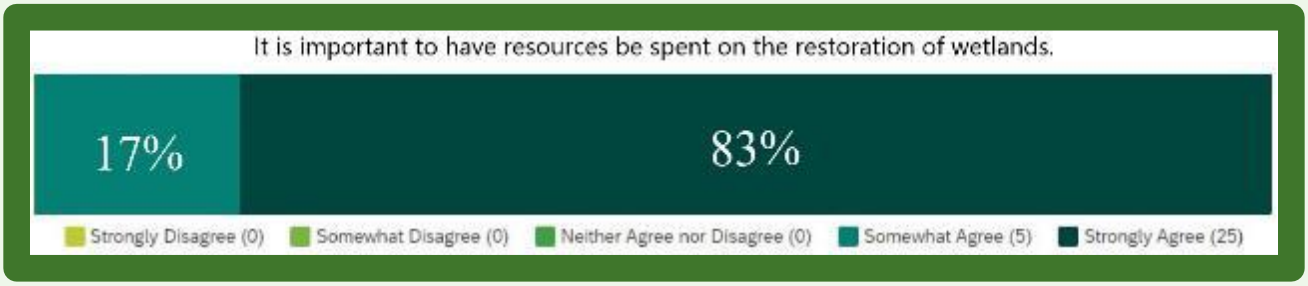

Figure E-6. Survey responses on wetland resource allocation (n=30)**.**

Although most community members support wetland restoration efforts, we became aware of the lack of progress made in wetland restoration and preservation prior to surveys and interviews. Surveys and interviews also suggested that most landowners are striving to take care of their land with sustainable farming practices. When discussing the legislations regarding wetlands, farmers and landowners identified the current legislations as limiting, hindering innovation and progress on wetland restoration. A majority of farmers interviewed also indicated that there are lack of incentives and publicization of these incentives among the farming community. Māori interviewees also reflected on how their cultural values are inconsistently represented in wetland management decision making processes.

Data collected revealed Māori have a connection to their land that “culturally, spiritually, and physically unites all the iwi, hapū, and whānau [family] of the Wairarapa." This has been negatively impacted by the degradation of wetlands. Māori people’s sense of place is tied to wetlands through their ancestors, tohi [blessing to newborns], and other traditions that “essentially root themselves in the land” (R. Smith, personal communication. 2021). The “cut-off”, or the Blundell barrage gate, for example, led to emotional turmoil by preventing tohi from taking place. Displacement, loss of access to resources, and marginalization has forced many Māori to prioritize making a living and surviving over participating in wetland restoration efforts.

Despite the hardships that Māori people have endured, many are hopeful that through education and collaboration the community can come together to help restore wetlands for future generations. Providing for future generations is a motivator for Māori and other stakeholders. One farmer who is currently running his 166-year-old family farm, explained how he wants to "provide the same opportunities to future generations", and "everything we do is based around our land and community". Interviews with farmers revealed that many community members were not aware or had limited awareness of the Māori cultural significance even though they may share similar values. Interviews also reflected on how farmers often felt vilified by other groups for not being more proactive about wetland restoration, despite the desire of many to be good ecosystem stewards.

When interviewees were asked to elaborate on the economic value of wetlands, Māori participants and scholars mentioned native plant farming such mānuka farming. One Māori participant and scholar commented on tourism opportunities in the region. Most farmers interviewed elaborated on wetland's ability to remove pollutants and slow water down. When asked "what encouraged you to restore wetlands?", most interviewees did not mention the economic value as a main factor in wetland restoration. They are often influenced by personal reasons such as biodiversity, aesthetics, and recreation. Case studies also indicated that although economics plays a lesser role in farmers' decisions on wetland restoration, financial stability influences the likelihood of farmers' willingness to restore wetlands.

Discussion

Across a variety of perspectives and cultural backgrounds, some themes were continuous. We saw a common belief expressed amongst participants regarding a commitment to the land and a desire to preserve and protect it for future generations to enjoy and appreciate. Although there was a consensus that people want to collaborate on protection and restoration efforts, we noticed there was a lack of understanding between diverse groups and there are many different opinions that are not speaking together as one unified voice.

Various stakeholders support wetland restoration due to cross-generational thinking. Those who are inclined to preserve wetlands do so because they are connected to the land they occupy – Māori through their ancestors and traditions, and farmers through stewardship of the land that their family has lived on for generations. However, supporting wetland restoration does not necessarily mean participating in wetland restoration. Farmers lack the means to incorporate sustainable practices on their land. Many regulations implemented at the national level lack an understanding of farmers' needs and can limit innovation. However, not having enough regulations in place can lead to environmental hardships. What can be changed so farmers can obtain more support in their restoration efforts?

Everyone that we spoke to mentioned that education and collaboration were crucial steps to increase awareness of the importance of wetland restoration. Each group wants their perspective to be understood by others. Participants elaborated that this would serve to unite the community as people began to understand others' struggles and personal motivations. However, collaboration in the eyes of one stakeholder does not necessarily mean everyone's ideas or wants

will be incorporated in the overall outcome. Participants indicated a need for balance between an industrial view which prioritizes the economic benefits of productive land, and a willingness to adapt protective measures to the ecosystem, a practice known as two-eyed seeing.

The overall message we identified was that various stakeholders value wetlands for unique things, and that education and collaboration among different communities are a necessity to make progress on protecting, revitalizing, and developing wetlands to provide the same opportunities previous generations have had for generations to come.

Recommendations

Education, collaboration, and implementation go hand in hand. Our findings and discussion confirmed a commitment to the wetlands, and a strong baseline appreciation for the catchment. They also raised the question of whether people can align worldviews to design a common goal for the future that can be approached from different positions in the catchment. One point is clear: there is a growing shift towards thinking about the economic value of biodiversity from the point of view of western science.

Recommendation 1: Create a Ruamahanga Catchment Working Group – UNSDG 17

Working groups should be implemented to facilitate conversations between community members. Community members will be encouraged to attend these discussions and thus attain high participation rates. The conversations will encourage a blended two-eyed seeing perspective that facilitates progress for all critical stakeholder groups. To address the lack of education and collaboration in the community, the working groups are crucial.

Recommendation 2: Establish a Ruamahanga Catchment Community Laboratory & Resource Guide – UNSDG 12

Farmers will inform others of innovative strategies for working with the environment, and there will be models of these ideas for others to see their practices firsthand. School children and scholars would visit the lab and contribute their ideas for advancing the systems being utilized. Following the construction of the lab, a resource guide should be created that includes the innovative practices and suggestions for implementing them. The community catchment lab could be funded by the Department of Conservation or another environmental group and advertised in a way that inspires action from the community. With the creation of the resource guide and community lab, those who do not currently utilize wetlands would have the tools they need to start implementing the sustainable practices of other landowners.

Recommendation 3: Increase Education of Māori Perspectives – UNSDGD 3

Schools must educate their students on Māori traditions surrounding wetlands and te reo Māori [the Māori language] if this information is not already included in their curriculum. The implementation of afterschool programs encouraging adolescents to get out into nature after these teachings would lead them to appreciate the way Māori value the environment and the biodiversity of wetlands. This increased awareness and education would allow more progress to be made to remedy the injustices in the environment while also achieving UN and bio heritage benchmarks.

Recommendation 4: Implement a Ruamahanga Catchment Strategic Financial Plan - UNSDGD 8

Publicly available subsidies and grants will ensure funding for landowners to restore and protect wetlands on their property. Formal agreements with notable organizations will solidify these new incentives and provide funding. A strategic plan including initiatives for each community catchment should be established and enforced. Formal partnerships with the Department of Conservation, GWRC, Federated Farmers, Ducks Unlimited and community catchment groups should be incorporated into the strategic plan with financial support specified. Once incentives are increased, it will cause a domino effect in which farmers learn wetland benefits through collaboration with the farms around them and can be supported in doing so.

Summary

New Zealand has an opportunity to unite perspectives under the recommendations of the Biological Heritage Challenge as well as the UN Sustainability Development Goals. The Bio-heritage challenge specifically recommends to whakamana, tiaki, whakahou [empower, restore, and protect] bio heritage through innovation and community action. The outcomes of UNSD Goals number 3, 6, 8, 12, 15, and 17 also support action and effort for the catchment. Our four recommendations can increase collaboration, further define wetland value, amplify conversations on Māori worldview perspectives, and expand incentives for wetland restoration funding to work towards their restoration.

Acknowledgements

We would like to thank everyone who supported us and led us to success throughout the course of the project. First, we would like to thank our 14 interviewees and 30 survey respondents for their willingness to share their knowledge on wetlands and the Ruamahanga catchment community with us. Next, we would like to show our gratitude toward our sponsors Ian Gunn and Rawiri Smith for providing us with resources such as contact lists, articles, photographs, insight, and feedback. We would also like to thank Professors Ingrid Shockey and Fred Looft for their invaluable guidance and support throughout the study. Furthermore, we would like to thank Karen Coughlan for aiding us with reference and citation information. Finally, we would like to thank Kahungunu ki Wairarapa, Sustainable Wairarapa, and Worcester Polytechnic Institute for providing us with the opportunity to work with people across the globe.

Meet the Team

This report is a result of equal contribution of all authors.

Hello! My name is Brooklynn Paris, and I am originally from Upstate NY. I am currently studying biomedical engineering at WPI along with pursuing my Masters degree in management. Since I started working on this project, I have gained valuable life experience interviewing with people from all different backgrounds from across the globe! Learning more about Māori culture and their worldview has been my favorite part of this experience and although we weren't able to travel to New Zealand, I am hopeful that I will be able to visit soon! This project gave me the opportunity to learn and grow alongside my amazing team and I am so grateful. I will carry the lessons I have learned during this IQP with me forever.

Hi there! My name is Caroline Dalton, and I am originally from Holden, MA. I am currently a junior at WPI pursuing a degree in Civil Engineering with an environmental concentration. Despite not being able to complete this project in New Zealand, I have been lucky enough to work on this project with my amazing sponsors, advisors, and team from home! I have learned so much over the course of this project and have had the pleasure of being able to speak with people from various backgrounds and worldviews. I loved being able to meet with Māori people and learn more about their culture. Overall, this project has been an incredible experience and I hope that one day I'll be able to see the Wairarapa Moana in person!

Hi everyone! My name is Meng Lian, and I'm originally from Beijing, China. I am currently a junior at WPI pursuing a degree in Chemical Engineering with a biological concentration. I'm extremely grateful for this opportunity, working with our amazing sponsors across the globe, our diligent advisors, and my wonderful teammates. I have gained so much knowledge over the course of the project on Māori culture and New Zealand through conversations with various experts in different fields. I'm eager to visit New Zealand one day and feel my feet in the land! Stay safe!

Hello everyone! My name is Daniel Dietrich, and my hometown is Topsfield, MA. I am currently a junior at WPI studying mechanical engineering. After working on this project, I have developed an understanding of a different culture, and although I was unable to travel to New Zealand, it has shown me a different perspective on the world. In order to work towards a better future, becoming a global citizen is a necessary step. Understanding a different worldview provides so many opportunities to collaborate with others and build positive relationships. Working completely online with people halfway across the world due to the COVID-19 pandemic was not easy, but my teammates and I achieved far more than I ever expected. Working with my teammates and our sponsors has helped me progress in my writing, communication, and leadership skills and I am grateful for spending 14 weeks working with them. I am looking forward to traveling to New Zealand sometime in my life and experiencing, in person, the landscape, culture, and history of the country.

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Chapter 1: Introduction

Wetlands are often called the “kidney in the landscape”, filtrating excess nutrients such as nitrates and phosphates in water before it flows downstream into the ocean (Fuller, 2020). The wetlands are also crucial to the Māori way of life, serving as “the food basket” and “source of mana [spiritual power]” (Fuller, 2020). The Ruamahanga catchment, including Wairarapa Moana, is now home to approximately 40,000 New Zealanders (Barlow, 2018; Smith, n.d.). Since European settlement, 97% of the wetlands in the Wairarapa Moana region have been eradicated as a part of the Lower Wairarapa Valley Development Scheme, in an effort to control flooding and create farmland (Fuller, 2019; R. Smith, personal communication, February 1, 2021).

As shown below in the green shaded area in Figure 1, the majority of the remaining wetlands are concentrated in Wairarapa Moana. Wairarapa Moana contains Lake Wairarapa (the largest lake in the green area of Figure 1), Lake Onoke (located south of Lake Wairarapa near the ocean), the Ruamahanga River (located on the eastern edge of the green area), and many other smaller rivers, marshes, and tributaries (Wairarapa Moana Wetland, 2020).

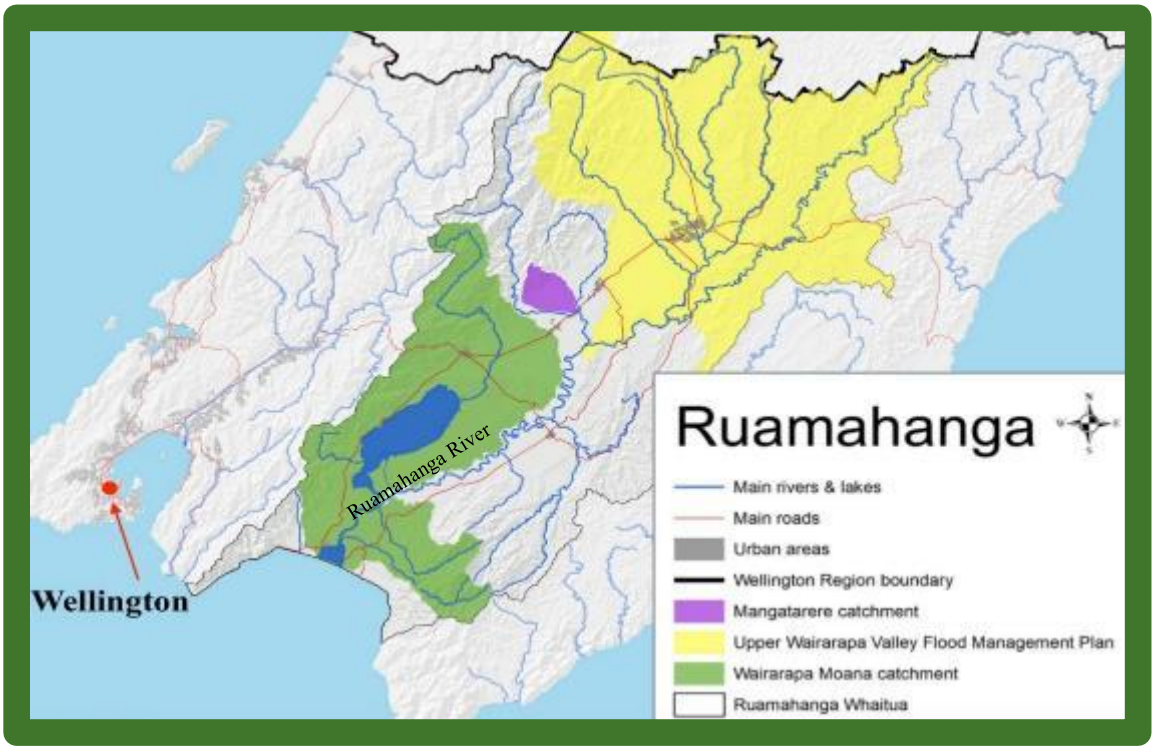

Figure 1: "Ruamahanga Catchments" by Ruamāhanga Whaitua.

Although recent efforts have been made to restore wetlands, the government, which is primarily aligned with industry and agriculture rather than Māori environmental perspectives, has made restoration difficult.

It is estimated that 85% of residents living around the Wairarapa Moana are not of Māori descent. Many of these people may not be well-informed about the significance that the wetlands have in Māori traditions and perspectives, or how wetlands can support the health of the environment (Ministry of Health, 2019). Building awareness about the wetlands in the Wairarapa Moana region is a crucial component in saving the fragile ecosystem. This process also develops a consensus among diverse local communities about environmental management, as the wetlands represent natural, social, economic, and cultural value to not only the Māori but also to the integrity of the country's ecosystem as a whole.

In 2016, a project team assessed public perception of the Wairarapa Moana's water resource usage to "address the resource management conflict" of Lake Wairarapa[1] (Diltz et al., 2016). Their survey focused on public participants' knowledge about "the water quality, flood levels, and the resource consent[1] [to operate the barrage gates]", and their opinions about the "current and future flood management" (Diltz et al., 2016). This study revealed the need to expand Māori involvement in water management and use strategies within the Wairarapa Moana region, the need to educate the public about water management practices, the need to protect the environment and improve water quality, as well as to reconcile conflicts between various controlling interests including environmental perspectives, tourism, and resource management (Diltz et al., 2016). While concerns such as resolving conflict of interests and restoring the ecosystem are still relevant, there were no recommendations concerning restoring wetlands and managing or utilizing wetlands in this study, especially in a manner that would benefit all perspectives (Diltz et al., 2016). Additionally, recent progress on wetland restoration in New Zealand may have changed community perceptions about wetlands, especially with regard to the role of wetlands when ecosystem service contributions are measured, including the value of controlling flooding.

[1] Resource Consent - right to "undertake activities that might affect the environment" such as building structures, discharging wastewater, etc. As a part of the Resource Management Act (1991), local councils need to evaluate and grant people resource consent upon request.

The aim of this project is therefore to collect perceptions of the economic, environmental, cultural, and social importance of wetlands to the Ruamahanga catchment community. To accomplish our goal, we identified three objectives: 1. Document how the wetlands within the Ruamahanga catchment are currently used, managed, and defined; 2. Identify and record the Ruamahanga community's perspective on wetlands and ecosystem stewardship; and 3. Understand how economic value is determined for wetlands in the Ruamahanga catchment. These objectives will provide insight into economic, environmental, social, and cultural baselines that can help build greater cohesion towards the sustainable restoration of wetlands.

Chapter 2: Literature Review

This chapter introduces background material on the Ruamahanga catchment, including the Wairarapa Moana, and the history, environment, and preservation of the region. We examine the Treaty of Waitangi for its relevance in land management, discuss wetlands, and provide examples of synergistic relationships within these ecosystems. We also introduce our partners, other key stakeholders, details about the Māori perspective, and approaches to understanding wetland value that informed our methodology and approach.

2.1 The history of the Wairarapa Moana region

Wetlands are integral to the ecosystem, providing water storage, coastline protection, pollution filtration, oxygen, and more. While they are understood to have an environmental significance, the wetlands within the Wairarapa Moana specifically have taonga [treasure] which can be interpreted as cultural and spiritual value, to Māori (Wetlands., 2018). Wairarapa Moana translates to "sea of glistening waters" in 'te reo Māori' [the Māori language] (Wairarapa Moana Wetlands Park, n.d.). Figure 2 displays Lake Wairarapa, Lake Onoke, the Ruamahanga River that runs between them, and the surrounding wetlands. They make up what is known as the Wairarapa Moana, which is fed by the Ruamahanga river catchment. (Lakes380, 2020).

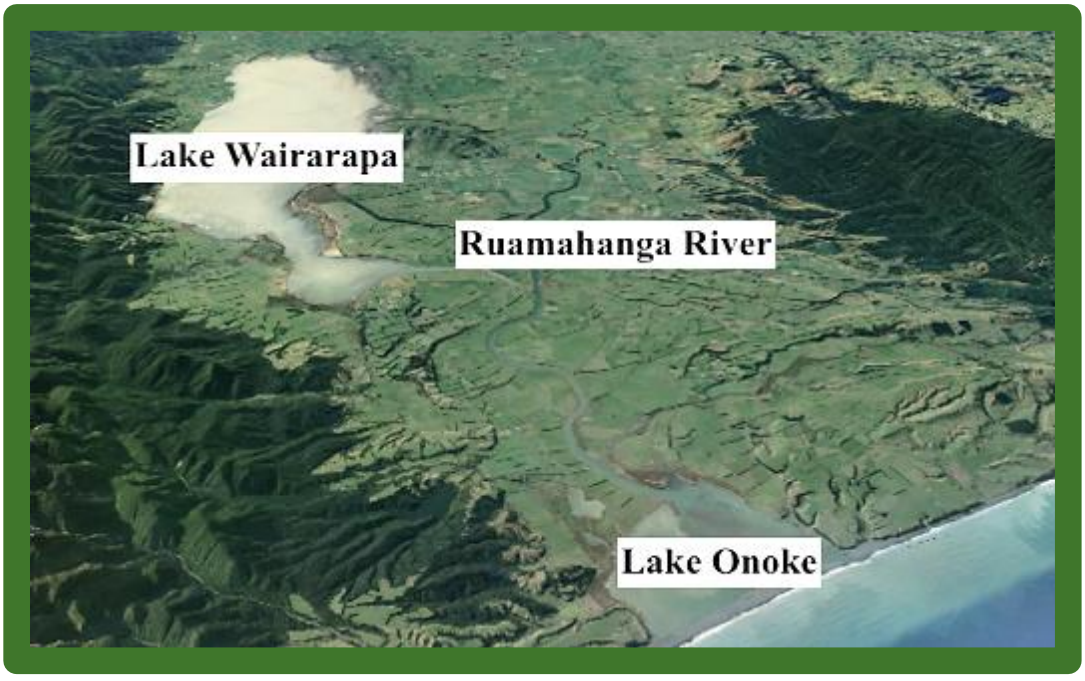

Figure 2: Overhead view of the Wairarapa Moana region (Google Earth, n.d.).

This region was among the first sites settled by Māori after Kupe, a Polynesian navigator, discovered Aotearoa [New Zealand] (A Brief History of New Zealand., n.d.). Māori communities have since relied on these waterways for centuries. Prior to the arrival of European settlers, there was an abundance of native species residing in the Wairarapa Moana. Local residents were able to catch plenty of tuna (the native freshwater eel), during their migration season without fear of overharvesting (Wairarapa Moana Wetlands Park., n.d.). This species is shown below in Figure 3. Māori people also used regional plant species to make clothes, food, medicine, and dyes (Wetland Action Plan., 2003). The water levels in the catchment were deep enough to navigate the Wairarapa Moana's waterways by waka [canoe] (Lakes380, 2020). After European settlers came to the Wairarapa Moana, conflicts arose over land use. One point of contention was ecosystem stewardship of the wetlands and control over their water levels. For decades, Europeans wanted to close the Mouth of Lake Onoke in order to drain the wetlands for agriculture and industry, whereas Māori advocated to keep it open in order to retain high water levels for fishing (Wairarapa Moana Wetlands Park., n.d.). These conflicting views were the basis of land disputes that have made a lasting impact on wetland management and governance.

Figure 3. "Longfin Eel/Tuna" by Alton Perrie is licensed under CC BY 4.0.

2.1.1 The Treaty of Waitangi

In 1840 following Britain's colonization of New Zealand, the Crown and over 500 Māori chiefs signed the Treaty of Waitangi. This treaty contained three articles that were intended to make Māori feel like their rights were being respected while the Crown declared sovereignty over New Zealand. However, there were differences in the English translation and the te reo Māori translation of the treaty (Treaty in brief., 2017). The most important mistranslations can be found within the first two articles, a basis for fundamental differences in how land is shared and governed.

Article I of the treaty contains the first difference in translation. In the English translation of the Treaty of Waitangi, the Crown was granted complete sovereignty over New Zealand. In the Māori translation of the treaty, the Crown was only granted governance, or 'te Kawanatanga katoa' over the land (Orange, 2012). Article II of the treaty contains the second difference in translation. In the English translation of the Treaty of Waitangi, Māori were granted control over their land, fisheries, and other properties: however, only the Crown was allowed to buy land from Māori. In the Māori translation, the Crown would have a right to buy Māori land, but not exclusively (Orange, 2012). Article III gave Māori the same rights and protections as their British counterparts (Orange, 2012). It was understood that Māori would still retain the right to their own land, fisheries, forests, etc. Despite these claims, the Crown saw the Māori king as a challenge to their sovereignty and thus conflict became inevitable (Orange, 2012).

2.1.2 Implications for land rights

After the Treaty of Waitangi was signed, the Crown sought to gain control over Māori land through purchase, confiscation, and acquisition (Fyers, 2018). The Crown used Article II as means to purchase two-thirds of the total land area of New Zealand from Māori for an exceptionally low price. To coerce iwis [Maori tribes] into selling their land, the Crown made promises that were later broken, or were never honored at all (Fyers, 2018).

From 1840 to 1872, the Crown and Māori engaged in wars that spanned from months to years and are now known collectively as The New Zealand Wars (New Zealand's 19th-century wars, n.d.). In the 1860s, legislation was passed that allowed for the confiscation of Māori land from any tribe that fought against the Crown in these wars (Fyers, 2018). In 1865, around 19 million acres of land were Māori "customary lands", which are usually thought of as collectively

owned land. By 1909, 18 million acres of that land was converted to individual ownership for settlements. This was achieved through use of The Native Land Acts of 1862 and 1865 (Taonui, 2012). Furthermore, almost all of this land was settled by Europeans (Fyers, 2018). As of 2018, Māori only owned 4.8% of their original land (Fyers, 2018). As the Crown gained control over land, be it through purchase, confiscation, or occupation, the landscape of the Wairarapa Moana began to change. The wetlands were drained for farming, livestock, forestry, urban settlement, roads, and so forth (Wetland Action Plan., 2003).

In the 1960s, the Lower Valley Development Scheme started a project to cut off the Ruamahanga River from flowing into Lake Wairarapa and redirected it to connect to Lake Onoke (Barlow, 2018). This disrupted the natural flooding of the wetlands by allowing floodwater to flow directly into Lake Onoke and therefore preventing seasonal flooding from occurring (Wairarapa Moana Wetlands Park., n.d.). As a result, more land was able to be converted to farmland without the threat of flooding. However, without high water levels from seasonal flooding, it became increasingly harder for Māori people to fish (R. Smith. Personal communication, November 2021). The government legislators did not stop encouraging farmers to drain wetlands until 1980s (McLeod, 2006).

2.2 Significance to Māori

Māori have said that without action to repair the wetlands, their future is at stake (Smith, n.d.). When considering the rich history of the region, and the economic, environmental, cultural, and social significance that it has, it becomes clear that restoring and preserving this area is of the utmost importance not only to current iwi, but also for generations to come.

2.2.1 Ecosystem stewardship

Māori believe that all things living and non-living are connected as they are all descendants of Papatūānuku [the Earth Mother], Ranginui [the Sky Father], and their children. Māori are deeply connected to the Earth and its biodiversity (Māori and Biodiversity., n.d.). Papatūānuku gave birth to all life, therefore it is essential to protect all that she created including land, water, and soil (Royal., 2007). Historically Māori have been the kaitiaki [guardians] to protect the mauri [life force], wāhi tapu [sacred sites] and taonga [treasures] of their ancestral lands (Māori and Biodiversity., n.d). In order to do so, Māori must retain guardianship of the

land through ecosystem stewardship (Māori and Biodiversity, n.d.). Traditionally, Māori people have been the tangata whenua [people of the land] due to their ancestral roots, and therefore have mana whenau [authority over land] (Understanding Kaitiakitanga, n.d.). The Māori proverb "Te toto o te tangata, he kai; te oranga o te tangata, he whenua" [while food provides the blood in our veins, our health is drawn from the land] displays the significance of land to the Māori people (Keana, B., 2007). Similarly, the Māori proverb "Ko ahau te awa, ko te awa ko ahau" [I am the river, the river is me] illustrates the significance of water to the Māori people (Understanding Kaitiakitanga, n.d.).

Tikanga is interpreted as a set of traditional values and practices that allow Māori people to feel connected to their identity and the natural world (Use and Harvest, n.d.). Additionally, tikanga dictates the way that taonga are managed, protected, and utilized (Use and Harvest, n.d.). Māori traditionally utilized these taonga for a multitude of purposes, including food, medicine, clothing, and traditional ceremonial purposes among others (Use and Harvest, n.d.). As kaitiaki [guardians], Māori people feel a responsibility to adhere to tikanga when utilizing resources from the natural world, such as gathering and growing food, in order to promote preservation, conservation, and protection of taonga (Understanding Kaitiakitanga, n.d.). Following tikanga also ensures that Māori are able to preserve the mauri of the land for future generations (Understanding Kaitiakitanga, n.d.).

2.2.2 Sense of place in the Ruamahanga Catchment

From a Māori perspective, the wetlands carry cultural significance and are extremely important to their identity. Our sponsor Rawiri Smith shared knowledge relating to his Māori identity. This "sense of place" can be described as a genealogical connection to nature and is felt by many Māori. The wetlands are part of their shared historical narrative and have generated stories from childhood to adulthood (R. Smith, personal communication, January 2021). This is reflected in the mihi, the traditional Māori introduction, in which the nearest body of water and other ecological landmarks related to each person's place of origin is mentioned. The greeting reinforces the connection to the landscape associated with each person's personal story, with a secondary acknowledgement of the family thread (Smith, n.d). Māori proverbs related to the Wairarapa Moana such as 'He wai maru tuna, he wai rakau' [water full of eel, water full of logs], 'Whakaora te repo, ka ora te taonga wai' [restoring our wetland treasure] and 'Ko Remutaka ki te tonga' [resting place to the south] (R. Smith, personal communication, January 2021)

These proverbs illustrate the Māori sense of place, and the sense of belonging that is an essential part of the environment (R. Smith, personal communication, January 2021).

2.3 Community partners and advocates

The Wairarapa Moana has a complex range of partners, advocates, and regional interests at stake. The region is home to over 40,000 individuals including farmers, fishers, businesses owners, and other rural and urban residents (Schrader, 2020). Conservation and management agencies have legal jurisdiction over the region's planning processes, but Māori community partners and advocates have a longer-range view of how the region is managed and integrated into community practices. Some of these positions are outlined below in greater detail.

2.3.1 Māori perspective

The degradation of the wetlands has been particularly difficult for Māori communities who share this landscape. Since the ratification of the Treaty of Waitangi, Māori have lost jurisdiction over wetlands. In recent years, negotiations between the New Zealand government and two local iwis, Ngāti Kahungunu ki Wairarapa, and Rangitāne o Wairarapa, have discussed the future of the region (About the Project, n.d.). Decisions involving the Wairarapa Moana resulted, and some land was returned to Māori (About the Project, n.d.). A statutory board to oversee resource management was also formed. This is discussed further in section 2.3.4.

2.3.2 Federal, regional, and local governance structures

The wetlands are currently managed through a partnership of federal and central governments with local territorial agencies with interests in various components of regional management. Figure 4 below shows three governance bodies and their roles in management of the catchment.

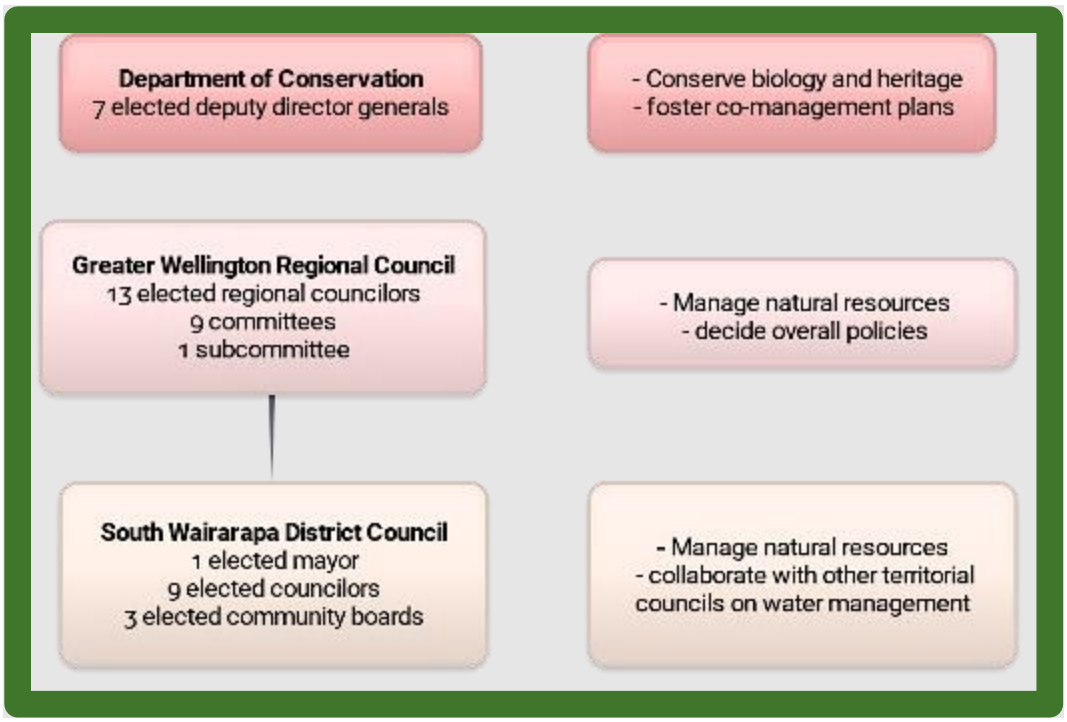

Figure 4. Federal, regional, and territorial government involved (DOC, GWRC, SWDC, n.d.).

Three agencies form the primary governance structures for the region. They include the Department of Conservation (DOC), the Greater Wellington Regional Council (GWRC) and the South Wairarapa District Council (SWDC). DOC aims to "protect and restore our species, places and heritage, and provide opportunities for people to engage with these treasures" (Dept. of Conservation, n.d). They seek to restore the habitat that has been degraded over time by flood control, waterway diversions, and other harmful man-made drainage systems (Wairarapa Moana Wetlands, n.d.). DOC works with local iwi, governmental and community councils, and the widespread community to accomplish this goal by establishing co-management systems to work towards restoring the Wairarapa Moana (Dept. of Conservation, n.d.).

The GWRC manages and collaborates with city and district councils regarding natural resources (Greater Wellington Regional Council, 2020). The core functions of the council show their commitment to protecting the environment and meeting the "economic, cultural and social needs of the community" (Greater Wellington's role and functions, 2020). They have conducted surveys and interviews to gather feedback from the community about the wetlands, and have helped committees to further its preservation, such as the Ruamahanga Whaitua Committee. The Whaitua Committees monitor water quality within five catchments within Greater Wellington

(All About Water, 2020). The committees are a branch of the GWRC, and their main task is to implement the Whaitua Implementation Programme (WIP). Committees were established to work towards this in 2013, 2014, and 2018 and two more will be established in the near future. The council's mission is to improve the water quality, working with multiple stakeholders to work together to improve the quality of the wetlands (WIP, n.d.). In August 2020, as part of a COVID-19 infrastructure fund, the government gave $11 million to the GWRC to put towards 'flood protection and resilience'. The money went towards planting 120,000 trees throughout the Ruamahanga river catchment's 100 hectares. Initially, the trees were planted on public land, and as private residents saw their success, trees were planted on their land as well (Funding, 2020).

SWDC is another territorial government agency which collaborates with other groups on water management (South Wairarapa District Council, n.d.). The SWDC has historically funded water preservation. They have educational information for the public about history, flora and fauna of the region to increase awareness (Policies and Plans, n.d; Controversial Waste Water, 2020). Despite this, some local residents and stakeholders are frustrated by the lack of progress and feel that SWDC's underinvestment has prevented the Moana from becoming restored effectively (Controversial Waste Water, 2020; Wairarapa Moana, n.d). The SWDC recently proposed a resource consent for the Moana which they withdrew after spending twelve years and $7 million on the progress (Controversial Waste Water, 2020). This shows a lack of consistency in restoration efforts and shared vision for planning.

2.3.3 Regional landowners and interests

The majority of farmers and private landowners are motivated to be a part of wetland restoration efforts (McLeod, 2006). They develop wetlands for personal, economic, and environmental reasons such as shades for [live]stock, water recreation, fish and games, wildlife, and appreciation of nature (Whitby, 2018). However, their eagerness to restore wetlands is hindered by financial considerations and legislative barriers (McLeod, 2006). They desire to be more involved in decision-making processes as well as have more clarity and consistency from government officials on wetland projects (Whitby, 2018). The landowners also expressed the need for lawmakers to understand farm management strategies within different segments of farming (McLeod, 2006). Additionally, the farmers are unsatisfied with resource consent procedures which have made the restoration of wetlands difficult (Whitby, 2018). Furthermore,

farmers indicated the lack of time to manage wetlands and the lack of support with maintenance after wetlands are developed (Whitby, 2018). These individuals also feel that their effort in wetland restoration is often overlooked and under-appreciated by the wider community (Whitby, 2018).

The Federated Farmers of New Zealand have made comments on the WIP. They want to improve the Wairarapa but have a more relaxed stance on implementation (Ruamahanga Whaitua WIP, n.d.). They believe the next phase of restoration will focus on "harvesting high flows, enabling storage and enhancing aquifer recharge" (Ruamahanga Whaitua WIP, n.d.). They mention their support for improved water efficiency but highlight that their primary focus is enabling water storage (Ruamahanga Whaitua WIP, n.d.). They are also concerned about the economic standpoint. Costs are between NZD 50-100M, but in their opinion the results are not reflective of this cost (Ruamahanga Whaitua WIP, n.d.). This highlights the economic realities when it comes to restoration, and how certain stakeholders may be motivated by wetland productivity. It seems that the farming union wants to be supportive, but economics are their primary focus.

2.3.4 Advocacy groups

One partnered effort to aid restoration is the Wairarapa Moana Wetlands Project [Whakaora te repo ka ora te taonga wai], which was started in 2008 to restore the wetlands (About the Project, n.d). It is a collaboration between the Greater Wellington Regional Council (GWRC), the Department of Conservation (DOC), South Wairarapa District Council (SWDC), and iwi's Kahungunu ki Wairarapa and Rangitāne o Wairarapa (About the Project, n.d.). One of the main aspirations of the project is to pool resources and expertise about ecology, recreational and cultural values of the moana from a variety of community members (About the Project, n.d). There is an emphasis on collaboration between everyone - mahu whenua, local government, and central government (About the Project, n.d.). As shown in Figure 5, a Statutory Board including representatives from each group has been established to manage the Lakes and reserves within the catchment and report to the DOC regularly (All about the Project, n.d.). The organizations involved in the Statutory Board are described in detail in the following subsections.

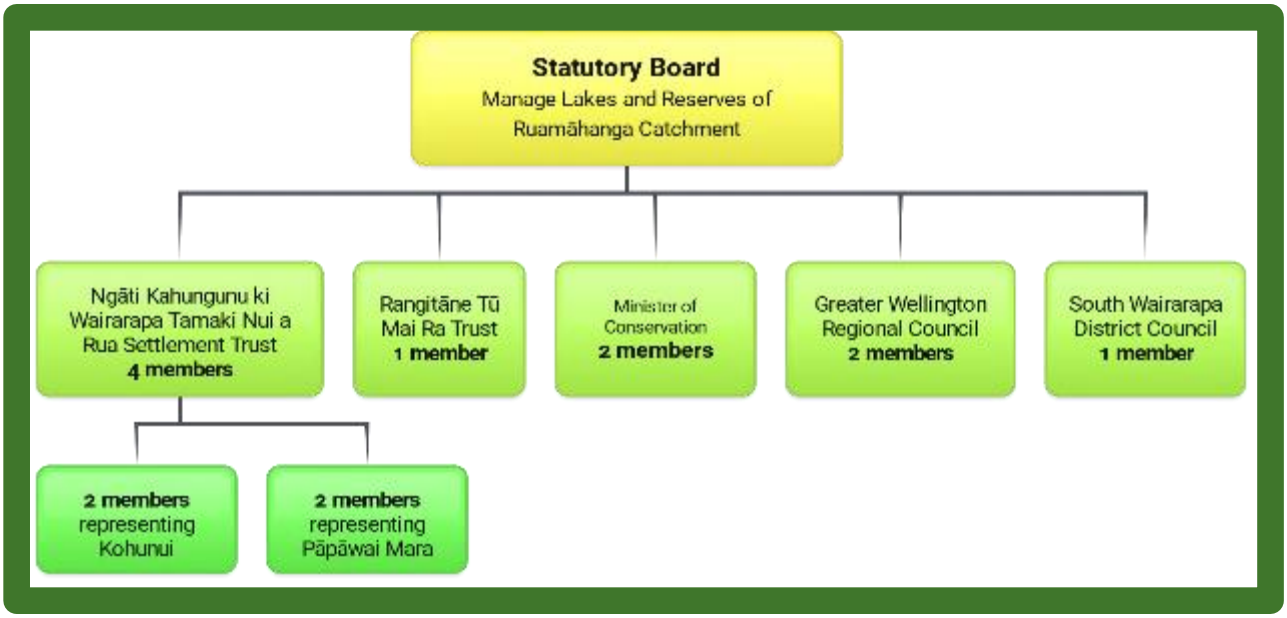

Figure 5: Statutory Board composition (About the Project, n.d.).

The Ruamahanga Whaitua Committee, established in 2013, has developed a Whaitua Implementation Programme (WIP). It provides recommendations for people to manage their water usage, and it will be implemented in the proposed Natural Resources Plan (Ruamahanga Whaitua WIP, n.d.). They would like to see a future where everyone is connected to the water and has responsibility for creating a more natural state, as well as enhanced water quality, recreational, and cultural opportunities (Ruamahanga Whaitua WIP, n.d.). They also advocate Ko wai, Mo wai, No wai, which means that waterways connect communities and bring them together with a common identity (Ruamahanga Whaitua WIP, n.d.). Their mission is for all members of the community to be aware of the significance the wetlands have, and to gain a greater appreciation for their social and cultural history.

Lakes380 is a public science project funded by the Ministry of Business, Innovation and Employment. It is the largest scientific study of Aotearoa's lakes in New Zealand's history. The project aims to gather new data about 380 lakes' sediment cores in order to understand how the health of the lakes has changed over time (About the Lakes380 project, n.d). This knowledge facilitates a deeper understanding of the lakes which encourages effective education and restoration. Within the Wairarapa Moana, the Lakes380 team is examining Lake Pounoi, Lake Onoke, and Lake Nganoke. This group also collaborated with local iwis to create the previously

mentioned Wairarapa Moana Kete Pūrākau [Wairarapa Moana Lake Stories], which further describe the history and significance of the region.

There are many more groups who are involved in the usage of the region. Each has its own list of priorities and partners. These advocacy groups have contributed to make progress in the restoration and preservation effort.

2.4 The value of wetlands

While the environmental and cultural considerations surrounding wetland restoration are crucial, economics are a determining factor as well. Wetland restoration projects are very costly, but wetlands provide value in many ways. Ecosystem services provide substantial value to wetlands, medicinal products can be made from unique Māori plant species in the wetland region, and there is economic opportunity for Māori due to these coveted species. Māori desire to unify people's approach to the wetlands by using the land and its resources responsibly (Oceania/Smith, n.d).

2.4.1 Ecosystem services

The wetlands are an integral part of an ecosystem but may be overlooked despite their contributions to a healthy environment. Although wetlands only make up 1.5% of the Earth's surface, they provide 40% of global ecosystem services (Dymond, 2013). Wetlands can improve water quality, protect against flooding, and be highly effective carbon sinks (Wetlands, 2018).

Due to their topographical location at land-water interfaces, the wetlands receive runoff water, act as a filtration system, and remove sediments and pollutants (Dymond, 2013). As a result, they improve the water quality for humans and wildlife. Plants and vegetation are able to thrive in the shallow water, which is rich in nutrients, and the terrestrial and aquatic species can take advantage of the habitat and the food sources (Dymond, 2013). Wetlands also act like a sponge by absorbing and storing runoff water from storms, floods, and ocean swells (Wetlands, 2018). These sponge-like qualities allow a slow discharge rate of water which protects the land from over saturation and lowers peak water levels (Wetlands, 2018). The wetlands provide a natural barrier against stormwater which helps reinforce shores and coastlines (Dymond, 2013). With the help of vegetation and plant roots, the wetlands are able to hold soil together, which prevents erosion and degradation of the shoreline (Dymond, 2013).

Carbon emissions are a significant contributor to climate change and require regulation. Wetlands play a vital role as a carbon sink by trapping and storing carbon in peatlands (Wetlands, 2018). Peatlands are waterlogged areas in which dead organic material is condensed and never fully decomposed because of the anaerobic environment (What are peatlands?, n.d.). The accumulation of peat in a wetland increases the amount of carbon that can be stored there, thus lowering the atmospheric carbon levels (Dymond, 2013). Healthy wetlands can absorb between two and five metric tons of carbon per hectare. Moreover, wetlands contribute to the overall reduction of greenhouse gases in the atmosphere (Wetlands, 2018).

The Ramsar Convention, an international organization dedicated to making sure wetlands are sustained, has recently recognized the Wairarapa Moana wetlands as internationally significant (Wairarapa Moana Wetland, 2020). In 2019, the journal of Marine and Freshwater research published a study about the monetary value of wetlands. The study found that globally, wetlands are worth 47 Trillion USD (64.6 trillion NZD) per year (Worth of Wetlands, 2019). This number was based on data gathered in 2011 that measured the value of ecosystem services that wetlands provide. Ultimately, this data displays the monetary significance that wetlands have, which supports the idea that increasing funding to restore wetlands is warranted and crucial to a strong global ecosystem.

2.4.2 Biodiversity

The wetlands of the Wairarapa Moana support a unique and diverse group of 96 bird species, 25 native fish species, and countless plant species (International recognition, 2021). This diversity extends across Wairarapa Moana to include the Eastern Wetlands and the Ephemeral Wetlands. The Eastern Wetlands support only the hardiest plant species due to the high winds and lack of cover in the area. This exposed area, known as the turf fields, is home to 55 different plant species including common water milfoil (*Myriophyllum propinquum*) and pondweed (*Stuckenia pectinata*) (Grant, 2012, p.165). Many of these plants are a vital food source for wading bird species that migrate from Alaska and Siberia such as the bar-tailed godwit, the knot, and the golden plover (Grant, 2012, p.212).

Figure 6: Amphibromus fluitans by Peter de Lange is in the Public Domain, CC0.

The Ephemeral Wetlands also support a hardy group of plant species due to the varying amount of water in the region. Species that live in Ephemeral Wetlands must be able to endure periods with little water as well as periods where they may be submerged. Species like *Centipeda*, a quick growing daisy, and *Amphibromus fluitans* (shown in Figure 6), a rare grass, must be able to colonize rapidly in order to survive in these conditions (Grant, 2012, p.167). Both of these plants can lay roots and reproduce before heavy rainfall comes. Unfortunately, competition has posed a problem for these species, and due to the introduction of invasive species, these plants often struggle to grow when non-native plants take up the area. In the recent history of Wairarapa Moana and the entire Ruamahanga catchment, human interaction, such as development for agriculture and the introduction of non-native species, has also created issues in the environment and for the wildlife living there.

2.4.3 Mānuka

Rongoā Māori [traditional Māori healing system] has been passed down for generations and utilizes holistic medicinal practices (Māori Medicine., n.d.). Such practices include plant use, massage, and incantations (Māori Medicine., n.d.). The mānuka tree is just one of many native plant species used for traditional Māori medicine (Māori Medicine., n.d.). Mānuka, or *Leptospermum scoparium*, is a scrub-type tree native to New Zealand (The History of Mānuka). It is able to grow under various ecological conditions and is found anywhere from geothermal areas to wetlands (The Mānuka & Kānuka Plantation Guide., n.d). Until the 1980s, mānuka was treated as a weed by Europeans (Derraik, n.d.). Mānuka often competes with kānuka, a similar species of plant, for habitats. Compared to kānuka, mānuka is more tolerant of wetlands as it is able to withstand continuous flooding up to 272 days (Derraik, n.d.). Mānuka is also tolerant of soils that are high in acidity, low with fertility, and sites with high nickel and chromium concentration (Derraik, n.d.).

Prior to the arrival of European settlers, Māori used the mānuka tree for a variety of purposes. The wood of the mānuka was used as building material for items such as "paddles, weapons, spade blades, bird spears and mauls to house building" (The History of Mānuka., n.d.). Other parts of the tree were used for medical purposes such as the bark of the tree, which when infused can treat scalds and burns (The History of the Mānuka., n.d). Mānuka oil can be applied to cuts due to its healing properties that speed up wound recovery (Smith, n.d.). It is also traditionally used for treating diarrhea, colds, and inflammation (Lis-Balchin and Hart, 1998). European settlers and explorers were among the first to utilize the mānuka flower for brewing tea and beer (The Mānuka & Kānuka Plantation Guide, n.d). They also appreciated the flower for its pollen as a valuable asset for the honey industry (The Mānuka & Kānuka Plantation Guide, n.d.). Honey produced from the mānuka flower is highly sought after for its healing properties (The Mānuka & Kānuka Plantation Guide, n.d). In 2016, bulk mānuka honey could be sold at a price up to $148 per kilogram (Lloyd, 2017). From 2012 to 2017, the bulk price of mānuka honey more than doubled, suggesting that the mānuka honey industry is highly profitable (Lloyd, 2017). The US military recognized the value of the mānuka plant and began applying the oil to bandages to accelerate healing processes (Oceania/Smith, n.d.). The mānuka plant not only carries economic and medicinal value, but also carries ecosystem service value.

2.4.4 Monetary value of wetlands

Wetlands have immense value to the environment through their ecosystem services, but there is a monetary value to these services as well. The monetary values of ecosystems services were examined by researchers in 2013 (Dymond, 2013). The services were broken down into four categories: provisioning services, regulating services, habitat services, and cultural (Dymond, 2013). Values were given per hectare per year in international dollars, which are dollars standardized among countries and equal to 1 USD (Dymond, 2013). The values of each of the services of wetlands as of 2013 can be seen below in Figure 7.

	Relative importance (TEEB 2013)	Mean global value (Int'$$_{2007}$$) (de Groot et al. 2012)	Maximum global value (Int$$_{2007}$$) (TEEB 2013)	Manawatu-Wanganui Region (NZ$$_{2008}$$) (van den Belt et al. 2009)	New Zealand (NZ$$_{2012}$$) (Patterson and Cole 2013)
TOTAL		25,682[2]	44,597	43,320	52,530[3]
Provisioning services		1,659	9,709	17,026	84
Food	●	614	2,090	104	
Fresh water supply	●	408	5,189	16,814	84
Raw materials	●	425	2,430	108	
Genetic resources	•				
Medicinal resources	•	99			
Ornamental resources	•	114			
Regulating services		17,364	23,018	20,339	45,217
Influence on air quality	•			586	711
Climate regulation	●	488	351		
Moderation of extreme events	●	2,986	4,430	16,017	19,530
Regulation of water flows	●	5,606	9,369	66	20,500
Waste treatment	●	3,015	4,280	3,670	4,476
Erosion prevention	●	2,607			
Maintenance of soil fertility	●	1,713	4,588		
Pollination	•				
Biological control	●	948			
Habitat services		2,455	3,471	971	
Lifecycle maintenance	●	1,287	917	971	1,175
Gene pool protection		1,168	2,554		
Cultural		4,203	8,399	4,982	6,054
Aesthetic	●	1,292	3,906	3,896	
Recreation/tourism	●	2,211	3,700	1,086	1,313
Inspiration for culture, art, design	●	700	793		4,741
Spiritual experience	●				
Cognitive information	●				

Figure 7. Valuation of services provided by freshwater wetlands per hectare per year by relative importance (Dymond, 2013). (Note: Some values may have changed since publication).

Wetlands provide a place for farmers to graze cattle, sustain fishing and hunting, decrease the likelihood of stock loss, and offer shades for stocks. In addition to traditional economic value, wetlands have value for other reasons including the scarcity of the species they protect. Without the wetlands of the Ruamahanga catchment, other sectors of the economy, such as ecosystem services and water treatment facilities, would suffer.

2.5 Relevant case studies in complex ecosystem governance

Two Ramsar Convention sites are analyzed below to investigate pre-existing methods for wetland restoration and preservation. One of the case studies is situated in Chilika, India. This case study depicted the complex cultural dimension and stakeholder relationships surrounding the lake. The study was chosen for its use of applicable methods that we used and assessed for their effectiveness. The second case study features the Whangamarino Wetlands in NZ, which depicts a case study which is similar to our project and used a relevant methodology.

2.5.1 Case 1: Chilika, India

Lake Chilika, in Odisha, India has been a wetland of national importance designated by the Ramsar Convention since 1981 (Finlayson, 2018). The wetland suffered rapid degradation from 1950-2000 due to increasing sediment, invasive species, dysconnectivity with the sea, and shrimp cultivation (Kumar, 2012). In 1991, the Chilika Development Authority (CDA) was established to initiate the wetland restoration effort (Finlayson, 2018). Within 11 years, the CDA received the Ramsar Wetland Conservation Award in recognition of their achievement in wetland ecological restoration with regards to economic and social considerations (Finlayson, 2018). Our team analyzed the methods that led to Lake Chilika's successful restoration.

The Chilika management plan took a socioecological approach, considering the "human and ecological components as a part of a complex system with multi-scale feedback and dependencies" (Virapongse, 2016). In addition to an assessment of rainfall, sediment build up, and shoreline recession, an extensive analysis on the land use was also conducted (Kumar, 2012). The CDA also performed a stakeholder analysis to study the various interests and expectations of the communities, government departments, policy makers, and organizations

(Kumar, 2012). After the detailed study, the CDA opened an artificial mouth in the waterway allowing a passage between the lake and the sea (see Figure 8) (Kumar, 2012).

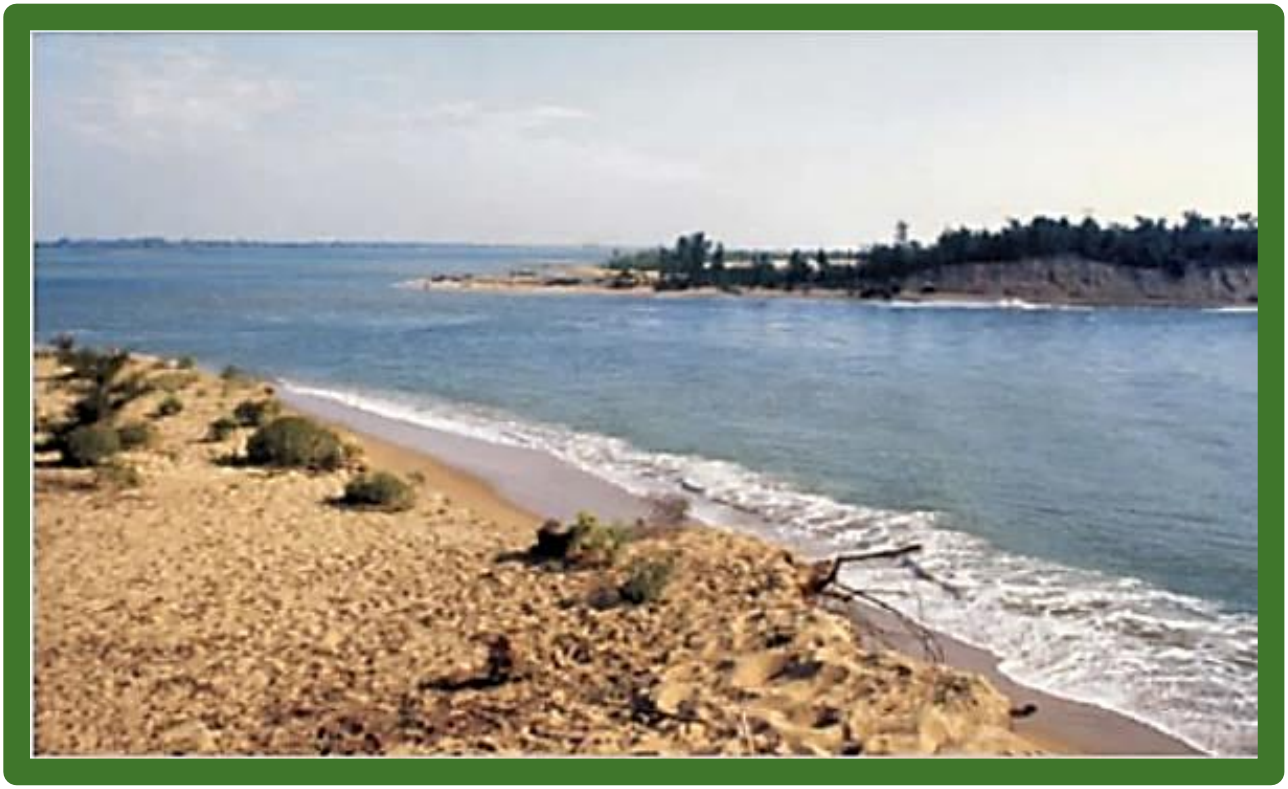

Figure 8. New opening of Lake Chilika to the sea (Kumar, 2012).

As a part of the strategy, the "revival of indigenous knowledge and traditional practices for managing biodiversity" was listed as a key approach (Kumar, 2012). Much of the biological heritage surrounding Lake Chilika is related to fishing. Fishing was practiced sustainably until the emergence of shrimp culturing in the 1990s (Kumar, 2014). To promote sustainable fishing culture and reduce use of the lake, the CDA promoted tourism, published newsletters and brochures, included Lake Chilika's history and culture in school curriculums, and encouraged celebration of environment related holidays such as World Wetland Day and Environment Day (Kumar, 2012).

While the mitigation efforts succeeded in improving the ecology of Lake Chilika, some problems remained. Pollution was still a contributor to the degradation of wetlands (Pattanaik, 2007). Fishing remained a major income source, but the fish per catch capita declined, causing hardship for fishers, and suggesting a continual need for sustainable fishery practices (Kumar, 2014; Pattanaik, 2007). Tourism aided the economy near the lake, but also brought pollution and

litter due to the lack of eco-friendly waste management (Pattanaik, 2007). There is still a lack of communication between stakeholders such as the fishing community, shrimp culturing community, tourism organizations, and the government (Pattanaik, 2007).

From this study, we see the importance of communication and involvement in planning to foster long-lasting wetland management and valuation success. We also learned that some short-term strategies, such as tourism, may lead to other consequences that negatively impact the ecosystem.

2.5.2 Case 2: Whangamarino Wetlands

The Whangamarino Wetland on the North Island of New Zealand is a wetland of international importance which suffers from severe degradation due to economic projects and the Lower Waikato Waipa Flood Control Scheme (FCS) (Magnolfi, 2020). Similar to the Ruamahanga catchment, the wetland is culturally significant to the Māori community (Magnolfi, 2020). In 2007, the Whangamarino Wetland Restoration Programme (WWRP) was launched to restore and protect the biodiversity of the area, conserve historic sites, promote sustainable use of land, and maximize community involvement in wetland restoration efforts and decision-making.

Figure 9. Whangamarino Wetlands by Collin O'Donnel | (Department of Conservation NZ) is licensed under CC BY 4.0.

The WWRP studied the communities of the region and revealed a need to increase communication between various stakeholders, consider all perspectives, and empower the community (Magnolfi, 2020). Furthermore, the study revealed the region's lack of Māori cultural knowledge of Whangamarino, especially with regard to the local iwis (Magnolfi, 2020). Researchers found that conducting dialogues with individuals in the community was effective to build trust and create "a sense of ownership of the process" (Magnolfi, 2020).

To address the lack of communication, the WWRP held public engagement days where all agencies were present to answer questions the community had about the project (Magnolfi, 2020). The community was informed about progress being made through direct communication, phone calls, focus groups, and websites (Magnolfi, 2020). WWRP also added signs surrounding the Whangamarino Wetlands to add Māori cultural information and to encourage shared knowledge, but this failed as the area allocated for the signs were not frequently visited (Magnolfi, 2020).

This case study, along with the Lake Chilika study, indicate a need to build stakeholder communication by focusing on shared definitions of wetlands, whether using scientific, cultural, and practice-based frameworks. Our team also learned about interview and communication strategies such as discussion of common interests and creating "a sense of ownership" of the process (Magnolfi, 2020). These strategies helped to develop stronger connections and have deeper conversations with individuals, fostering a finer cultural and historical understanding of the site (Magnolfi, 2020).

2.6 Summary

This review revealed several key points that we will take into consideration. First, we learned about the ecological, economic, and cultural significance of the Ruamahanga wetlands as a region that cannot be defined by simple management tools. We identified critical treaties and policies that have influenced how residents have engaged with the catchment in the past and present. We learned that early communication between stakeholders and partners is crucial to unifying how wetlands are understood. This will inform our approach as we move into the methodology chapter.

Chapter 3: Approach to Understanding Wetlands

The goal of the project was to collect perceptions of the economic, environmental, cultural, and social importance of wetlands to the Ruamahanga catchment community.

- Document how the wetlands within the Ruamahanga catchment are currently used, managed, and defined.
- Identify and record the Ruamahanga community's perspective on wetlands and ecosystem stewardship.
- Understand how economic value is determined for wetlands in the Ruamahanga catchment.

The concept of two-eyed seeing and assessments of participatory decision-making further clarified our background understanding of differing perspectives on the catchment from residents in the Ruamahanga community (Black, 2016; Martin, 2017). Our strategy for data collection for each objective has been outlined in greater detail in the following sections.

3.1 Document how the wetlands within the Ruamahanga catchment are used, managed, and defined

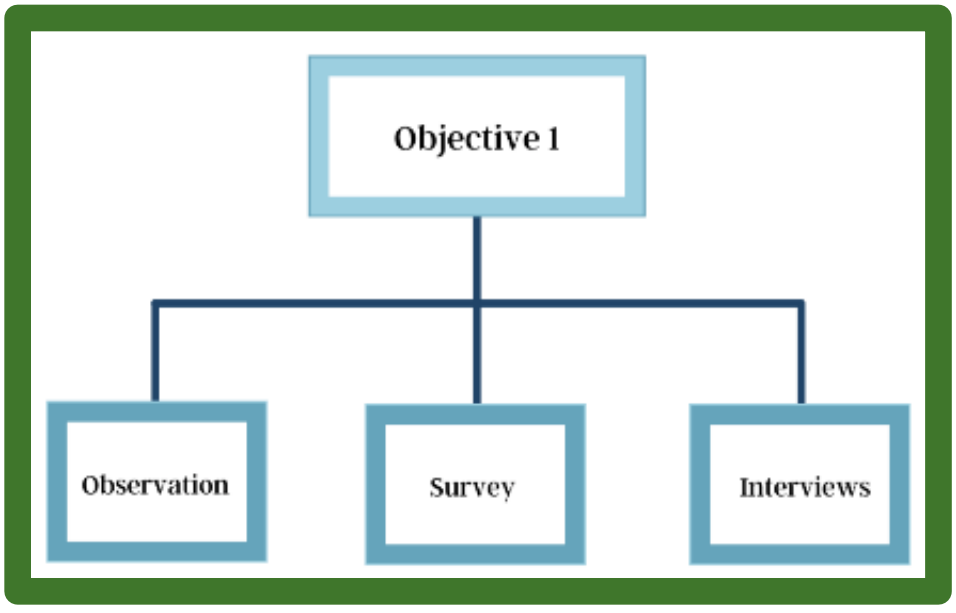

Figure 10. Methods used for objective 1.

Our first objective was to learn more about the wetlands within the Ruamahanga catchment by focusing on evaluations of their ecosystem services, how they are presently managed, and the way they are perceived by the Wairarapa community. We used remote observations, interviews, and surveys to aid in our data collection. Due to the COVID-19 pandemic, our team had to rely on online interviews and virtual site visits.

To develop a sense of the physical terrain of the region, we used Google Maps and online videos to understand how the wetlands and surrounding communities are situated around the catchment. The research included observations and compiled documentation about how different stakeholders interacted with the land in the catchment. This gave us an understanding of the overall geography and landscape which offset not being able to visit the site directly.

We utilized previous data and information gathered from the local communities of the Ruamahanga catchment that developed our understanding of public perceptions of the wetlands and their management. This provided data on community perceptions of economic, social, cultural, and management aspects of wetlands before the survey was conducted. The information not only reduced the time required to collect and analyze data, but also helped in shaping our survey and interview questions. We reached out to individuals directly through email and leveraged our sponsors' local contacts to distribute a survey to the groups they worked with. These surveys were documented with the consent of the interviewees (see Appendix A).

We created a baseline survey in Qualtrics to evaluate how representatives from diverging opinions viewed aspects of land use, restoration, and preservation. This survey was sent out electronically to contacts provided by our sponsors and snowball sampling was used to accumulate more responses (see Appendix B).

To learn more about how the region is defined by government and management agencies, we reached out to local government representatives. Before contacting these organizations, we conducted research to establish the framework currently in place for wetland management planning in the region. We contacted the Department of Conservation (DOC), the Greater Wellington Regional Council (GWRC), the South Wairarapa District Council (SWDC), the Masterton District Council, and the Carterton District Council through contact portals, email contacts, and our sponsors. Their responses were used to learn more about how the wetlands were managed at the time, including conventional management practices (see Appendices C and D).

Semi-structured interviews with experts in management, economics, the environment, cultural values, and ecosystem services provided the opportunity to gather stories and experiences from a variety of points of view (Ward, 2020, p. 46). We chose a stratified sample to ensure that we had ample perspectives to draw conclusions regarding the wetlands. The interviews were conducted over Zoom. After conducting these interviews, we used snowball sampling to expand our contact lists, sources of expert information, and sample size. We asked participants if they could refer us to two or three people or groups that had a stake in wetland management. Contacts gathered from snowball sampling aided in our objective to include multiple demographics or stakeholders (see Appendices E and F).

3.2 Identify and record the Ruamahanga community's perspective on wetlands and ecosystem stewardship

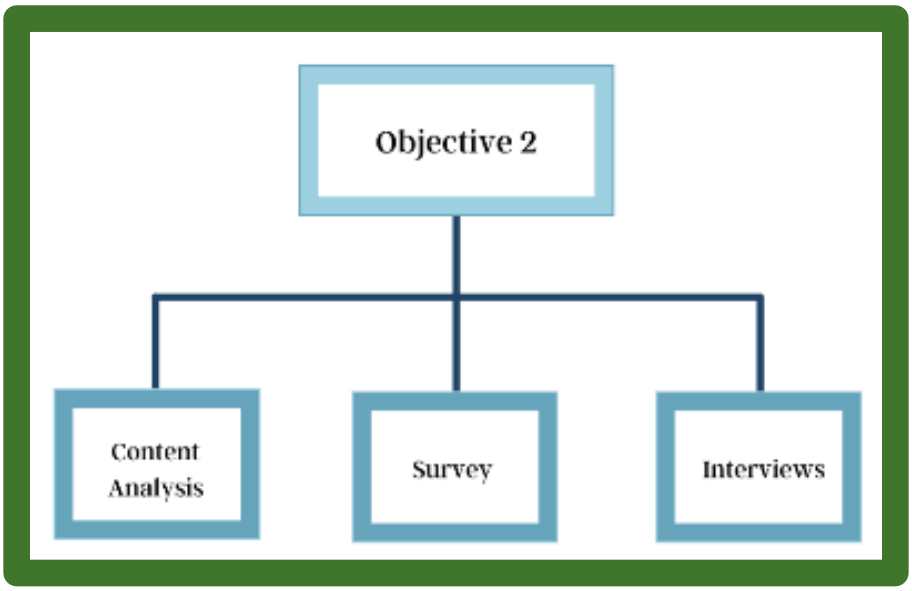

Figure 11. Methods used for objective 2.

Our second objective was to identify and record the Ruamahanga community's perspectives on wetlands and ecosystem stewardship. In order to further understand the Māori sense of place and connection to the land, we conducted content analysis and in-depth interviews. We asked all interviewees to discuss their relationship to the land, and to expand on the role that wetlands have had in their lives.

Content analysis was used to collect information on Māori frameworks. An excellent collection of video interviews and audio stories called Lake Stories provided initial insights into the Māori relationship with the wetlands (Lakes380, 2020). We listened deeply to these recorded lake stories and coded the interviews for the cultural importance of wetlands and how that impacts Māori sense of place. The information collected enabled us to tailor our interviews more carefully to uncover nuanced perspectives.

We conducted semi-structured interviews to gather information on how Māori culture is tied to both their views of the wetlands and their use. We worked with Rawiri Smith, a prominent restoration advocate and liaison between our team and the Māori community, to develop a list of contacts who elaborated on the cultural relationship between Māori people and their perceptions of wetlands. We offered these contacts the choice between filling out our survey, scheduling an interview, or both. Respondents from groups such as Kahungunu ki Wairarapa, Rangitāne o Wairarapa, and those involved in the Lake Stories project discussed the history of wetlands, ecosystem stewardship, and sense of place.

We reached out to other contacts, including farmers involved in organizations such as GWRC and Federated Farmers, as well as three local district councils via email to ask if they would be willing to participate in interviews with more focused questions about ecosystem services and management aspects of wetlands from a Māori perspective (see Appendix G). Some of our interviews included more questions across a broad social context. The information documented varying importance of wetlands and people's sense of place in different sectors of the community. We met with all participants over Zoom due to COVID-19 restrictions.

3.3 Understand how economic value is determined for wetlands in the Ruamahanga catchment

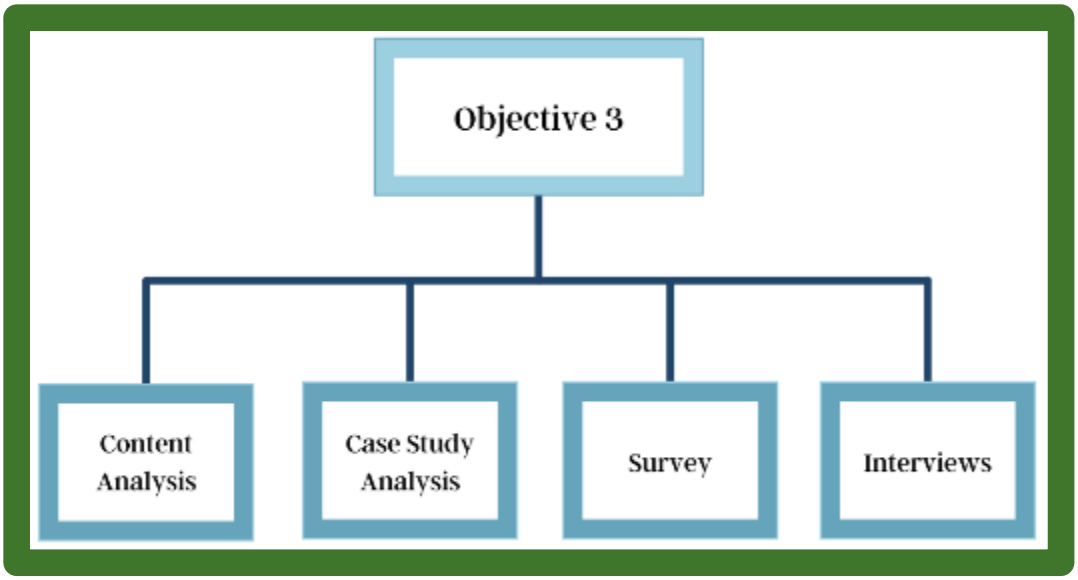

Figure 12. Methods used for objective 3.

In order to determine how economic value was understood by stakeholders in the community, we used content analysis, case study analysis, and interviews. Content analysis was used to estimate the economic significance of preserving wetlands, economic gains of land development, and how much economic factors influence decisions made on wetland restoration. Interviews were conducted to determine how experts and others viewed the economic value of wetlands. From this, we were able to analyze how much each group prioritized the features of wetlands and the economic impact of wetland conservation.

Case studies on economic evaluation methods of wetlands were used to identify which wetland features have traditional economic value and further examined to determine what restoration strategies had been used in the past and how they affected the economy. These case studies indicated stakeholders' perspectives on wetland restoration as it related to economics. This information was used to direct our research population for interviews and surveys. Case studies were accessed through resources provided by our advisors. In particular we evaluated an important case study from Canada which recommended the concept of two-eyed seeing. This concept incorporates diverse perspectives in environmental decision making.

From previous case studies, we determined that a variety of interests can be found in economic perspectives. For example, while some farmers may seek to develop the land for farming, others seek to preserve the waterways for fishing. Many environmental advocates argue that wetlands contribute to the economy through natural benefits such as their preservation of biodiversity, pollution control, and flood protection. Therefore, in order to truly understand the economic value, interviewing a range of stakeholders was necessary. The actual economic value of the wetlands and the perceived economic value had the potential to be conflicting, so we ensured that many perspectives were solicited and represented. The information gathered from the baseline mapping survey was used to identify possible groups in the community to interview. These groups provided information on the value wetlands had for them and explained the importance of economic considerations with regard to wetland preservation and restoration.

Interviews were conducted over Zoom and recorded with the consent of participants. Speaking directly with individuals who are impacted by the economics of wetlands allowed us to truly understand their perspectives on preservation and restoration (see Appendix H).

Chapter 4: Results and Discussion

To view the raw data collected during results, please see Appendix J for written survey responses and Appendix K for interview quotes.

4.1 Results

After engaging with stakeholder surveys, interviews, and stories about discussing the environmental, cultural, social, and economic perceptions of wetlands, certain themes and trends became apparent. The most significant finding was a feeling of commitment to the land and a goal of preserving and restoring the wetlands for future generations. However, this was offset by a lack of feeling that other stakeholders understand their perspectives. Furthermore, they had unique world views which influenced their values and perceptions of wetlands. The survey and interview participant breakdown is shown below in Figure 13.

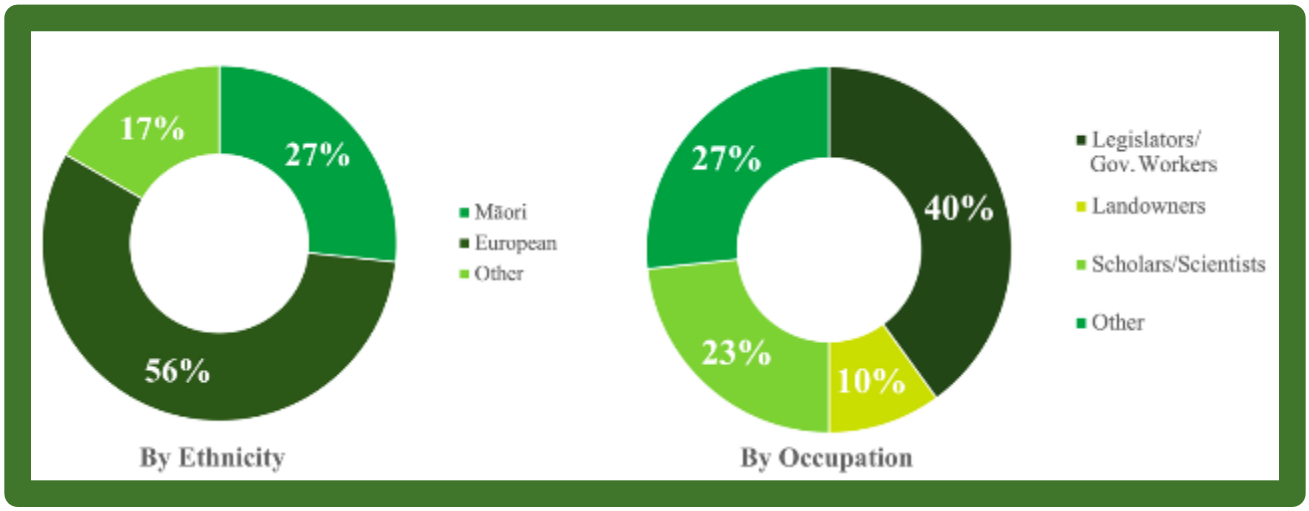

Figure 13. Survey Participant Breakdown (n=30).

Objective 1: Wetland use and management in the Ruamahanga catchment

The four main themes that came up in this objective were the importance of biodiversity, sustainable land practices, policy and regulation from local and national bodies, and cultural representation in decision making.

Our findings from objective 1 revealed that the community generally identifies with the landscape and appreciates their close connection with nature. We found that groups in the Ruamahanga catchment recognize the importance of biodiversity and want to work to restore and protect it. When asked in our survey "What are five words you associate most with wetlands?", the most frequent responses reflected the variety of wildlife and diversity of the wetlands with words like habitat, birds, fish, life, and abundance (see Figure 14, below).

Figure 14. Survey responses for "What five words do you associate with wetlands?" (n=30).

The native species in wetlands contribute greatly to biodiversity and are crucial to the wellbeing of the ecosystem and the people who make a living working off the land. When surveyed about the importance of wetlands, biodiversity and the protection of native species was mentioned in 59% percent of responses.

When Māori first came to the Wairarapa Moana, they were not aware of how their fishing practices could impact the native species in the catchment. One lake story participant in "What my grandfather told me" elaborated on the evolution of management techniques to compensate for the loss of biodiversity (Lakes 380, 2020).

> *"They were always careful not to take too many [eels] because the earliest people that had arrived here know and acknowledge that some mistakes of the things [they] got up to. They realized that if they destroyed the area that they were living in or put it under threat then they weren't gonna survive themselves. So that's where they developed smarter management practices..."*

After recognizing and taking responsibility for their past mistakes, Māori prioritized maintaining the integrity of the biodiversity in the catchment. This would constitute how they managed and utilized the land. Certain fishing areas would be closed off for periods of time to allow the tuna population to recover. They also restricted the times in which people could go eeling (Lakes 380, 2020). Māori have always recognized the importance of biodiversity and were able to adapt their land use practices to achieve balance in the catchment. These sustainable practices allowed the native species to flourish which further enhanced the environmental health and productivity of the wetlands.

We also learned that most landowners strive to be good caretakers of their land. It is important to note that the people we engaged with are not representative of the entire population of landowners. However, all the farmers we talked to practice careful fencing and other means to restrict livestock to certain areas along the waterways. Many of these famers also plant trees, introduce dung beetles, and manage weeds as part of ongoing strategies to protect wetlands. As one participant noted,

> *"To restore or protect existing wetlands, by excluding stock, you're going to improve biodiversity because on the farm here, sheep and cattle eat everything. As soon as you fence the stock out you get immediate benefits from a whole range of different plants that weren't growing before which can now take hold."*
>
> *- Michael Birch*

Farmers who have gone through the legal processes of identifying wetlands on their property can be supported with subsidies or labor to aid in fencing and planting native species. We spoke with government officials from local and regional management groups such as GWRC and SWDC, as well as with farmers in the Ruamahanga catchment. All these groups indicated that the funding is often not publicized, and some farmers are not aware of the resources that are available to aid in the restoration process.

> *"We don't really actively advertise those grants, but generally farmers that are interested will call us. A lot of farms in the region have farm environment plans so I work with about 60-70 farmers down in South Wairarapa and there's a bunch more land management advisors like myself who have similar farm plan portfolios. So those people that we work with typically know about the opportunities around funding availability, but if you're outside and not part of that farm plan program then it's harder to know about what the opportunities are to get funding to do that type of environmental work."*
>
> *- Kolja Schaller*

When asked "Which community and or governmental organization(s) or individual(s) do you think should be responsible for the restoration of wetlands in the Ruamahanga catchment?", 73% of respondents said that governmental organizations, community groups, and individuals alike should be a part of the restoration process.

> *"I think community should be empowered to drive restoration work supported by government and partner organizations. Community led conservation builds a sense of ownership and investment in delivering good long-term outcomes and builds the connection people have with their local environment and each other."*
>
> *- Biodiversity advisor*

> *"Regional council, local council, iwi, and community. We are all responsible for the decline of wetlands it needs to have community buy in to succeed."*
>
> *-Part-time farmer*

Interviewees echoed this same message, emphasizing the need for discussions, and indicated developing a mutual understanding between local and national groups regarding different stakeholders needs. This would help achieve a balance between regulations and policies that are imposed.

While farmers spoke of close connections with the community and a shared vision for sustainability, it was noted that they felt regulatory policies have worked against collaborative and locally sourced management practices. Although the goal of these policies is to improve the health of the land and people, some farmers believe that efforts between government and local catchment groups have not always been beneficial. One farmer indicated that some government

policies have had a negative impact on the farming businesses and that they limit innovation in the farming community (Anonymous farmer, personal communication, March 1, 2021). He continued by saying that farmers are often overwhelmed by new regulations and that guidance, education, and support are the most crucial aspects in changing this (Anonymous farmer, personal communicaton, March 1, 2021). Another added,

> *"Now I'm a bit older, I kind of realized that to get behavior change, people got to believe it. So [regarding] penalties, the stick's not as good as the carrot. I think they need to provide, [incentives] instead, so that people will get better understanding, and they know what to do with them."*
>
> *- Michael Birch*

Other farmers indicated a lack of time or understanding when it came to wetland restoration and the importance of wetlands, as many of them are just learning the necessity of sustainable practices and may not have experience in this area (K. Williams, personal communication, March 1, 2021). This was supported by our survey responses. From the data we collected it was clear that although 83% of respondents strongly agreed that resources should be spent on restoration, only 37% of respondents strongly agreed that they are confident in why the wetlands are important to the community and the ecosystem, indicating a lack of knowledge.

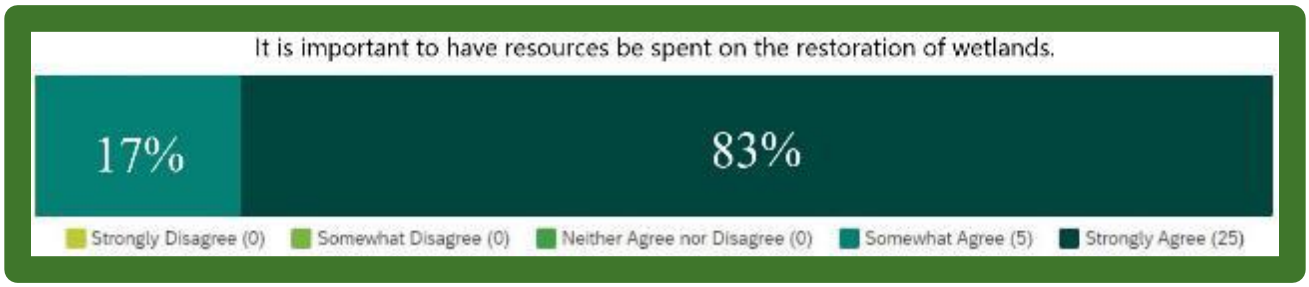

Figure 15. Survey responses on wetlands resource allocation (n=30).

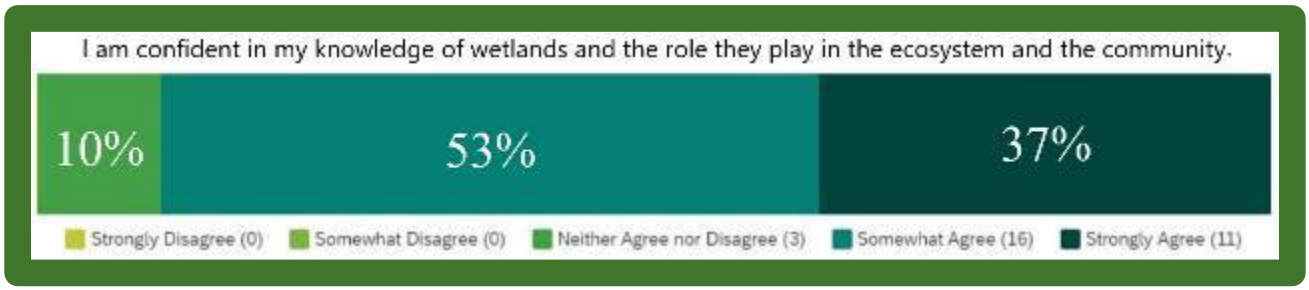

Figure 16. Survey responses on knowledge of wetlands (n=30).

Overall, the farmers we interviewed want to work sustainably and contribute to wetland restoration but feel that some policies and management have hindered progress that could have emerged more organically from long term stewardship.

> *"I've come to realize that while there's a lot of people that have good intentions, if the government doesn't put policy in place to support that, it's very hard work. So, with freshwater policies coming into play, it forces people to have conversations that they wouldn't have had before ...and it forces you to have to treat water differently and not think of it as your intrinsic right to have it. Because we're very lucky in New Zealand that we have a water source, but we need to look after it."*
>
> *- Kereana Sims*

Another topic that came up in our interviews was cultural representation regarding wetland management. Māori cultural values are inconsistently represented in wetland management and decision making. In recent years, a more holistic view of wetlands and the environment are being considered by the wider community however, this view has not always translated into progress with the government. In public spaces such as Lake Wairarapa, cultural values are starting to be recognized and incorporated, but on private land these values are not always integrated into the decision-making process (M. Birch, personal communication, March 2, 2021).

> *"I just wanted to say, many people as individuals are starting to understand, you know, the whole narrative...in support of Māori getting back to the traditional spaces and having more authority... I think a lot of our people within those institutions, feel the same but they are bound by those institutions."*
>
> *- Raihania Tipoki*

Objective 2 Perspectives on wetlands, ecosystem stewardship, and sense of place

Through content analysis of Lake Stories, surveys, and interviews, we discovered reoccurring themes that appeared across our data referred to sense of place, connection to the land, connection to tradition, and cross-generational thinking.

Following our literature review we found that it was necessary to gain a deeper understanding of sense of place and connection to land. We collected data pertaining to sense of place specifically in the wetlands of the Ruamahanga catchment. In our survey and interviews we asked respondents if wetlands had a special meaning to them and to elaborate on their sense of place. We heard from a sample of participants representing a variety of connections to the region: landowners, Māori and non-Māori residents, farmers, and other community members.

The responses captured the range of deep connections that are held in the Ruamahanga catchment.

> *"The Ruamahanga culturally, spiritually, and physically unites all the iwi, hapū, and whānau of the Wairarapa. We are water people and originally that was literally our grocery store."*
>
> *- Māori survey respondent*

> *"...Māori, we're not just here as individuals. We're here as a very long line of, you know, a long line of life really, I was going to say, of other people...Most Māori…there'll be someone in your family, your hapu, your iwi...your tribe who will know your ancestry right back to the sky and the earth…we can trace their lineage back to all these places and believe that in the spirit world that those, all of those things that came before us are still there and in the spirit realm."*
>
> *- Raihania Tipoki*

> *"Wairarapa tangata, Wairarapa whenua, Wairarapa Moana. Ko au te Wai ko te Wai ko au." [Wairarapa people, Wairarapa land, Wairarapa Lake. I am the Water, and the Water is me.]*
>
> *- Māori survey respondent*

One survey respondent also noted that the wetlands are a traditional food source for Māori, a source of mahinga kai [food gathering place]. Eeling practices have been passed down by Māori for generations. Following a content analysis of the video "Whakapapa Kōrero - What my grandfather told me" from the collection of video interviews and audio stories called Lake Stories, we noticed that five out of six interviewees had shared a memory relating to eeling (Lakes380, 2020). Most of the stories involved a family member introducing them to eeling and teaching them how Māori traditionally harvested eels [tuna]. These findings in particular emphasized how the Māori sense of place is tied to the wetlands.

> *"I've been out here as far back as I can remember with my Grandfather. He taught me everything that I know with regards to fishing in general."*
>
> *- Māori Lake Stories Interviewee*

> *"...my father and his family, they were one with the lake. You couldn't separate them, that was home."*
>
> *- Māori Lake Stories Interviewee*

Figure 17. "New Zealand longfin Eel Anguilla dieffenbachii" by Tony Foster is licensed under CC BY-ND 4.0.

Māori also expressed ties to the land through traditional practices following the birth of a child. When a baby is born, Māori perform a tradition called tohi. Following our content analysis of the video "Tohi" from the Lake stories, we asked Rawiri Smith, who spoke in this video, to go more in depth about this tradition (Lakes380, 2020). After speaking with him, we were able to gain a deeper understanding of the spiritual importance of childbirth and how it exemplifies the Māori sense of place.

> *"A tohi was when a baby was blessed and so a rough approximation of that might be a baptism, but it was more about the blessing of the baby then, and the blessing was in water. And so, the place where two waters meet in a confluence... at that point the mana of one is meeting the mana of the other...and so babies from hapū around the lake would take their babies to be blessed, ...after the waters have woven, so a bit of bubbling before then and then it's still. And that's the place where there's two mauri - the mauri of Lake Wairarapa and the mauri of the Ruamahanga river coming together so this is then an auspicious place where you might want to bless a child."*
>
> *- Rawiri Smith*

During the tohi, the family stands on the riverbanks and sings an oriori [lullaby] that they learn before the child is born. After the child is born, Māori bury the placenta in the whenua [land, also placenta]. Through this process, "Māori essentially root themselves in the land" (R. Smith, personal communication, February 23, 2021). This tradition highlights the cultural and spiritual ties that Māori have to the land and the importance of the waterways in strengthening this connection (R. Smith, personal communication, February 23, 2021). This culturally significant blessing has been impacted by 'the cutoff', shown in Figure 18, which obstructed the confluence, disrupting the mana and mauri of the two bodies of water.

Figure 18. 'The cutoff' (Google Earth, n.d.)

The decision to manage the wetlands in this way has prevented the traditional blessing from taking place and caused distress and trauma in the Māori community and to cultural heritage (Lakes380, 2020).

> *".... when you cut off a waterway, the biophysical thing is about...not wanting flood waters here, there's a social consequence, and that social consequence is now a river isn't meeting a lake, and you can't be blessing your children because now it doesn't have the mauri of the river, and there's nothing meeting the lake. So rather than this being a river, now it's an outcrop of the lake. And the stagnant water that's here, even though it looks beautiful, um, there's a mauri life force that's not there...that was the mauri that the baby would be taken."*
>
> *- Rawiri Smith*

In additional to emotional turmoil that comes from changes in land management, Māori people have suffered because of displacement and loss of access to the economic resources in the Wairarapa Moana.

> *"During my time I can remember the clothes lines being filled with produce, with drying of the eels, with the birds, the geese, the swans. We were never hungry, and we never had disease, we were healthy. I don't see that happening today. I feel that our people are sick like our water and our whenua [land]…."*
>
> *- Teresa Aporo*

> *"...this area was heavily populated by Māori villages all around Wairarapa Moana. Now, because of the draining and everything will have those traditional villages that are, that are still that you know you can still see them on the landscape. They're all owned by the pakēha settler families. And you can't get to them unless you have permission from those families in these, these places are where our ancestors are buried... the people said so many of our whānau in poverty... living... on the side of Masterton so that about an hour away from where their ancestors used to live, and they, you know, by and large, they don't really know what... the history is that they don't know what their forefathers went through."*
>
> *- Raihania Tipoki*

This marginalization and other socio-economic disparities have forced many Māori to prioritize making a living and surviving over participating in wetland restoration efforts. You must come from a place of privilege to have the ability to contribute to such efforts (R. Tipoki, personal communication, March 3, 2021).

> *"...anyone living in poverty, they're not thinking, you know, what's happening next year, you know what's happening next month or even what's happening next week they're just like, what's happening this today like you know what am I gonna do in the next few days."*
>
> *- Raihania Tipoki,*

To change this dynamic, many are hopeful that education and collaboration within the community can restore wetlands for future generations.

> *"A lot of Māori are moving back and with a combination of having the people caring for the waterways is actually helping the whenua [land] and when they see this… it's really great to see… we've run holiday programs where the teenagers and the children are out there planting and when they can come back and see those plant grow, it makes them grow, spiritually, culturally. And it's a good feeling they get and its sort of restoring our waterways and it sets them up to protect."*
>
> *-Teresa Aporo*

The idea of providing for future generations was identified as a huge motivator for Māori and other stakeholders including farmers. We interviewed a national meat and wool chair of the Federated Farmers. His family farm has been passed down for 166 years. From his interview, we found that farmers also feel a deep sense of responsibility for their land, although it may come from a different kind of relationship to the land (Anonymous farmer, personal communication, February 28, 2021).

> *"We believe that those who have gone before us have given us a significant opportunity to live the life and have the opportunities that we do, so we have a strong responsibility to provide those same opportunities to future generations and learn from those who have gone before us, and everything we do is based around our land and our community."*
>
> *- Anonymous farmer*

Farmers felt a strong sense of responsibility to feed their local community and they are contributing to an important economy through their exports. There has been a positive push towards running family farms over the past few decades, which can allow farmers to incorporate more sustainable practices within the realm of farming in order to provide opportunities for future generations.

> *"A lot of farmers in our region are becoming intergenerational because of certain reasons. It wasn't perhaps the same 30 or 40 years ago or 50 years ago and a lot of the commitment now is to become intergeneration landowners, or land managers, or land stewards or guardians. And so their values and commitments have almost seen a change in more recent times and that then gives the opportunity to focus on much longer term horizons which has huge environmental benefits when you're not thinking about how much you can sell your land for.... and make for now and how that can be sustainable for your family now and how can you ensure that that's sustainable through to future generations including how can I be sustainable within the resource use."*
>
> *-Anonymous farmer*

While the idea of responsibility was shared as a common descriptor, essential worldview differences about the extent of relationship to the land could be seen in more complex conversations. Many members of farming groups had little to no awareness of the Māori cultural significance of wetlands even though they share similar values. We found that famers often felt vilified by other groups for not being more proactive about wetland restoration, despite the desire of many to be good ecosystem stewards in their own right.

> *"Farmers normally get the blame, but they're an easy target. We have to work with everyone in the catchment to come up with a solution."*
>
> *- Esther Dijkstra*

"The farmers are blamed, and that is and, often, the blame comes from a significant of lack of understanding and self-responsibility. It becomes a very emotionally damaging process for, especially, rural communities…the blame comes from very polarized views…and significant lack of understanding"

- Anonymous farmer

In the simplest framing, it was clear that residents are connected to the wetlands and to the regional landscape in general. Survey responses and interviews confirmed that most had visited more than one body of water in the Ruamahanga catchment.

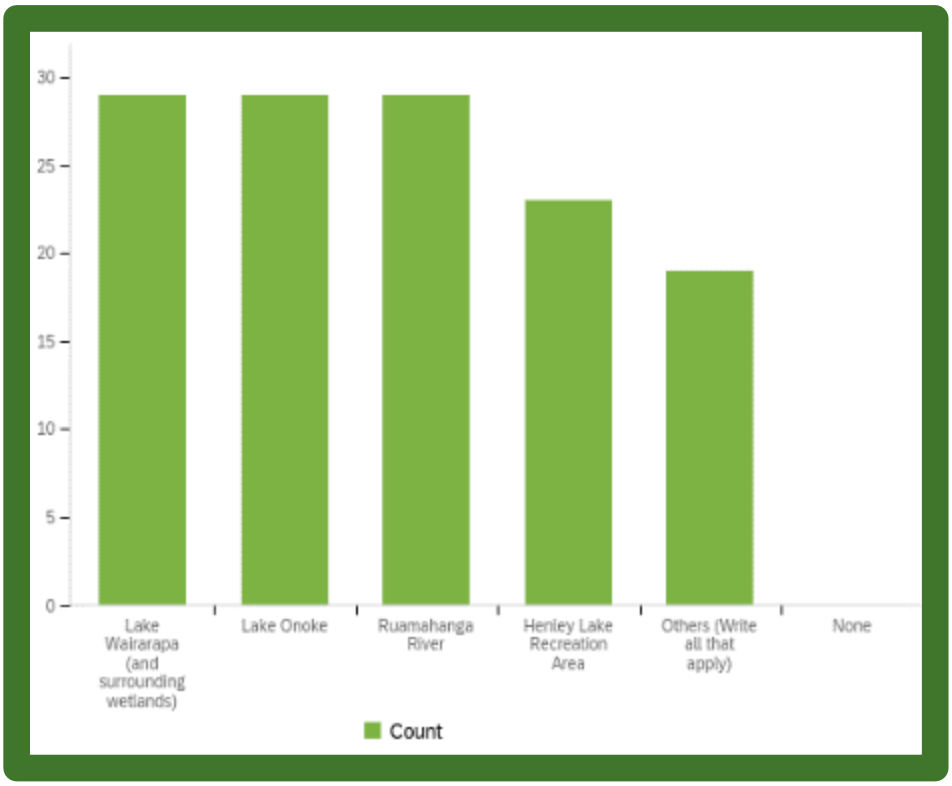

Figure 19. Survey responses to bodies of water visited in the Ruamahanga Catchment (n=30).

These same respondents also indicated their desire to spend time in nature and displayed interest in protecting and restoring wetlands.

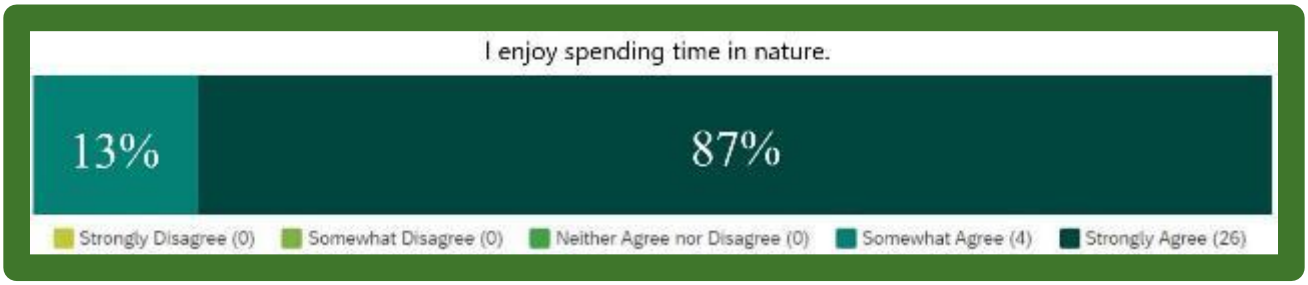

Figure 20. Survey responses about spending time in nature (n=30).

We also asked participants if they thought anything needed to be done to the wetlands in the catchment. We received the following answers from four respondents:

"Continue to restore and enhance."

- Sheep and beef farmer

"Much needs to be done to restore the existing and re-establishing wetlands in the catchment."

- Retired/Treaty Settlement Negotiator

"There needs to be greater awareness of importance of wetlands and promotion of the benefits they provide, as well as more funding on restauration of wetlands."

- Local authority for the Masterton district council.

"Absolutely. Protect what we have, add to what we have and curb their reckless exploitation. They need to be viewed through a new lens - not wasted farmland to dump effluent in but an intrinsic part of our environment."

-Anonymous Fish and Game member

We found distrust with regards to the depth of sense of place, and the ability of others to recognize a difference between kinship and ownership, and whether or not that fact has fundamental implications for creating a unified understanding of the catchment.

"...If you have a connection then you feel a sense of- and it's not ownership- but you feel a sense of kinship. And then you actually will do your best for whatever it is that you're doing, the stuff that's making [a] connection with the wetlands that you feel like you'll do your best in that wetland because you've made that connection, just like people connections."

- Kereana Sims

Objective 3 Valuation of wetlands in the Ruamahanga catchment

Through content analysis, surveys, and interviews, we discovered that there is a continuum of perspectives on the value of wetlands, and that the depth of knowledge of them is crucial to understanding their value. Most survey respondents indicated that wetlands carry a broadly defined "economic value" as shown in Figure 21. However, based on interviews conducted, how this value is understood varies. The concept of two-eyed seeing can be applied to the valuation of wetlands as well. Incorporating the western and indigenous view in harmony is crucial to understanding their importance. The consensus was that economic gain was not the primary motive for wetland restoration. It was also understood that there is a lack of economic resources and incentives targeted toward wetland restoration.

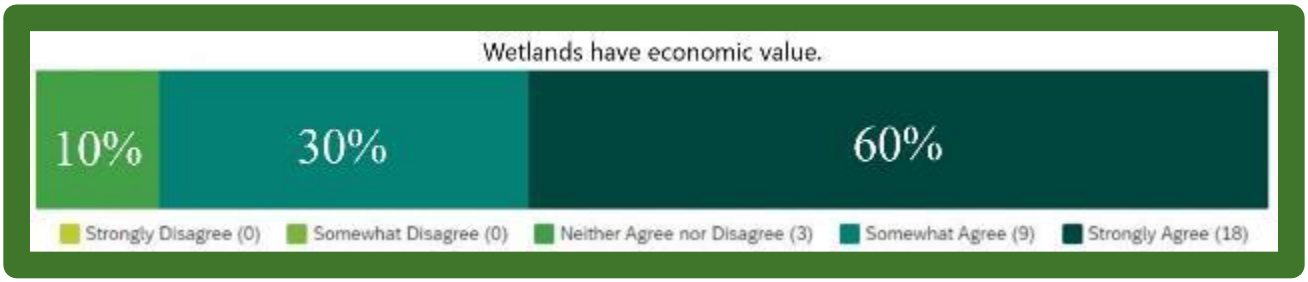

Figure 21. Survey responses on the economic value of wetlands (n=30).

There are different perspectives about the value of wetlands between critical stakeholders in the community. As mentioned in objective 2, Māori see wetlands as holding tremendous cultural, environmental, and economic value. When talking about the economic value of wetlands, the Māori interviewees referred to traditional medicine and practices, both as a place of significance and as an economic opportunity through the native plants that can be used for weaving and medicinal purposes.

> *"Swamp manuka grows in wetlands. So, we can say, if you put this product into wetlands, you can get a return."*
>
> *- Rawiri Smith*

> *"...I do see organizations coming up...woven flax, woven beds for babies...Māori owned companies, looking at making coffin from flax and other natural fibers. We've got a native nursery on our marae down here...just established last year. And I think we're going to have plants for sale. Hopefully by this year, which will be income for the Māori. Yeah, a lot of those plants will be sold to the local landowners who are fencing off waterways and things like that so you know that definition, definitely commercial growth that will support the reestablishment and regeneration of wetlands here."*
>
> *- Raihania Tipoki*

Although traditional farming practices minimized the natural values of wetlands, more New Zealanders are now recognizing the worth of wetland ecosystem services. Figure 22 demonstrates that the Wairarapa community understands the importance of the ecosystem of wetlands. With the increased acknowledgment of wetland environmental benefits, the presence of wetlands on private properties has started to add economic value to the land.

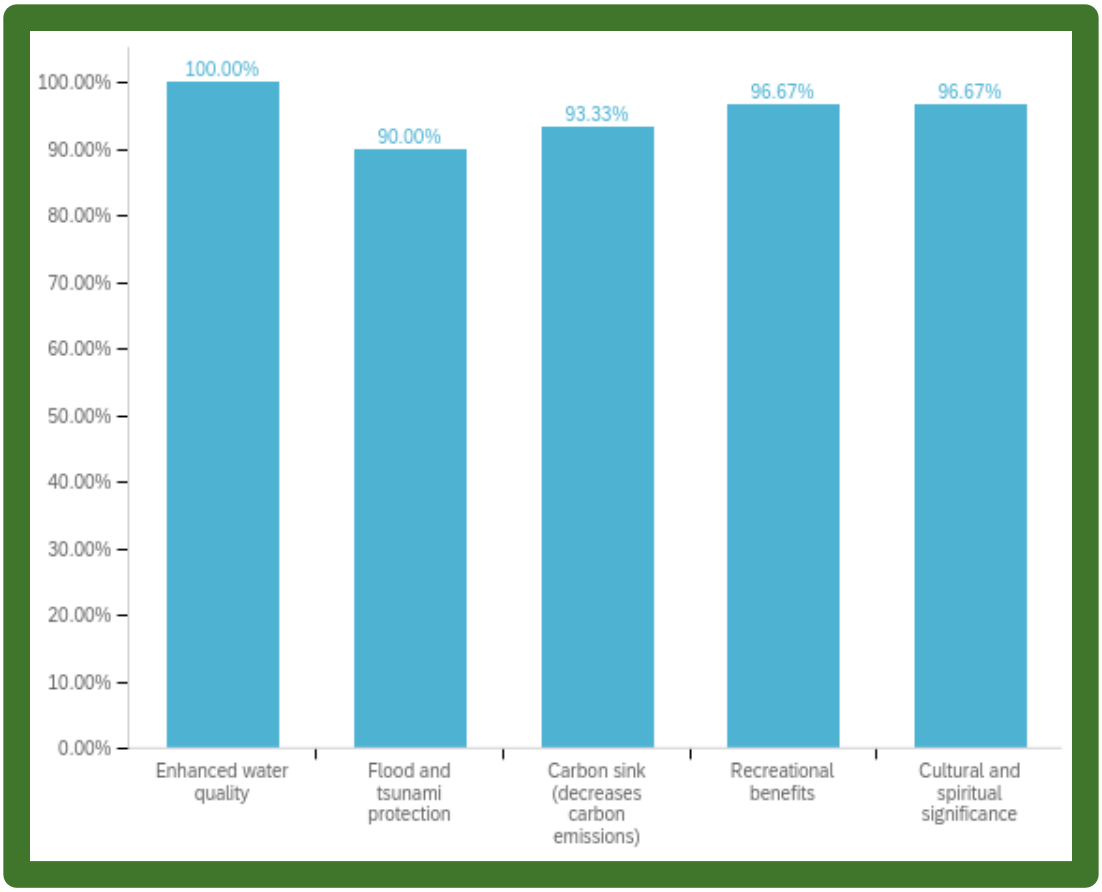

Figure 22. Survey responses about wetland benefits respondents were previously aware of (n=30).

Many of the farmers interviewed indicated that wetlands increase the value of their farm by preventing stock loss and providing a natural filter for their land. One example of this is effluent ponds, which farmers are required to have on their property. Rawiri Smith explained that while both effluent ponds and wetlands can reduce excess nutrients from water at the same scale, effluent ponds cost approximately 450,000 NZD to install compared to wetlands restoration cost of approximately 45,000 NZD (R. Smith, personal communication, February 2021). Other farmers also spoke to the value wetlands could have on their land.

"The value of our farm in the recent time...started to be recognized by the footprint relief by what we do. In the past if you have two farms that produce over $100,000 (NZD) and one has a nitrate leaching rate double the other one you would pay the same value for the farm. Nowadays that's actually not quite the case…"

- Vern Brassel

"...environmental benefits, but also, more importantly, stop stock getting stuck in the mud in the summertime and losing them. That was a half dozen, maybe a dozen sheep per summer. Even if you were more vigilant and pulling them out, you still spend an awful lot of time doing it. So, it came at a cost to the farming operation, so it was a really good win-win. Get the stock out. So, saved time losses, but also provided the environment benefit."

- Michael Birch

Wetlands are a source of economic revenue through tourism. In two cases, Dr. Stephanie Tomscha and Rawiri Smith recall Wairarapa community members, as well as travelers, visiting wetlands for the recreational benefits (S. Tomscha, personal communication, February 25, 2021). Rawiri Smith also commented on how the cultural significance of wetlands encourage people to pay for their visit.

"What could happen the other parts, it can be tourism. People like to go to different places... these forested area with the short walk through wetlands that could be a whole different place…We could also extend the [Māori] stories that we tell for tourism to be stories that we tell for education...we might get people to pay to come on the trip. We might ask them for a whole cheaper cost, so we have the tourism and sustain the education."

- Rawiri Smith

As mentioned in objective one, funding opportunities are not actively promoted to the communities that would benefit from them. Only wetlands that are deemed environmentally significant after inspection will receive funding (K. Schaller, personal communications, February 25, 2021). Numerous farmers interviewed indicated a need for more incentives. The processes after identifying a wetland on their property often discourage farmers from taking action. They feel that increasing funding would also increase the likelihood of restoring wetlands by relieving the financial burden.

"[The biodiversity team] have a specific program …farmers can contact the regional council if they're interested, a biodiversity advisor will make a trip out to the farm and have a look at the site that the farmer is interested in fencing or doing some restoration work…. I think the fencing [support/reimbursement] is at 50% up to a maximum contribution of $20,000 NZD and that would also support planting at $1,000 NZD a year for three years, and that's just for the farmer to buy some plants which they would plant themselves. If there were significant plant issues, they would provide up to $5,000 NZD for up to three years for weed management."

- Kolja Schaller

"The government provides some funding, and currently because of covid…there is a fear that there'll be a collapse in the economy in terms of people being made unemployed. There are lots of grants, which some of us are working…to try and get money to do things in the environment…There will never be enough money."

- Ian Gunn

"I don't know if you've had a crack at restoring a wetland but it's a lot of work…the planting is ongoing but then the weeds and things…that is often a challenge financially."

- Karen Williams

Ultimately, we found that most members of the community understand the ecosystem service values wetlands have. Although the economic value of wetlands is significant in influencing a farmer's decision to restore them, economic gains from wetland restoration have not been greatly considered. Some farmers indicated that they felt overwhelmed by the requests being made to fence off and protect their wetlands. Many private landowners hope to have more funding available toward wetland restoration for fencing and planting. More farmers are starting to see that wetlands can provide long-term benefits to a farm's overall asset value. Farmers see themselves as caretakers of their land and they feel proud to be able to supply food to their community and to the rest of the world.

4.2 Discussion

Across a variety of perspectives and cultural backgrounds, some themes were continuous. We have seen a common ground amongst participants regarding a commitment to the land and a desire to preserve and protect it for future generations to enjoy and appreciate. Although there is a consensus that people want to collaborate on protection and restoration efforts, we noticed there is a lack of understanding between diverse groups and there are many different opinions that are not speaking together as one unified voice. This disconnect has raised questions including: What does collaboration mean? How do we foster trust among different groups? How can collaboration incorporate viewpoints and values of these groups?

There was a shared desire amongst interviewees to leave the ecosystem in a better condition than they found it, which indicates a sense of responsibility to restore wetlands. Those who are inclined to preserve wetlands do so because they are connected to the land they occupy, Māori through their ancestors and traditions, and farmers through stewardship of the land that their family has lived on for generations. This trend of cross-generational thinking reflects a

commitment to something bigger than themselves and is a primary motivator for wetland advocacy.

When speaking to Māori participants especially, it was clear that they feel a deep sense of connection to the land and water. Even though all the individuals we interviewed were highly familiar with wetlands and their benefits, many who were not of Māori descent could not speak to the cultural significance of wetlands. This reflects a lack of understanding and widespread awareness for this perspective. The sense of place and relationship with the land is something that has great spiritual significance, and the wider community could benefit from developing their own personal connection to the wetlands. Without this understanding, it would be difficult to accurately represent or support Māori ideals when considering regulations or the timeline for wetland restoration.

Contrary to public perception, farmers are not opposed to wetland restoration; they lack the means to incorporate sustainable practices on their land. Many regulations implemented at the national level do not indicate an understanding of the needs of the farming community and can limit innovation. How do you maintain a balance between regulation and innovation? Even if farmers want to collaborate on restoration efforts, they are often discouraged by the obstacles that result from national regulatory bodies. This raises a few questions: How can this be changed so that farmers can be supported more in their restoration efforts? What systems could be put in place that dissolve doubt amongst the farming community? How could landowners become more educated on sustainable practices and alternatives to traditional methods?

Many community groups have the ability to meet and engage in productive discussions about wetlands, but progress cannot be made unless government officials and policy makers are willing to listen to the needs of the people in the region. Participants expressed that having a sense of personal responsibility to the health of the land and water would also promote restoration. They indicated that if more people had a connection to their land and a desire to protect it, they would actively seek out restoration projects rather than being forced to do so. The lack of urgency for restoration projects can be attributed to a lack of awareness about the issue at hand – that the ecosystem is suffering greatly from increased pollutants and sediments in a way that is not sustainable. How do you emphasize the urgency of these matters?

"What if the timetable was looking at the life of a river? So now what's the timetable? Whole lot of ecological things are at tipping points. We are doing irreparable damage…for those in the waterways their population are at a crisis…they can't breathe in the water anymore…What about the life of Lake Wairarapa? When do we consider the lake itself, as opposed to what it's useful for? So, it's on life support right now. How long do we wait for it to be on life support before we move the gate? In terms of things Maori, what's the cultural reason that we have…what's the blossoming of lake Wairarapa like? When you dive into it and you look under water. It's a barren. It's not blossoming."

- Rawiri Smith

Everyone that we spoke to mentioned that education was a crucial first step to increase awareness of the importance of wetland restoration. Each group wants their perspective to be understood by others. Participants elaborated that this would serve to unite the community as people began to understand others' struggles and personal motivations. How do these groups define education? What level of awareness would satisfy this need?

Collaboration was another common request of those we interviewed, but similarly to education, the problem lies in the lack of understanding between stakeholders. It is important to consider what collaboration really means. Collaboration in the eyes of one stakeholder does not necessarily mean everyone's ideas or wants will be incorporated in the overall outcome. Participants indicated a need for balance between an industrial view which prioritizes the economic benefits of productive land, and a willingness to adapt protective measures to the ecosystem.

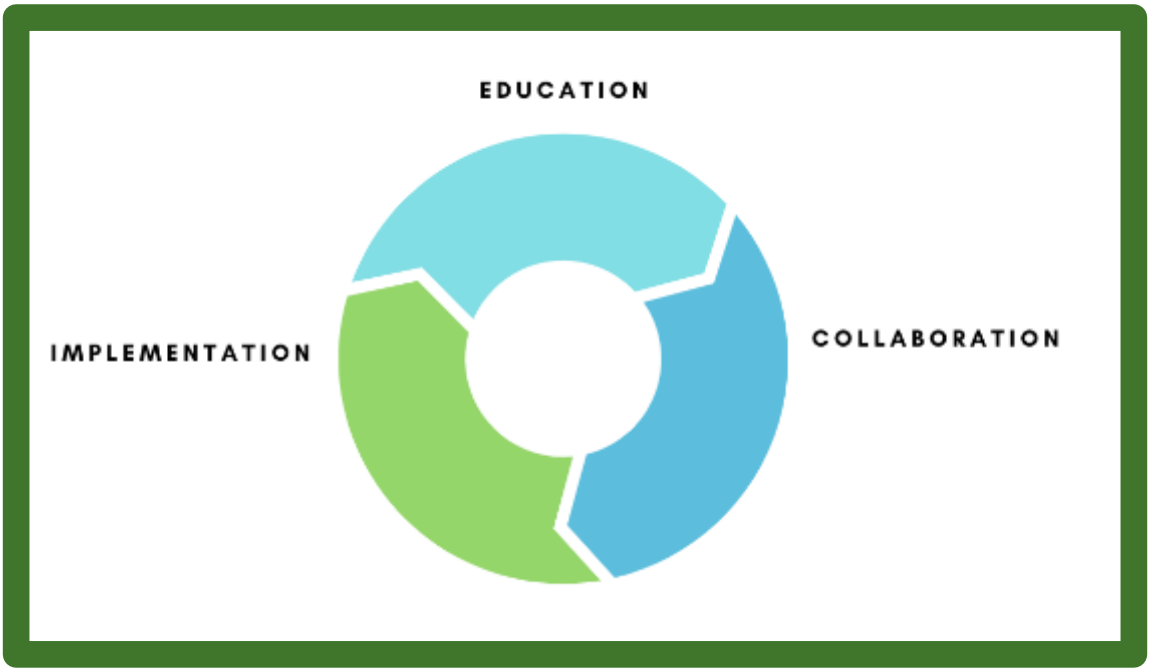

Figure 23. Relationship between education, collaboration, and implementation

The overall message we identified was that various stakeholders value wetlands for unique things, and that education and collaboration among different communities are a necessity to make progress on protecting, revitalizing, and developing wetlands to provide the same opportunities previous generations have had for generations to come.

> *"I don't think that expansion of those [funding] grounds are the most important things to achieve better outcomes in terms of growth or protection or reestablishment of wetlands. The most important things [are] guidance, education, and support…[they are] better than just providing people with a lot of dollars without people understanding what's the greater outcome for your business and community."*
>
> *- Anonymous farmer*

Chapter 5: Recommendations and Conclusion

This project set out to learn how the role of wetlands is perceived in a shared landscape that holds diverse occupations, traditions, and expectations linked across past and future generations. Finding a path forward for the Ruamahanga catchment and all of its inhabitants may require small steps that can counteract some distrust and misunderstandings in order to work towards a unified view of how this critical ecosystem can benefit from two-eyed seeing.

Education, collaboration, and implementation go hand in hand. Our findings and discussion confirmed a commitment to the wetlands, and a strong baseline appreciation for the catchment. They also raised the question of whether people can align worldviews to design a common future that can be approached from different positions in the catchment. One point is clear: there is a growing shift towards thinking about the economic value of biodiversity from the point of view of western science. This article and this report on the economic benefits of protecting nature are setting the tone for how conventional science moves forward.

New Zealand has an opportunity to unite perspectives under the recommendations of the Biological Heritage Challenge as well as the UN Sustainability Development Goals. The Bio-heritage challenge specifically recommends to whakamana, tiaki, whakahou [empower, restore, and protect] bio heritage through innovation and community action. The outcomes of UNSD Goals #3, 6, 8, 12, 15, and 17 as seen in Figure 24 also support action and effort for the catchment.

Figure 24. UN Sustainable Development Goals

Goals 6 and 15 represent the overarching objective of understanding community perceptions of wetlands and working towards their betterment, whereas goals 3, 8, 12, and 17 each represent the recommendations to achieve our project goal. The UN sustainable development goals and the biological heritage challenge can direct and inform a unified outcome for solidifying collaboration and education between stakeholders.

We have four recommendations that can increase collaboration, further define wetland value, amplify conversations on Māori worldview perspectives, and expand incentives for wetland restoration funding.

Recommendation 1: **Create a Ruamahanga Catchment Working Group**

A key aspect of fostering collaboration between stakeholders is education. If community members are able to have an open forum where they can discuss their viewpoints and be heard by their peers, a wider understanding of values can be represented in planning processes for wetland projects. We found this recommendation to be most related to UN sustainable development goal 17, which is to "strengthen the means of implementation and revitalize the global partnership for sustainable development" (United Nations, 2015).

How:

To accomplish this, working groups should be implemented to facilitate conversations between community members. We also recommend hosting forums at varying locations (farms, schools, marae, etc.) and times throughout the year to accommodate people with different schedules. By doing so, community members will be encouraged to attend these discussions and thus attain higher participation rates. The conversations will encourage a blended two-eyed seeing perspective that facilitates progress for all critical stakeholder groups.

Partners:

We also encourage the GWRC and local district councils to provide a facilitator who will help guide conversation and keep a positive atmosphere. This will ensure that various stakeholders are able to voice their opinions without being interrupted and that all groups present are given the opportunity to speak. Ideally, this would be implemented at least quarterly over the next decade. We suggest that these meetings are made accessible via Zoom (for online meetings) and with consent, they are recorded and posted so that people who are not able to attend can still hear from other members of the community. The minutes from these meetings should posted on local district council websites to further inform those who are unable to attend the meetings or have limited knowledge.

Outcomes:

This will encourage legislators to develop more comprehensive policies and regulations that align with the goals and values of the diverse community. To address the lack of education and collaboration in the community, the working groups are crucial.

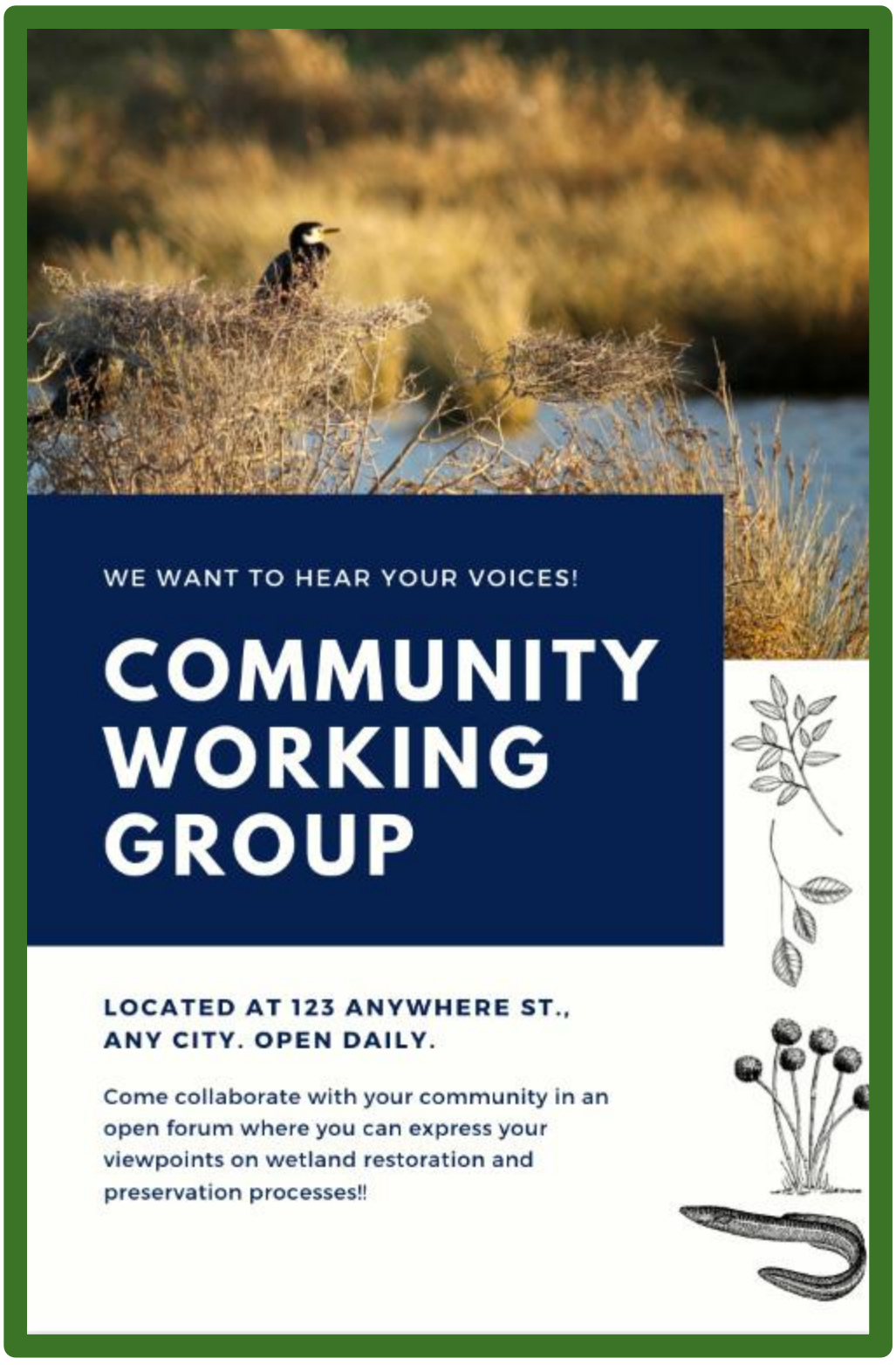

Figure 25. Ruamahanga Catchment Working Group Flier

Recommendation 2: **Establish a Ruamahanga Catchment Community Laboratory & Resource Guide**

After speaking to landowners who utilize wetlands on their property, it became apparent that with more exposure and awareness of wetland ecosystem services, innovative practices are more likely to gain traction in the wider community. We found this recommendation to be most related to UN sustainable development goal 12, which is to "ensure sustainable production and consumption patterns" (United Nations, 2015).

How:

A community lab space would serve as a place for people to test their ideas and collaborate with others to advance their techniques. Farmers could inform others of innovative strategies for working with the environment, and there would be models of these ideas for others to see their practices firsthand. School children and scholars could visit the lab and contribute their ideas for advancing the systems being utilized. Schools in particular could have field trips to the lab where they could work firsthand with nature and gain an appreciation for, instilling its value in them from a young age. This community lab should be created over the next year and advertised to the wider community after completion to support the urgency of this issue.

Figure 26. "Mosquito Census" by Katherine Long, Andrew Moore, Anthony Topper, Georgianna Wood, Chase Woodward, IQP, WPI

Following the construction of the lab, a resource guide should be created that includes the innovative practices and suggestions for implementing them. The guide would then be advertised and after gauging interest, other guides could be created to extended knowledge to other forms of lab engagement in the catchment.

Partners:

The community catchment lab could be funded by the Ministry of Conservation or another environmental group and advertised in a way that inspires action from the community. School children and scholars would benefit from a visit to the lab where they could contribute their ideas for advancing the systems being utilized. Farmers, diverse working groups (as mentioned above), and national organizations such as GWRC and Federated Farmers should also be involved as they would be instrumental in accumulating necessary information and resources to produce their resource guide. By creating this guide through collaborative efforts in the community, we hope that the cost to produce it would be minimal as increased participation would provide a wealth of knowledge.

Outcomes:

With the creation of the resource guide and community lab, those who do not currently utilize wetlands would have the tools they need to start implementing the sustainable practices of other landowners. Students and other members of the community would also have the opportunity to work directly with the wetlands and gain knowledge of sustainable practices. This could greatly improve the water quality in the Ruamahanga catchment as a whole.

Figure 27. Community guide example.

Recommendation 3: **Increase Education of Māori Perspectives**

Through our research, we found that the wider community could benefit from developing a greater understanding of Māori cultural perspectives and values. By fostering education, we hope the community will feel more connected and willing to collaborate. We found this recommendation to be most related to UN sustainable development goal 3, which is "to ensure healthy lives and promote well-being for all at all ages" (United Nations, 2015). This recommendation is also closely aligned with New Zealand's biological heritage challenge.

How:

In order to make progress, New Zealanders should further incorporate the Māori worldview into their education system. An audit of the schools within the Ruamahanga catchment to assess the degree of Maori teachings in their curriculum would encourage leaders in school systems to consider their relationship to these cultural ideas. Schools must then educate their students on Māori traditions surrounding wetlands and te reo Māori [the Māori language] if this information is not already included in their curriculum. This would be implemented within the next 5 years to allow teachers to adapt to the new curriculum. The implementation of afterschool programs encouraging adolescents to get out into nature after these teachings would lead them to appreciate the way Māori value the environment and the biodiversity of wetlands. Students should also participate in activities such as counting eels and freshwater mussels whenever possible to develop their own sense of place and connection to the catchment.

Figure 28. "Summerland NZ" by Greg Whitby is licensed under CC BY-NC-SA 2.0

Partners:

Government organizations such as the Ministry of Education could provide grants to schools who wish to assess curriculums and incorporate Māori teachings to minimize the costs for schools to update their resources. Māori community members could be incorporated into the learning process as they are able by going into schools every few weeks as guest speakers to talk about their values and perspectives. The Department of Conservation and other environmental groups could also provide resources for students to spend time in nature to instill the importance of protecting the environment from a young age. The bio heritage challenge is also closely related to this recommendation so a partnership with this organization would further education of Maori priorities substantially.

Outcomes:

This increased awareness and education would allow more progress to be made to remedy the injustices in the environment while also achieving UN and bio heritage benchmarks. The increase in diverse perspectives facilitates a deeper understanding of one another and a more harmonious desire to protect the wider environment and the wetlands within it. The younger generation would also develop a better relation to the land, thus encouraging sustainable practices in the future.

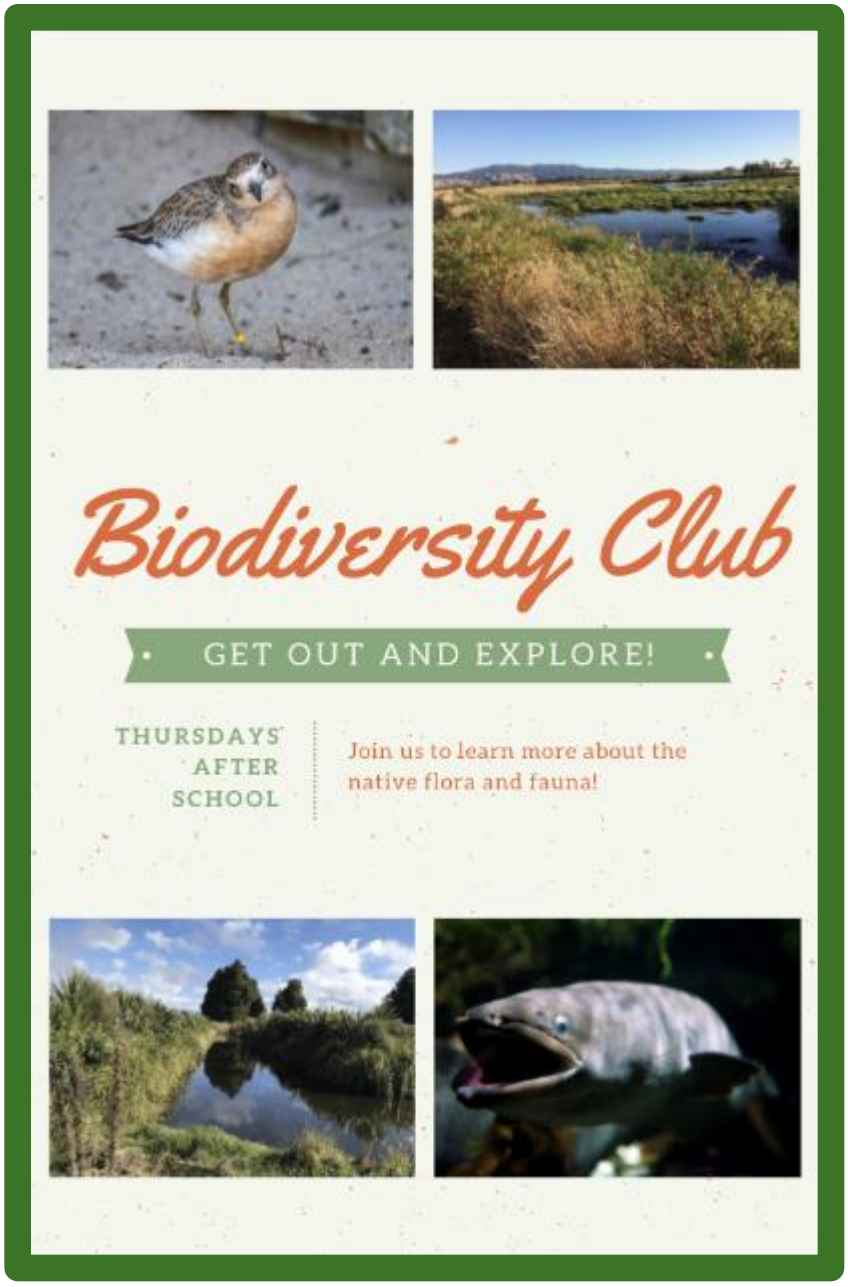

Figure 29. Biodiversity Club flier

Recommendation 4: **Implement a Ruamahanga Catchment Strategic Financial Plan**

More farmers would be inclined to participate in wetland restoration if more incentives could be provided and advertised. Interviewees also indicated that gaining a sense of responsibility over the environment and the land would encourage farmers to restore wetlands out of their personal desire. We found this recommendation to be most related to UN sustainable development goal 8, which is to "promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all" (United Nations, 2015).

How:

Publicly available subsidies and grants will ensure funding for landowners to restore and protect wetlands on their property. Formal agreements with notable organizations will solidify these new incentives and provide funding. To accomplish this, open communication between government and private landowners should be facilitated through the previously mentioned working groups. One they have collaborated and discussed their priorities, a formal strategic plan including initiatives for each community catchment should be established and enforced. This will promote investment and action. The current process for identifying wetlands on private property should be improved through an expansion of incentives and a redefinition of what constitutes the need for funding. This should be accomplished within the next 5 years in order to support the urgency of this issue and involve individuals from all critical stakeholder groups. While the costs of increasing subsidies and incentives may be substantial, the longer this takes to implement, the more likely irreparable ecological damage will be done.

Partners:

Formal partnerships with the Department of Conservation, Ministry of Conservation, GWRC, Federated Farmers, Ducks Unlimited and community catchment groups should be incorporated into the strategic plan with financial support specified. Farmers who already utilize sustainable practices should be incentivized to share their knowledge with colleagues through increased funding for their ongoing restoration projects. This will increase motivation for knowledgeable farmers to share how they incorporate wetlands into their property and business to their friends, neighbors, and community members.

Outcomes:

A formal financial strategy implemented and enforced by the government would strengthen support for restoration projects and incentives. Once incentives are increased, it will cause a domino effect in which farmers learn wetland benefits through collaboration with the farms around them and can be supported in doing so. This revolution of innovation, permitted by incentives, would hopefully change the way farmers and landowners work with nature.

Land management

Measuring our performance

Level of Service	Performance Measures	Baseline (2017)	2018/19 Target	2018/19 Result (Audited)	2018/19 Status of Result	2019/20 Target	2019/20 Result	2019/20 Status of Result	Commentary on 2019/20 Results
Implement farm plans to reduce nutrient and sediment discharges from erosion-prone land	Erosion prone hill-country covered by an active[11] farm plan	60%	61%	61%	Achieved	62%	60.4%	Not Achieved	C
Deliver planting programme on identified erosion-prone land	Erosion-prone hill country planted	446.1 hectares	500 hectares	718 hectares	Achieved	550 hectares	755 hectares	Achieved	D
Deliver farm environment plans to reduce nutrient and sediment loss	Over 50% of all contestable funding is allocated to priority catchments identified in the proposed Natural Resources Plan[12]	New measure	Achieved	Achieved[13]	Achieved	Achieved	Achieved[14]	Achieved	
Provide high quality goods and services to landowners from the Akura nursery	Survival of poles planted under the Wellington Regional Erosion Control Initiative (WRECI)	New measure	85%	94%	Achieved	85%	56%	Not Achieved	E

Narrative on performance

C – This result represents the total area of properties that have engaged in erosion mitigation work in the past three years, and have a Greater Wellington-produced farm plan.

D – Due to programme growth enabled by One Billion Trees funding support, we have exceeded this measure by over 37 percent, with more hectares treated than planned.

E – Significant summer drought caused greater tree mortality than typical years.

Figure 30 Land management plan (Greater Wellington Regional Council's Annual Report [Purongo a Tau] 2019/20)

Conclusion

Wetlands are integral to the culture, environment, and economy of the Ruamahanga catchment. Not only do wetlands protect the environment through their ecosystem services such as filtration and flood prevention, but they also have immense value as a crucial part of Māori culture through their traditions and sense of place. Wetlands are also beneficial to the economy of the Ruamahanga catchment by aiding sustainable farming practices that can benefit the business lifespan through their ecosystem services. Based on our research we found that the Ruamahanga community generally supports wetland restoration and preservation efforts. We must increase the rate at which wetlands are being restored, and with the help of collaboration and education between community groups to fill the gap of understanding between them, it can. One respondent said it best:

"Healthy wetlands mean healthy people. I see our future being inextricably linked to the health of our wetlands." The importance of the wetlands extends beyond the Ruamahanga catchment to the rest of New Zealand and the rest of the world.

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Appendices

Appendix A: Interview consent form

This form is applicable to all interviews conducted as shown in Appendices B-I. C, D, E, F, G, H, and I.

Who we are: We are a group of students from Worcester Polytechnic Institute (USA) collaborating with Rawiri Smith (Kahungunu Ki Wairarapa) and Ian Gunn (Sustainable Wairarapa) to understand the region's relationship with wetlands.
Purpose: Your answer will inform interviewers of the accommodations necessary for your comfort level in regards to interview style. We will ask for your consent to record the interview if you choose Zoom as your preferred method. Your participation in the research is voluntary.

1. What is your name?
2. Are you willing to participate in an interview?
    a. Yes or No (circle one)
3. If you chose yes, which method would you prefer?
    a. Zoom or Email (circle one)
4. If you chose Zoom, do we have your permission to record the audio of the interview?
    a. Yes or No (circle one)
5. If you chose Zoom, do we have your permission to record the video of the interview?
    a. Yes or No (circle one)

I understand that these interviews will be published at WPI for educational purposes and made available to the public.
Sign: _____
Date: _____
Print: _____

Are you willing to have images, audio clips, and film clips published at WPI for educational purposes and made available to the public?

Yes or No (circle one)

Sign: _____

Date: _____

Print: _____

Appendix B: Baseline survey

The survey was created and distributed using Qualtrics.

Consent Agreement

Who we are: We are a group of students from Worcester Polytechnic Institute (USA) collaborating with Rawiri Smith (Kahungunu Ki Wairarapa) and Ian Gunn (Sustainable Wairarapa) to understand the region's relationship with wetlands.

Purpose: Your answers will inform us on the role wetlands play in your community. Your answers will be non-identifying.

Procedures to be followed: This survey will ask you about your demographic, your opinion, knowledge, and experience about wetlands and their management. Your participation in the research is voluntary.

Confidentiality: Any publication or presentation of the data will not be used to identify you.

By checking yes, you give consent to the publication or presentation of your data, which will not be used to identify you.

- ○ Yes

The following questions are related to demographics.

Q1 Please Indicate your age.

- ○ 16-25
- ○ 26-35
- ○ 36-45
- ○ 46-55
- ○ 56-65
- ○ 66 and above
- ○ Prefer not to say

Q2 Please indicate your ethnicity. Choose all that applies.

- ○ European
- ○ Māori
- ○ Asian
- ○ Non-Māori Pacific Islanders
- ○ Other _____
- ○ Prefer not to say

Q3 Please indicate your town of residence.

- ○ Masterton
- ○ Carterton
- ○ Greytown
- ○ Gladstone
- ○ Martinborough
- ○ Featherston
- ○ Lake Ferry
- ○ Other _____
- ○ Prefer not to say

Q4 How long have you lived there?

_____

Q5 Do you live in the Ruamahanga catchment?

- ○ Yes
- ○ No
- ○ Don't know
- ○ Other_____

Q6 If so, which body of water is closest to your home?

_____

Q7 What is your occupation (e.g. farming, etc.)? Please specify (e.g. dairy farming, etc.) if possible.

_____

_____

Q8 Please select the choice that is the most applicable to you.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
I spend a lot of time outdoors interacting with nature.	○	○	○	○	○
I enjoy spending time in nature.	○	○	○	○	○
I am significantly involved in my community.	○	○	○	○	○

Q9 Please check all that apply to you.

- ○ I hunt.
- ○ I fish
- ○ I farm.
- ○ I hike.
- ○ None of the above
- ○ Prefer not to say

The following questions are related to water quality.

Q10 Please select the choice that is the most applicable to you.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
I have a significant amount of interactions with bodies of water within the Ruamahanga catchment.	○	○	○	○	○
I am aware of how regional activities in my community affect the water quality in Ruamahanga catchment.	○	○	○	○	○
The water quality of Ruamahanga catchment significantly impacts my health and living.	○	○	○	○	○
The water quality of Ruamahanga catchment significantly impacts my recreational use of wetlands.	○	○	○	○	○
The quality of bodies of water in the Ruamahanga catchment significantly improved since I have lived at my current residence.	○	○	○	○	○

Q11 Can you elaborate on the regional activities and the effect they have on the water quality in Ruamahanga catchment?

_____
_____
_____
_____

The following questions are related to wetlands.

Q12 Which of the following would you describe as a wetland? Select all that apply.

- ○ 
- ○ 
- ○ 
- ○ 
- ○ 

Q13 Please indicate which of the following bodies of water you have visited within the Ruamahanga catchment. Select all that apply.

- ○ Lake Wairarapa (and surrounding wetlands)
- ○ Lake Onoke
- ○ Ruamahanga River
- ○ Henley Lake Recreation Area
- ○ Others (Write all that apply)

  _____
  _____
  _____
- ○ None

Q14 Can you describe your visit to your favorite body of water selected in the previous problem? Please specify which body of water is your favorite.

_____
_____
_____
_____

Q15 Please list up to 5 words you associate with wetlands.

- ○ 1. _____
- ○ 2. _____
- ○ 3. _____
- ○ 4. _____
- ○ 5. _____

Q16 When you think of wetlands, what community or governmental organizations come to mind? Why?

_____
_____
_____
_____

Q17 Please select the choice that is the most applicable to you.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
I am confident in my knowledge of wetlands and the role they play in the ecosystem and the community.	○	○	○	○	○
I am aware of actions that impact wetland use in my community.	○	○	○	○	○
I desire to learn more about wetlands and their benefits.	○	○	○	○	○
Wetlands play a crucial role in my life.	○	○	○	○	○
Wetlands have economic value.	○	○	○	○	○
It is important to have resources be spent on the restoration of wetlands.	○	○	○	○	○

Q18 Of the following wetland benefits, please select all that you were previously aware of.

- ○ Enhanced water quality
- ○ Flood and tsunami protection
- ○ Carbon sink (decreases carbon emissions)
- ○ Recreational benefits
- ○ Cultural and spiritual significance
- ○ Potential economic value
- ○ None of the above

Q19 There have been numerous reports on wetland degradation in recent years. Approximately what percentage (0% - 100%) of wetlands have been degraded in New Zealand?

_____

Q20 What role do wetlands play in your life?

_____

_____

_____

_____

Q21 Do wetlands have a special meaning to you? If so, what?

_____

_____

_____

_____

Q22 To what extent is the Ruamahanga catchment a part of your sense of place? Please explain.

_____

_____

Q23 Do you think anything needs to be done to the wetlands in Ruamahanga catchment? If so, what needs to be done?

_____

_____

Q24 Which community/governmental organization(s) or individual(s) do you think should be responsible for the restoration of wetlands in the Ruamahanga catchment? Why?

_____

_____

Conclusion

Additional comments or feedback you may have:

_____

_____

If you can help us to expand our knowledge on community perception on wetlands, we would love to talk with you! Are you willing to join a short 15-30 minute interview over Zoom or email before March 3, 2021? Please provide the best method to reach you.

Name: _____
Email: _____
Other (Please specify) _____

Thank you for your time and responses! Your data is valuable to our research. If you would like to inquire further about the purposes of this survey or have any other questions, please contact:
gr-wetlands2020@wpi.edu.

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Appendix C: Interview guide for environmental organizations

Goal: Understand the environmental impacts of agriculture and development in the wetlands.
Type of Sampling: Snowball Sampling & Sample of Convenience

Start by asking about their background: tell us about yourself, learn more about them, might provide more information and break the ice. What are their values, what establishes them?

1. (Use a map, share screen) What part of New Zealand do you currently reside in?
2. Have you always lived there? If not, how long have you lived there?
3. What is your current position at the (organization) and what does that entail? (What do you do?)
4. What are the primary objectives of the (organization) in regards to the wetlands of the Ruamahanga catchment?

Catchment knowledge:

1. How would you define a wetland?
2. What are the primary objectives of the (organization) in regards to the wetlands of the Ruamahanga catchment?
3. How is water controlled and managed in the Ruamahanga catchment?
4. How is land utilized in and around the wetlands of the catchment?
5. Has there been a significant amount of land use by agriculture and development recently around the wetlands of the catchment? If so, how has it affected the wetlands? Are you aware of if there has been land encroachment, is it legal? (did you have the proper approval/permits)
6. In your opinion, how is the cultural value of wetlands considered in the wetland management processes?
7. Is there any subsidy, or grant, for people wishing to restore wetlands on their private properties?
    a. What kind of funding or support, if any, does wetland management receive in the Ruamahanga catchment?

8. Do you know of any other organizations involved in the wetland management process of the Ruamahanga catchment?
9. Do you know of any groups or individuals that have contrasting views about wetland management? If so, can you share their contact information or refer us?

Department of Conservation (DOC) Specific Questions:

10. How are wetlands managed on a national scale in New Zealand?

Greater Wellington Regional Council (GWRC) Specific Questions:

11. What are the GWRC interests in the Wairarapa Moana?
12. How does the GWRC manage the wetlands in Wairarapa Moana?
13. What are the resources that are managed by the GWRC? How are they managed?
14. Do you incorporate Māori people in the decision making process? If so, how?

Additional comments you may have:

Appendix D: Interview guide for management organizations

Goal: Understand the wetlands and their management on a local level.
Type of Sampling: Snowball Sampling & Sample of Convenience

1. What part of New Zealand do you currently reside in?
2. Have you always lived there?
3. What is your current position at the (organization) and what does that entail?
4. Could you explain the role of the (organization)?
5. How are wetlands managed and perceived on a local scale in New Zealand?
6. What are the primary objectives of the (organization) in regards to the wetlands of the Ruamahanga catchment?
7. How is water controlled and managed in the water system of the Ruamahanga catchment?
8. How is land utilized in and around the wetlands of the catchment?
9. Do you know of any other organizations involved in the wetland management process of the Ruamahanga catchment?
10. Do you know of any groups or individuals that have contrasting views about wetland management?
11. Do you incorporate Māori in decision making? If so, how?

Appendix E: Interview guide for perceptions of wetland management

Goal: Determine regional knowledge of wetland management & how they are perceived.

- What is your name?
- What's your occupation?
- How long have you lived in the Ruamahanga catchment region?
- Describe your connection to the Ruamahanga Catchment.
- How would you define wetland?
- What values do wetlands have to you?
- Describe what you believe wetland management entails.
- What impact have wetland management policies had on you?
- Have you been a part of any restoration or preservation projects? If so, please describe.
- Do you know of any groups or organizations involved in the Ruamahanga catchment wetland management? If so, what do you know about these organizations?
- Who has a stake in the management of wetlands?
- What suggestions would you make to alter wetland management?

Additional comments you may have:

Appendix F: Interview guide for role of wetlands

Goal: Determine knowledge of the role wetlands play in the ecosystem and in peoples' lives.

1. What is your name?
2. What's your occupation?
3. How long have you been living in the Ruamahanga catchment?
4. When you think of water, what is the first place or event that comes to mind?
5. List some bodies of water that you know of.
6. What do you know about water quality within the Ruamahanga catchment?
7. Does flooding within the Ruamahanga catchment affect you? If so, how? As of now, is the flooding well managed?
8. How would you define wetlands?
9. What value do wetlands have to you?
10. What is your sense of
11. Do you have any wetlands on your property?
12. How do wetlands impact their ecosystem/water quality?
13. Does the increase/decrease of wetlands within the Ruamahanga catchment affect you? If so, how?
14. What role does wetlands play in your life? How do you relate to the wetlands?
15. Have you ever been involved in any wetland restoration efforts?
16. What is the Treaty of Waitangi? Who is impacted by the Treaty? How are they impacted?
17. What is the Lower Wairarapa Valley Development Scheme? Who is impacted? How are they impacted?
18. Are there any actions that need to be taken related to wetlands?

Additional comments you may have:

Appendix G: Interview guide for Māori contacts

Goal: Understand the attitude towards ecosystem stewardship from the Māori perspective.

1. What is your name?
2. What is your age?
3. What is the name of your iwi?
4. Would you be willing to share your mihi or papeha?
5. How would you define a wetland?
6. What is the first interaction with a wetland that you can recall?
7. Do you live near the wetlands or Ruamahanga catchment?
    - How long have you lived there?
8. What are the words you would associate with the wetlands?
    1. Why did you choose these words?
    - Do you have any stories involving the wetlands that shaped your opinion?
9. What do the wetlands mean to you?
10. Can you describe any processes that take place within the wetlands?
11. To the best of your knowledge, how are the wetlands currently being utilized? (If these questions are hard for people to answer, we will only ask one to avoid making anyone uncomfortable)
    1. Are you satisfied with the current land use practices of the wetlands?
    2. Are you satisfied with the current degree of cultural recognition in wetland management practices?
    3. What impact have wetland management policies had on you?
    4. If it were up to you, how would you manage the wetlands?
12. Are there benefits that the wetlands once provided to you that are no longer available?
13. In your opinion, what groups are prominent advocates of wetland restoration? Are you aware of any opposition to the efforts made by these advocacy groups? What groups, if any, are in opposition?

Additional comments you may have:

Appendix H: Interview guide for the Wairarapa community (Economic Focused)

Goal: Determine the role economics play in wetland restoration efforts as well as perception of wetlands.

- What is your name?
- What's your occupation?
- Is your current occupation your sole source of income?
- How long have you owned your property?
- How much land on your property is considered a wetland?
- Do you use the wetland for economical gain? If so, how?
- What are some other ways a wetland can have economic value? How much value do you think they have?
- Are economics a significant factor in your decision on wetland restoration?
- How do wetlands affect the productivity of your land?
- Do you receive any financial support, such as grants, for wetland restoration effort?
    - If so, how did you receive that money?
- How likely how much money are you willing to spend on wetland preservation or restoration?
- What's your opinion on the current wetland management? Do you think the organizations have coherent legislations to follow?

Additional comments you may have:

Appendix I: Interview Demographics & Occupations

Name	Ethnicity	Occupation
1.Teresa Aporo	Māori	Landscaping
2.Esther Dijkstra	European	Environmental scientist/consultant
3.Kolja Schaller	European	Land management advisor
4.Stephanie Tomscha	European	Research at Victoria University
5.Kereana Sims	Māori	Wairarapa Moana Project Lead
6.Vern Brasell	European	Dairy farmer
7.Karen Williams	European	Crop & Stock farmer
8.Anonymous farmer	European	Sheep and Beef farmer
9.Michael Birch	European	Sheep and Beef farmer
10.Raihania Tipoki	Māori	Treaty negotiator, contractor, farmer
11.Stephen Hartley	European	Lecturer at Victoria University
12.Rawiri Smith	Māori	Environmental manager
13.Ian Gunn	European	Semi-retired; Sustainable Wairarapa
14.Treaty negotiator	Māori	Treaty negotiator

Appendix J: Survey Responses

Q1 - Please Indicate your age.

#	Answer	%	Count
1	16-25	0.00%	0
2	26-35	13.33%	4
3	36-45	16.67%	5
4	46-55	40.00%	12
5	56-65	16.67%	5
6	66 and above	13.33%	4
7	Prefer not to say	0.00%	0
	Total	100%	30

Q2 - Please indicate your ethnicity. Choose all that applies

#	Answer	%	Count
1	European	54.84%	17
2	Māori	25.81%	8
3	Asian	0.00%	0
4	Non-Māori Pacific Islanders	0.00%	0
5	Other	19.35%	6
6	Prefer not to say	0.00%	0
	Total	100%	31

Q3 - Please indicate your town of residence.

#	Answer	%	Count
1	Masterton	30.00%	9
2	Carterton	26.67%	8
3	Greytown	3.33%	1
4	Gladstone	3.33%	1
5	Martinborough	3.33%	1
6	Featherston	0.00%	0
7	Lake Ferry	3.33%	1
8	Other	30.00%	9
9	Prefer not to say	0.00%	0
	Total	100%	30

Q4 - How long have you lived there?

Answer	Count
Less than 1 year	2
1-5 years	7
6-10 years	1
11-20 years	9
21-30 years	4
More than 30 years	6
On and off my whole life	1

Q5 - Do you live in the Ruamahanga catchment?

#	Answer	%	Count
1	Yes	82.76%	24
2	No	17.24%	5
4	Other	0.00%	0
	Total	100%	29

Q5a - If so, which body of water is closest to your home?

Answer	Count
Waipoua river	3
Waingawa River	3
Waikakariki Stream	1
Turanganui River	2
Taueru	1
Ruamahanga	1
Opaki Stream then Waipoua River	1
Mangatarere Stream - Waiohine River	5
Mangahui Stream	1
Lake Wairarapa	1
Waipoua, Ruamahanga and waingawa	2
Whangaehu and Huangarua	1

Q6 - What is your occupation (e.g. farming/agriculture, etc.)? Please specify (e.g. dairy farming, etc.) if possible.

Answer	Count
Project Coordinator/Manager	2
Researcher/Scholar	4
Farmer	3
Retired/Treaty Settlement Negotiator	1
Kaiako [teacher]	1
Advisor/consultant	3
Local authority (government related)	11
Civil Engineer	1
Retired - Currently act CEO Fish and Game, New Zealand Council	1
Self-employed: Treaty educator and cultural/ environmental contractor	1
Landscaping	1
ol foggie	1

Q8 - Please check all that apply to you.

#	Answer	%	Count
1	I hunt.	9.52%	6
2	I fish.	14.29%	9
3	I farm.	12.70%	8
4	I camp.	28.57%	18
5	I hike.	34.92%	22
7	Prefer not to say	0.00%	0
	Total	100%	63

Q7&9&15 - Please select the choice that is the most applicable to you (in regards to Ruamahanga wetlands)

Question	Strongly Disagree		Somewhat Disagree		Neither Agree nor Disagree		Somewhat Agree		Strongly Agree		Total
I spend a lot of time outdoors interacting with nature.	0.00%	0	0.00%	0	10.00%	3	30.00%	9	60.00%	18	30
I enjoy spending time in nature.	0.00%	0	0.00%	0	0.00%	0	13.33%	4	86.67%	26	30
I am significantly involved in my community.	0.00%	0	3.33%	1	13.33%	4	33.33%	10	50.00%	15	30
I interact with the bodies of water significantly.	0.00%	0	6.67%	2	16.67%	5	40.00%	12	36.67%	11	30
I am aware of how regional activities affect the water quality	0.00%	0	0.00%	0	0.00%	0	20.00%	6	80.00%	24	30
The water quality significantly impacts my health and living.	0.00%	0	6.67%	2	26.67%	8	33.33%	10	33.33%	10	30
The water quality significantly impacts my recreational use of wetlands.	0.00%	0	13.33%	4	33.33%	10	33.33%	10	20.00%	6	30
The quality of bodies of water significantly improved since I have lived here	23.33%	7	30.00%	9	33.33%	10	13.33%	4	0.00%	0	30
I am confident in my knowledge of wetlands and the role they play in the ecosystem and the community.	0.00%	0	0.00%	0	10.00%	3	53.33%	16	36.67%	11	30
I am aware of actions that impact wetland use in my community.	0.00%	0	0.00%	0	6.67%	2	46.67%	14	46.67%	14	30
I desire to learn more about wetlands and their benefits.	0.00%	0	0.00%	0	10.00%	3	26.67%	8	63.33%	19	30
Wetlands play a crucial role in my life.	0.00%	0	3.33%	1	30.00%	9	36.67%	11	30.00%	9	30
Wetlands have economic value.	0.00%	0	0.00%	0	10.00%	3	30.00%	9	60.00%	18	30
It is important to have resources be spent on the restoration of wetlands.	0.00%	0	0.00%	0	0.00%	0	16.67%	5	83.33%	25	30

Q9b - Can you elaborate on the regional activities and the effect they have on the water quality in Ruamahanga catchment?

- I was walking in the Ruamahanga River … Other than the main channel having changed it was was similar to past years. Since deforestation started in the 1850s soil has been eroding from the hills into the catchment. For decades a range of materials have been seeping into the Ruamahanga degrading water quality. During my walk this morning I saw a hose taking water to a pump which in turn fed several irrigators in successive paddocks. The next paddock had a herd of dairy cattle in it. This farms neighbor is a secondary school with its own sewerage system that has been upgraded in recent years so that it no longer sends dirty water into the river. Along the way I saw olive groves which used to wetlands. Pine plantations that used to be at least manuka clad hills. I drove from and back through Masterton where the Waipoua goes through the town and connects with the Ruamahanga on the eastern side. The natural Waipoua was replaced by a manmade drain to take away stormwater. Right now we have algal bloom warnings. The towns dump is right next to the Ruamahanga. It is now a recycling center but the old tip face must be leaching. The above are some examples of activities that effect water quality.
- (I am not a resident of Wairarapa). For the past two years I have been interviewing and filming Wairarapa residents (manawhenua, landowners, historians, scientists, citizen scientists, artists and environmentalists) on historical and current issues regarding the health of Wairarapa Moana (lakes) and their catchments. In addition, I have read extensively. The Ruamāhanga River Diversion and other land drainage impacts have a substantial and ongoing impact on the water quality (and quantity) within the Ruamāhanga catchment.
- most of the recreational activities are impacted by intensive farming and poor water quality
- Intensive farming, particularly dairying. Irrigation and water takes/allocation in particular, sewage, storm water, run off from farming and residential activities, loss of habitat, deforestation etc
- GWRC and partner agencies along with Iwi deliver programmes to improve the health of waterways and the Moana, including waterway fencing, planting, erosion protection, and restoration.
- A century and more of unthinking exploitation of the natural resources of the Wairarapa in the interests of a particular agricultural and economic model have seriously degraded the natural and indigenous values of the catchment with drastic consequences for the ecological services that natural system provides
- The Willow aphid has had a major detrimental impact on the Taueru. This is from the excreted honey dew
- Speed boat racing causing erosion and pollution
- Illegal dumping of rubbish including chemicals into streams from urban and industrial areas. Effluent discharged near waterways, introduction of exotic fish species. Run off from Masterton refuse tip. Waste water from local towns
- I don't live in the Ruamāhanga catchment, but I do quite a bit of work there. I am very aware of how human activity has a huge impact on water quality in the catchment. Farming, Urban stormwater and wastewater, Flood Protection activity all have huge impacts on water quality and any attempts to improve water quality in the catchment require a holistic view of all of those aspects.
- I am not an environmental expert, but things like nitrate leaching, water take, water water outfall, gravel take, and chemical leaching all have an impact on the waterways. Often it is the cumulative effect that is the issue.
- all 3 Wairarapa Councils still discharging treated waste waste water into the river.
- Intensive farming and poor effluent disposal by district councils have degraded the river leading to elevated levels of nitrates. This is further exacerbated by significant over extraction of water from the system for both agriculture and town supply. The over extraction concentrates the nitrates, eColi and other farm and town runoff so that the river is fast becoming a toxic soup, particularly in the summer.
- Farming, septic tanks, urban development, industry
- Land use changes (farming and lifestyle blocks) typically have adverse impacts on water quality compared to natural systems, through predominantly the addition of pollutants, but also modifying hydrological flows. Farmers and communities are also starting to take active steps to rectify this and have a positive effect on water quality.
- There's probably not enough space but let's just say conventional agricultural practices have totally changed the landscape here. And, thanks to capitalism, profits have been more important to councils than water quality of human health.
- Ruamahanga Whaitua, many catchment groups e.g. Mangatarere Restoration Society, Parkvale Catchment Group, Wairarapa Moana group..... Involved in fencing waterways, planting trees, weed & pest control
- Negative impacts: Fertilizer and effluent run-off from farming. Overflow from sewage treatment or storm water networks Road run-off Sedimentation from harvesting plantation forestry Water abstraction for irrigation or other purposes Positive impacts: Riparian planting, fencing off waterways and wetland restoration/construction
- Since the Ruamahanga whaitua, a lot more people seem to be aware of the water quality issues.
- Nutrient losses from farming operations entering waterways. Lack of shade and vegetation around our waterways due to clearing for farming

Q11 - Please indicate which of the following bodies of water you have visited within the Ruamahanga catchment. Select all that apply.

#	Answer	%	Count
1	Lake Wairarapa (and surrounding wetlands)	22.48%	29
2	Lake Onoke	22.48%	29
3	Ruamahanga River	22.48%	29
4	Henley Lake Recreation Area	17.83%	23
5	Others (Write all that apply)	14.73%	19
11	None	0.00%	0
	Total	100%	129

Q12 - Can you describe your visit to your favorite body of water selected in the previous problem? Please specify which body of water is your favorite.

- Hawaeki is the old name for part of a farm where my family used to live and now my eldest daughter and her fiance live. The farm is called 'Springlea'. The Ruamahanga forms its east and northern boundary. As the name suggests there are numerous springs on the farm which create several streams. There are also a number of wetlands that are fenced off and protected as QE II reserves. Large stands of harakeke, raupo, kahikatea, tawa, titoki with the odd totara, matai now thrive. There is a sole and unique maire tawake. With numerous life in the streams, in the soil and around the plants or trees it is a wonderfully soothing place. My favourite spot is by the farmhouse where the large longfin eel we call Mamae lives. She comes to see us, the water talks and sparkles, the warmth of the sun envelopes you, or the wind causes the trees to sway, or the rain refreshes everything, whichever way you are enveloped amongst the atua.
- Lake Onoke is a favourite, although my appreciation for the interconnectedness of Lakes Wairarapa and Onoke (collectively, Wairarapa Moana) means that separating these bodies of water is somewhat culturally determined. The intermittent opening and closing of the sandspit at Onoke, and early settler/Māori clashes from the 1850s - known as the 'Battle of the Lakes' - remains of critical importance today. (Although outside the Ruamāhanga catchment, Lake Pounui on the western side of Lake Wairarapa is a real treasure!)
- probably northern shore of lake wairarapa
- Ruamahanga river near my family home Moiki where I use to swim growing up
- Wairarapa Moana - My most recent visit involved supporting the annual citizen science kakahi (freshwater mussel) count at Lake Domain on the northern shore of Wairarapa Moana. It involved joining keen members of the community to get in the water and collect and measure kakahi. The physical act of being in the water and connecting with life in the lake is a really special experiance.
- The Atiwhakatu is a vibrant stream running through mature native forest - it is idyllic and good for the soul
- None are my favourite I dont consider them in that way
- Te Roto o Onoke- he pātaka kai, wai tai,he puna waiora, ko Tangaroa, Ko Hinemoana, Hinurangi,he kōhanga Kai-tiakina!!
- Lansdowne Rec trail wetland. Because I am managing a restoration project and I'm surprised how well the wetland is recovering after one year of exotic weed species control on a very limited budget.
- That's a difficult question because they are all incredible in their own ways, however Waiohine River is special because it is the only one that I feel fully comfortable swimming in (close to the Tararua Range, not close to town). I have spent a lot of time camping and swimming there.
- A favourite spot would have to be Carter's Reserve and the river down there. We often walk around Carter's Reserve with the kids and go down to the Ruamahanga river for exploring, throwing stones, or having a picnic.
- Ruamahanga river
- bird reserve
- Lake Wairarapa doing abird survey.
- I don't have a favorite. My frustration is we don't have open water suitable for swimming, we have limited access to rivers and most wetlands, rivers and foreshore are on private land with limited or no public access
- Waingawa river for swimming at Kaituna
- At the moment I'm loving the Waiohine! It's so beautiful up there :)
- Kaiwaiwai Dairies wetland is favourite as have invested considerable time into its development. Is designed to strip nitrogen from drainage water but has biodiversity improvements as well
- Wairio wetland near Lake Wairarapa. I enjoy this location because I have been involved in the restoration activities that have been happening there for the past 10 years. Both planting and monitoring the changes, as a supervisor of

numerous student projects. It has also provided the opportunity to get to know many passionate and informed people from the area.

- Kakahai Count at Lake Wairarapa. Citizen science at Lake Wairarapa to monitor Kakahai populations.
- Lake Wairarapa is my favourite. I love the wetlands along the edge. These are the first wetlands in New Zealand that I visited.
- Just a nice ambience
- Onoke
- Lake Wairarapa The isolation, the changeable weather patterns, the wildness, the potential
- Huangarua in mid summer is exposed to a lot of sun due to the width of the stream and not enough foliage cover. Not much insect bug or bird life there. Lots of snails and scarcely any aquatic plants. The riverbed is covered with sediment. Not a healthy environment.
- Mauri Tuhono means the connecting of the life force at a place called Kiriwai which is a South West branch of Lake Onoke. From this connection my sensing resulted in my wairua (spirit) being uplifted, my hinengaro (mind) was inspired; my whanau (family) built stronger connections with each other through whakapapa (genealogical) connections to Kiriwai
- Wairio/Boggy/Mathew lagoon complex do we need to say why???for jean and I its the native bird population and the vista

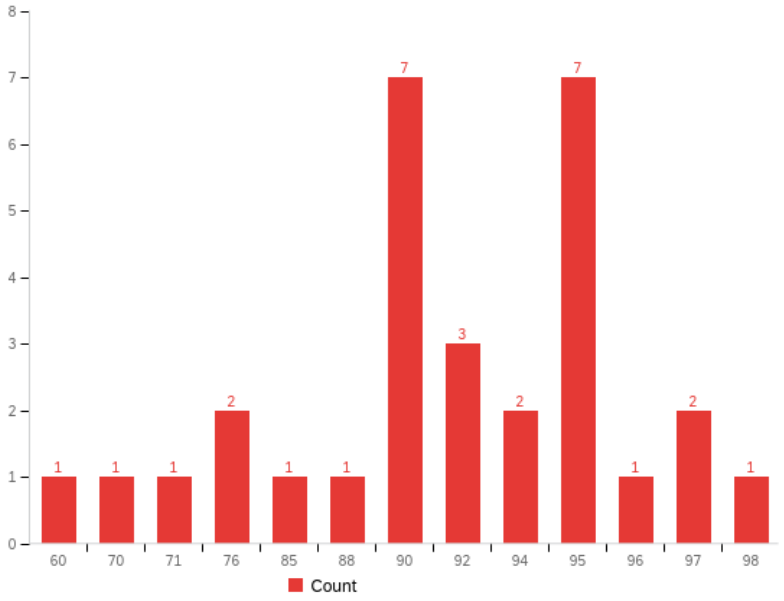
Q14 - When you think of wetlands, what community or governmental organizations come to mind? Why?

Organization	Occurrences
Regional Councils (inc. GWRC, Wairarapa Moana Wetlands Project)	18
District Councils (inc. SWDC, MDC, CDC)	9
QE II	1
Ramsar Convention,	2
DOC	11
Federated Farmers, farmers (inc. Kaiwaiwai Dairy)	4
Ducks Unlimited	6
Fish and Game (“last standing when issue go to court” by one respondent)	4
Māori (inc. iwi, hapu, marae)	16
Niwa,	1
Ministry for Environment	3
Groundtruth	1
Community groups or other	5
Pae tū Mōkai o Tauira	1
Forest and Bird,	2
Wairarapa Moana	1
NZ Wetland Trust	1
duck-hunters	1
fishermen	1
Environmental NGOs	1
P2K Alliance.	

Q16 - Of the following wetland benefits, please select all that you were previously aware of.

#	Answer	Count
1	Enhanced water quality	30
2	Flood and tsunami protection	27
3	Carbon sink (decreases carbon emissions)	28
4	Recreational benefits	29
5	Cultural and spiritual significance	29
	Total	143

Q17 - There have been numerous reports on wetland degradation in recent years. Approximately what percentage of wetlands have been degraded in New Zealand?



Q18 - What role do wetlands play in your life?

- Significant. My family and I are regularly in wetlands. We appreciate their beauty, their role and the ability just to walk through them. We lament their loss. We observe all the life around us sitting on the ground, we gather food from, we play, we enjoy working in them.
- As an environmental researcher / social scientist, I am aware of the critical role that wetlands play in ecosystem functioning and health, particularly for lakes and rivers. Their drainage and pollution has had a significant impact on other waterbodies and reduced habitats for a range of native flora and fauna. Protecting remaining wetlands and reconstructing wetlands needs to be a priority. As a fly fisher, I'm aware that wetlands play an important role in river water quality, and this in turn ensures a healthy habitat and productive nursery for fish. As a recreational hiker/camper, wetlands bring me much pleasure and intrigue.
- both professionally and personally
- Not enough probably
- The mahi I do is all about restoring wetlands, and building the connection people have with them. While this is a paid job I have a personal passion for restoring the environment and love spending time exploring and learning about wetlands
- Not much directly
- The level of degradtion has been overstated, esepcially when you consider the current intepretation means many areas of hill country are wetlands. Yes on the valley floor there has been changes
- He taonga tuku iho Mei kore ake ka mimiti haere ngā taonga ō roto I te wai, heoi e tika ana Kia whakatipu i ngā tupu hei whakaora ake I te katoa o Te taiao māori
- Pleasure, concern for our natural environment. Our native fauna and flora including declining whitebate
- They are a place I can go to enjoy nature, they sequester carbon, attenuate floodwaters, provide a nursery for juvenile fish.
- Not really in my life but mainly in the environmental. They have many roles (increase biodiversity, carbon sink, etc). Therefore they increase the health of the environment that surrounds me and my family.
- Mainly recreational and through that education with our kids. They also play a role in water quality and nurturing biodiversity which affects us all indirectly.
- they are significant because they can present a natural way of improving freshwater quality and provide carbon sink.
- improvement of river water quality, as a scout leader we take our troupe to the river regularly for water activities like tubing and swimming so have clean waterways is critical to one of the the long term sustainability's of the of the scouting movement.
- 1. As a birder they are a vital habitat. 2. As someone who supports game hunting, they are a vital habitat. 2. As a human being they add immeasurable value to my life through their vital place in the environment.
- they provide biodiversity and possibly some flood mitigation and nutrient attenuation

- Habitat for biodiversity on our farm, mitigation of floods on our farm, problems in trying to understand and follow new regional and national rules about management of wetlands
- I was born and raised on the land so have a strong affinity with her. I fenced off our farm's biggest wetland in 2010. We've created a waka ama club at Onoke to help whanau connect to their Moana. I work in the climate space and give various talks on environmental/ cultural issues.
- The last question was a bit meaningless - what time frame, definition of a wetland, what was the quality of the data being used..... Role - quite a bit, actively involved in developing 3 wetlands and enhancing a 4th
- A place for recreation, enjoying natural history, scenic beauty, walks and scientific study. A focal point for community interactions
- Not a huge amount, as there are not many left you tend to forget.
- Place for relaxation and enjoyment
- I research wetlands. My first field work experience took place in wetlands, and I started to love them after this. Research on wetlands is my primary source of income. Through this, I have learned about their importance in keeping water clean and storing carbon. I am passionate that wetlands should play a role in creating a better world.
- Not much indirectly but important for their intrinsic, existential, aesthetic, environmental and economic value
- Mainly recreation
- Past present and future
- Like our lungs in aiding us to breathe. Essential role
- It is a source of rongoa (medicine) for keeping me healthy.
- they provide recreational and mental stimulus

Q19 - Do wetlands have a special meaning to you? If so, what?

- They are a taonga tuku iho, a treasure from the atua.
- Yes. They are an indicator of our balance with nature and where our priorities lie as a nation.
- yes, places that allow you to connect mentally and spiritually
- yes particularly the Wairarapa Moana wetlands because of its historical importance to my iwi and hapu
- Healthy wetlands means healthy people - I see our future being inextricably linked to the health of our wetlands.
- Just that I know they are important ecologically - and economically
- it is good to have them and to be able to observe
- Nō tō tātou Whaea a Papatūānuku , he hono ngā ki a Ranginui te heke roimata, mirimiria, ka puawaitia...
- Yes
- Yes - I think of them as being important places teeming with life, but that we've lost so much of the extent of wetlands that we must be vigilant in looking after what we've got.
- I come from a place with many many wetlands and it reminds me of my home land.
- The more I learn about them, the more special they become. They are unique homes of biodiversity, native critters, and plant life.
- yes, they are and should be part of the solution to improving water quality and biodiversity as well carbon sink.
- reminds me of what it was like in the old days, and is a part of our past that been destroyed through the rush for commercialism ie making a quick $
- Yes - a place of peace, tranquility and life. A place to recharge my batteries.
- places of peace
- Not necessarily special, but recognized as important part of a broader picture.
- Hineterepo! She's an atua and an ancestor.
- No, but I like them and like spending time in them.
- yes. because of their diverse benefits - see all earlier answers
- not really
- Filters of the ecosystem
- wetlands provide livelihood to me through my research and work. I am very proud to do work to improve wetlands
- for reason above
- Yes - traditional food source
- Mana enhancing
- Culturally spiritually and physically a resource of mahinga kai
- Yes, because of all the value in a repo (wetland) when it achieves puawaitanga (full potential)
- forgotten and poorly understood regarding their potential functions within our landscape

Q20 - To what extent is the Ruamahanga catchment a part of your sense of place? Please explain.

- I grew up on ancestral land 3 kilometres to the east of Masterton (across the Ruamahanga river from what is now Henley Lake) Our house was 150 metres from the river. I learned to do and enjoy many things in the river, these continue today. My adopted dads family have lived by the river for centuries. I have been able to explore many of her tributaries both existing and past. Even Hapuakorari the lost lake of the Tararua mountains up by the Ruamahanga headwaters. My six children all know the river, rivers and streams. Our oldest daughter is expecting her first baby and our first grandchild - he will have a close relationship with the Ruamahanga. Today I was in the Ruamahanga, last night we had dinner beside the Kopuaranga, yesterday I was with our puppy beside the Waipoua, tomorrow we will be at the farm, last week we had dinner beside the Mangatarere Atiwhakatu at Mount Holdsworth. The catchment is a huge part of my sense of place.
- Because I'm not a Wairarapa resident, the Ruamāhanga is not directly contribute to my 'sense of place'. However, through interviewing manawhenua and Wairarapa historians, I've gained an unique insight into the powerful role that the Ruamāhanga catchment has for many residents.
- a lot, it's part of the landscape and the landscape is what gives us our sense of place and identity
- Highly significant, an important part of who I am
- I live in Wellington but the days I work in the Ruamahanga refresh my spirit.
- It is the thread that connects all the parts of the Wairarapa which I regard as my turangawaewae
- None i dnt view the river as part of my sense of place i view the landscape and where i live as that
- Wairarapa tangata, Wairarapa whenua, Wairarapa Moana. Ko au te Wai ko te Wai ko au.
- Fishing and just like to see healthy waters
- It's an area that I work in, and recreate in, but I don't live there - so it doesn't have quite the same level of significance to my personal sense of place as the environment local to where I live.
- Because it reminds me where I come from.
- It's a huge part of the Wairarapa and our backyard.
- My work and my personal interests are interlinked with nature and water.
- its our main playground. its awful as a local to be know as one of the worst polluted rivers in NZ.
- I fish, hunt, walk and relax in the system. It is one of the main reasons I live here.
- to some extent. It may be greater if there was more public access and walkways along the river...Imagine if you could ride your bike or walk along it's entire length
- It is where I have spent most of my life and…a fair chunk of time working to improve conditions in the Ruamahanga catchment. Particularly important to me is the small part of the catchment that I am currently looking after. Wider parts of the catchment are becoming more important as I have more to do with them and build up stories e.g family time
- I've had the privilege of growing up here. I have an obligation to seek justice for Wairarapa Moana and her descendents.
- I live in it, I work in it and I play in it - it is my place
- I tend to connect more strongly to Wairarapa Moan than the upper Ruamahanga catchment, but that is because I have spent more time in the lower catchment
- It is my home, part of the landscape where I live with my family.
- I live in Carterton in the Ruamahanga Catchment. I'm strongly connected to the land and water here.
- I am honored to take part in research that underscores the importance of wetlands in the Ruamahanga basin. I have spoken with many farmers from this area, as well as the many kind community members who care about wetlands. This has left a lasting impact on my life. These people are an inspiration for me to be a better person, and this inspiration is mediated by the wetlands of the Ruamahanga catchment. My sister now lives in the Ruamahanga catchment, so these are the waters my niece and nephew play in and drink.
- Much so - it is the catchment where I have lived all my life
- Ko Ruamahunga te awa
- Makes up my whole. My wellness is connected to its wellness
- The Ruamahanga culturally spiritually and physically unites all the Iwi hapū and whānau of the Wairarapa. We are water people and originally that was literally our grocery store
- In the pepeha that defines who I am, Wairarapa is my moana (large lake that is a sea) and the wetlands are interconnected as a part of the holistic connection
- they are a place I regularly visit

Q21 - Do you think anything needs to be done to the wetlands in Ruamahanga catchment? If so, what needs to be done?

- Restoration or reestablishment if possible. Though there are places such as farms where discussions need to be had to find the right locations so that the land, owners/manager/leasee, council, laws can find benefits.
- Yes, a lot needs to be done, such as: - riparian planting along the Ruamāhanga and tributaries; - reconstructing wetlands and extending remaining ones (e.g., lagoons); - environmental farm plans and incentives to protect, extend and reconstruct wetlands on farmland; - revisiting the Lower Wairarapa Valley Development Scheme (i.e. Onoke sandspit opening, the Barrage gates, Ruamāhanga diversion) to guarantee that more water seasonally inundates the land; - educating the public and landowners about the biodiversity, cultural, spiritual (and economic) importance of wetlands; - halting the conversion to dairy farming and reducing irrigation takes; - ensuring water storage schemes (e.g., Wakamoekau dam) are fully appraised from the start with tangata whenua and independent ecologists evaluating their merit; and - celebrating the role of wetlands and taking pride in the Ramsar Convention status accorded to Wairarapa Moana.
- yes, more wetland restoration to improve the water quality and mitigate the effects of farming
- Much needs to be done to restore the existing and re-establishing wetlands in the catchment
- Empower community to lead restoration work. This requires funding and support. There is no shortage of mahi to do (planting, fencing, habitat restoration, pest plant and animal control, visitor experience etc etc.). Agreeing which values are most important will be a challenge particularly with the Lower Valley flood management scheme having modified the drainage system so heavily e.g. should we raise levels to increase wetland extend, or lower them to protect migrant wading bird habitat.
- A shitload! They need to be given hugely more attention and resources
- Continue to restore and enhance
- Develop relationship with mana whenua, active participation from local Hapū..
- Yes, exotic weed control, no more draining of wetlands and fencing to remove stock
- Yes: We will need to see some quite radical change in land management for wetland health to improve, and this will require significant behaviour and systems change across a range of sectors (including local government and primary industry). Some land currently in primary production may need to be retired to allow for less restrictive flood protection regimes, and allow wetlands to more naturally flood and recede. We need to do a whole lot more work to understand not only how to restore existing wetlands, but how to create new ones, and better understand their potential carbon sequestration potential. We need to consider different ways we could value the natural environment - can we ascribe value to things that are difficult to quantify in economic terms? For example - legal personhood (which is what has been granted for Whanganui River and Te Urewera). If we properly honoured Te Tiriti o Waitangi, that would have a huge impact on wetlands.
- Restoration +++ Protection +++
- The history with Lake Onoke and Wairarapa Moana is an ongoing conversation…I think Wairarapa Moana would benefit from the river flowing through it once again. Increased planting would also be good.
- There needs to be greater awareness of importance of wetlands and promotion of the benefits they provide, as well as more funding on restauration of wetlands.
- more education and leadership from all. ownership like whats been done near nelson where volunteer groups take on a section of wetlands/wild areas to call their won and maintain them themselves.
- Absolutely. Protect what we have, add to what we have and curb their reckless exploitation. They need to be viewed through a new lens - not wasted farmeland to dump effluent in but an intrinsic part of our environment.
- we need to reinstate some wetlands
- General improvement and enhancement to allow them to play their role in the ecosystem
- We just simply need to stop draining the land! And in doing so wetlands will come back. Indigenous cultures are based on indigenous flora and fauna.
- Continued improvement - fencing, planting, weed/pest control, educational facilities (Sign boards, pamphlets), fish passages, reduced nutrient & sediment running into them
- Increase in extent. More riparian planting upstream. Weed control in some of the wetlands. Greater incentivization, financial and technical support for those wishing to undertake restoration
- Wetlands will need to be mapped and restored in strategic places.
- They need to be protected, planted, weeds controlled and hydrology restored
- We need more! I think that is the main thing to restore new wetlands.
- substantial restoration of fauna and fauna and natural functions
- Better access - to help raise awareness
- Coordinated approach to returning its health so the catchment can heal

- All tributaries have community catchment groups to measure and monitor their behaviour and health. Learning from those who have sustainable systems to help those that need support to become sustainable. Collecting data and sharing with other groups.
- They need to be valued in many ways so their full potential can be realised
- existing wetlands need to be restored and new(in previous localities) wetlands created. Currently because the numbers are so low they are treated as rare and the landowners don't understand their value. the landowners are resisting creating "new" wetlands because of the so called economic impact ie loss of productivity.

Q22 - Which community/governmental organization(s) or individual(s) do you think should be responsible for the restoration of wetlands in the Ruamahanga catchment? Why?

- There are a range of stakeholders that need to work together, some are named above. There are iwi and specialist organisations too. Whether individuals agree or disagree about water quality in their patch, global warming etc I haven't heard anyone disagree if a waterway is overly clogged up with silt. Willow extraction, wetlands, riparian and hill planting seem to make sense to people. Although over simplistic it is time, cost, to prescriptive descriptions in plans and occasional political influences that stifle progress.
- Greater Wellington Regional Council, Department of Conservation -- these have statutory responsibilities. The co-governance board arising from Treaty of Waitangi settlements - Kahungunu and Rangitāne in partnership with GWRC and DOC. Environmental groups - Forest and Bird, Pae tū Mōkai o Tauira, etc. (important for community involvement and advocacy, less than 'responsible for' per se). Landowners -- Federated Farmers or other local farming coalitions. Local/regional catchment groups (e.g., Ruamāhanga Whaitua Committee).
- regional council
- Iwi, Councils, Federated Farmers, Fish and Game, DOC, other community organisations
- I think community should be empowered to drive restoration work supported by Government and partner organisations. Community led conservation builds a sense of ownership and investment in delivering good long term outcomes, and builds the connection people have with their local environment and each other.
- All of them - a team of 40,000 (the population of the Wairarapa)
- catchment communities as individuals or individual groups should not have power over others.
- Tātou katoa, from all parties who have a relationship with ngā Wai tipua, ngā Wai atua.
- Regional council, local council, iwi and community. We are all responsible for the decline of wetlands it needs to have community buy in to succeed.
- At the top of the list should be mana whenua. They are descendants of the land, and have the longest connection with the land. While they should be guiding the process, they should not have to be the ones who take on the financial costs associated. That should be the Crown primarily - as degradation has occurred under the Crown's watch, and as a result of the Crown's legislation and policy.
- GWRC in collaboration with Mana Whenua, farmers and locals.
- I think the vision should be iwi led, but operationally supported by Greater Wellington Regional Council. Biodiversity volunteer (or paid) groups could also play a supporting role.
- multi agency approach - DOC, MFE councils, private organizations, sectors and care groups. However, central government should be providing more funding for restoration and promotion of benefits of of wetlands.
- I guess government department would be good, but any organization that has the mindset to get on with things, and support from govt agencies and landowners etc...Ra is a great educator and the wairarapa is so lucky to have people like this,
- People. The Regional Councils and DOC have done a woeful job, time to empower catchment groups.
- We probably need Iwi, regional and central government to buy back land in order to restore and reinstate but every one will say it isn't their responsibility and they don't have funds. Also in reality private land owners won't do anything unless there is a clear financial driver, eg subsidy or payment for ecosystem service
- We should all be responsible, but at different levels. COmmunity and individuals because that is ultimately where action takes place, Regional COuncil for co-ordination, Central government for helping rectify stuff ups from the past. Iwi and Hapu should be involved, but reluctant to say responsible because it it is not their responsibility to fix past poor management
- Mana whenua need to be empowered to take the lead. The declining health of the whenua (environment) has come hand in hand with the declining health of Maori.
- Catchment groups - far more likely to get real things done - by the local, for the locals. Less interference from Regional/Central Govt (one size fits all thinking) but these groups need support and encouragement. There are great examples all around the catchment (and the country) of groups doing great things.
- Multiple agencies: GWRC, district councils, land owners, Fonterra, iwi, QE2 trust. - especially those with expertise.
- It is the responsibility of all - landowners and government agencies
- MfE, GWRC, Community groups, Farming community, Urban community

- I don't think any one organization or individual should be in charge. People need to work together. However, I do think these sacred ecosystems are particularly important for iwi, and it is the responsibility of all New Zealanders, especially pakeha New Zealanders, as treaty partners to ensure that the damage that was done in draining the wetlands be repaired. This restoration should be done in a way that gives wetland access to Maori, and Maori should have the power guide the restoration process. So, if I had to pick any one organization, I would say iwi should have authority, but responsibility to restore lies with other organizations and individuals
- everyone - central and local govt, farmers, urban and rural communities
- GWRC - The have the resources
- Mana whenua with central/local government funding and support
- DOC and Pukaha ki Kawakawa Alliance group. Their are members of the Alliance group that have continue to preserve and protect wetlands long before of my awareness about wetlands and their passion drives me to do better
- A champion community should have a sustainable plan the puawaitanga (blossoming) of wetlands.
- Landowners(including local and central government) need to be encouraged to see the wider value of wetlands. Grants from government bodies could assist the restoration practise.

Q23 - Additional comments or feedback you may have:

- I used to hunt and camp. When I put fishing it is very rarely to kill anything for food these days. Rather to either observe, catch, count and release fishing. I appreciate your work.
- I'm pleased to share the documentaries, insights, audio stories and storytellers who have contributed to the Lakes380 project's Wairarapa lakes digital storytelling portal: Wairarapa Moana Kete Pūrākau -- www.lakestoriesnz.org.
- Much of the commentary around wetland importance i agree with However there is a large amount of mythology being created around flood management and water storage ability that is not backed by science or by observation. An example of this is below. The referral to wetlands being carbon sinks is only relevant if the wetland is growing in size or the plants in the wetlands are growing in volume and there is no decay. All of the information i have read is that wetlands produce methane, so at best might be carbon neutral. There is such a focus on reverting to natural and a dogma around native plants that we are limiting the opportunity to try to speed up the natural process of wetland enhancement and production Sorry to difficult to do zoom as too busy farming. For the record we have many areas of wetlands that are protected from stock and about 4 more wetlands that will be fenced off this year, and retired. So i am not anti-wetlands just anti the narrative that is being created
- If people don't have access to waterways/wetlands they become estranged from them. If private land owners want payment to protect or maintain then they need to provide access in return .... this will never happen
- GWRC allocates water takes and resource consents that conflicts with wetlands restoration
- The potential of wetlands to meet the wellbeings of the community whether it is the economic wellbeing through the rongoa plants being verified as medicinal plants or wetlands acting as a living nursery for a commercial nursery, especially as wetland plants become more important. The value of wetlands for ecosystem health can include trapping and using excess nutrients, for holding pathogens and taking out methane. The social wellbeing can be valued through the soothing nature of wetlands that can move from eco-tourism opportunities to mental health activities. The cultural wellbeing comes through the wetlands environment enhancing the cultural landscape. Where we now have pasteur we once had giant Kahikatea, a hub tree holding so many indigenous floraa and fauna.
- there are a couple of areas which require further qualification. how do we enhance the Maori point of view????save this and forward to ra!!!!!!!

Appendix K: Quotes

Kereana Sims

1. “You’re just lucky to- I suppose to hear other people’s stories and get lots of different views from it and seeing my people react the way that they do. People aren’t all bastards, it’s just what they’re used to, a generational thing. They’ve all got stories behind it and everyone shares a connection to water, they just think about it differently.”

Karen Williams

1. “We believe it is our role to leave this place in a better state than we found it, and that’s certainly what we’re, what we’re doing...[my husband] and I have been embracing this for 20 years...included some of the emissions reduction stuff...but for farmers who haven’t embraced this for whatever reason, they’re just scared, or overwhelmed, or just don’t know where to start, um, then it has felt like a lot coming at them all at once”

Michael Birch

1. “The money is the obvious one, but I'll think okay actually…some sort of program that results in peer pressure…because farmers definitely respond to that.”
2. “I have found managers are part of a discussion group is offered today. And they know that I have this discussion group…it's about 20 or farmers who visited a different farm every month, within the group, and I share financials…They have a tour around the farm. And they do debrief what goes through the financials, and have a roundtable discussion about how everyone thinks the farm could be run differently or better.”
3. “To restore or protect existing wetlands, by excluding stock, you're going to improve biodiversity because on the farm here, sheep and cattle eat everything. As soon as you fence the stock out you get immediate benefits from a whole range of different plants that weren’t growing before can now take hold. Yeah, I guess it provides habitat for native fish, and mussels and so forth as well.”
4. “But that's really not going to improve the bottom line I don't want to barb, and they are fighting environmental regulations… just uh, feel threatened by them and feel attached so they're just resisting rather than coming on board.”
5. “Now I'm a bit older, I kind of realized that to get behavior change people got to believe it. So the penalties, the sticks not as good as the carrot. I think they need to provide, instead, so that people will get better understanding, and they know what to do with them.”
6. “I think, I think one thing I'll say about regulation though that looks like we're going to get compulsory farm plans one way or another. I think that process…could really help, because just, just by documenting what people have, in terms of mapping, stop taking what they've got on their farm that some people will actually start to realize that their place might be more special than they were before.”
7. “All of the farms in the region have a land manager assigned to them. We work with them in terms of what areas we want to apply for funding to protect. That's been really good.”

8. “awful lot of fencing and replanting that just haven't got a budget for. But that even just what they consider wetlands, I don't know if they got enough budget…probably needs to be addressed at the national level.”
9. “The wetlands need protecting, that'll be the focus, and we tried a little bit every year. There's budget for it…and there's particular for forestry as well. What I'd like to say to in the future is somehow slowing down the, the water and the sediment that runs off our place, because the sediment is actually probably the biggest issue in terms of water quality for our farm.”
10. “I don't have an opinion on all that because I really don't have much experience with artificial wetlands and the scientists who work on those would have a better opinion than I would. But my gut feeling is that nature is hard to beat. So, nature based solutions are the, pretty much, answer for the challenges we face in terms of water resource and climate change.”
11. “In terms of public areas like Wairarapa Moana definitely. In terms of wetlands on private land almost zero, because there's no requirement to so people don't really...It's not obligatory, that actually, so, individuals to really make the effort on private land.”
12. “Little bit of both, the trouble is with some wetlands, they can be some of the most productive areas on the farm that can be developed and the family wants to drain that's all soil, can be really productive. And I think people are reluctant to go backwards from there.”
13. “Well, some farmers just react to regulation - No, Greater Wellington's gonna make us fence off these wetlands and cost… you know. That's the question we have to answer for them as what's the point. So, once I have once said education can be achieved, once people understand better benefits of wetlands.”
14. “It's hard to get some farmers to understand that they're part of a bigger picture too, because they can become quite parochial, defensive about their own land that's their kingdom. And so that they're often not really conscious of the fact that they are connected to the rest of the catchment from the, you know that they could do a lot more to help other people and not just people but to help the whole catchment.”
15. “But at least there are so much publicity around this sort of thing that I think most people are pretty, pretty keen to get on board with that. Except that, except for those who are really just focused on the money side of farming, and there's definitely…a segment of farmers like that.”
16. “[funding] is enough to apply, but frustrating when you don't result. There are obviously some other applications and other farms or elsewhere that have trumped us that we've missed out.”
17. “More recently, we've tried to finish off a large area. That includes some wetlands and bush remnants and a stream. So, we're talking about $100,000 worth of fencing for this particular area…we didn't meet the requirements from Rachel council because they think we already fenced it, despite the fact that we weren't going to replace the existing fences, we will go to play new fences and different area, but because those new fences were close enough to the old fences… there's no actual stipulation of how it closes so, have to be it. It was a judgement, a judgement call. We've missed out on that all together, which has been particularly frustrating.”
18. “What we can do though of course we can go to the Pirateu trust. Pirateu Trust is a national body that provides protection in terms of covenants, We can put a covenant on that land, so that it can be predicted forever. And that would help us with considerable costs, something like 50% of its costs. Greater Willington we're going to provide another 25% of the fencing cost. So that was significant, we are talking about $25,000. I just think that was, you know, it was difficult…I think the minister of existing fences needs to be looked pretty hard.”

19. “That whole discussion about enforcement and penalties, and, you know, whether these people should be charged, convicted over events, penalized, I think we should be focused on education…I think education is the key.”
20. “My motivation personally was environmental conservation reasons.”

Vern Brassel

1. “[For green parenting], early adaptors of good practice should be awarded. There has been past where we are talking about nitrate leaching and everybody needs to drop 10 or 20 percent, and people all of a sudden. thought, oh, in two years time I will remove parlor or stock and then I will take them away and done the job. So, you got to be careful.”
2. “5 years ago farmers tend to be individualists. A lot of them run family farms but now, with the regulations and the cost, they're becoming small corporate farms…They feel in the strike, and environmental groups do, whether rightly or wrongly, yeah, we get beaten up in the press and they get quite sensitive over time. I think the good thing about the climate change one is , uh, no, it's not just us…you better look at what you're doing, and we are all in this together.”
3. “[In terms of current legislations], I think they're about right it's just 20 years too late. But if we done it 20 years ago the cost to our economy during it would be greater…I suspect in the future, it's a demand of our customers.”
4. “In the past people tended to pus farm roads or tracks right next to drains of waterways, then cows walk up and down it, never gave it much thought. We are now moving them away, sloping the roads and drains to the paddock, not to the drains and the waterways.”
5. “The other things I've been doing is putting rocks and ripples in the farm drain…I've been trying to create fish blades to clean the drain and leave parts of the drain to enable some tuna and craters to not get hooked out with the digger.”
6. “We’ve been trying all these sort of things and planting along the edges of the waterways to shade them.”
7. “We were controlling the flow of water and then enable to work out what plants we could put in there, we added different plants to add carbon in it…with the depth of the water being right, supply of carbon, and nitrate and temperature to be the recipe. If you want to remove phosphates you need to have plants taking it up but you will have to remove them from the wetland.”
8. “How we feed the animals and the amount of nitrate in the urine things, so we've been planting plants in the pasture. We are keeping the animals out of the waterways.”
9. “It's the understanding how nutrients move through your particular farm as to how you deal with it.”
10. “We do have irrigation on parts of the farm and I believe that helps because…the plants are far more active, the plants have more time to take out the nitrate. Irrigation probably enables you to have more animals but also enables you to utilize that urine from the urine patches.”
11. “We're trying to slow the water down…and idea of that is to reduce the amount of sediment…as long as the water's gone within 3 days the pastures would recover and you would held the water back…if it was widespread…it can minimize the worst effects of flooding and reduce the sediment in the system.”
12. “One of the problems with a pasture based system you are not actually controlling…the animal. NZ dairy industry are climbing the climate change mission intensity of their product… 10% of

the animal dung and urine are actually collected…which again has that issue of how do you deal with the…one thing I haven't mentioned is we are working with dung beetles…the theory is they will bury the cow pads within a day and you wouldn't get the nitric oxide, the gas developing in the air…hopefully they breed up and in the future they will help the process."

13. "Dung beetles are what the regional council in the area have been encouraging…they are trying to get a mass amount particularly around Lake Wairarapa and the Moana. With the density of them they will make more of a difference."
14. "Ian talked about possums and the damages they do in the native forest and controlling them would be actually a really good way of holding water back and reduce the amount of sediment that comes into the system."
15. "We have an ethical reason we want to do ethical business, we have a community license to do what you do it's become a lot stronger now and more accepted by the farming community you can't just say it's my land and I do what I like."
16. "We are trying to put together a submission to climate change commission…and it's around what's the product intensity per hectare, how do you measure, how so you compare the…milk…how do you allocate a fair system. Nothing will be fair but you got to get as fair as you can."
17. "[For green parenting], early adaptors of good practice should be awarded. There has been past where we are talking about nitrate leaching and everybody needs to drop 10 or 20 percent, and people all of a sudden. thought, oh, in two years time I will remove parlor or stock and then I will take them away and done the job. So, you got to be careful."
18. "Because we are in the low rainfall area, we are controlling the drainage from farm for most of the year, and with the irrigation."
19. "The issue is there's very small streams or this water run through sometimes and there's all sorts of debate about that. There is help certainly but with industry such a large part…we can't support it…we don't have subsidies to do things. We get some help and encouraging but you can't support something that half your economy."
20. "To stay in business, we got to be profitable. We obviously got to balance our environmental projects and the farm has 6 owners."
21. "The local authority is promoting [carbon storage] should be another reason why farmers could retire areas and quite often they don't produce anything anyhow. There could be another reason to do that. That process is just getting to the sharp end of the argument and I'm sure there will be discussion among farmers."
22. "Industry is helping, the regional councils do help. If you are fencing off waterways you can get half the cost of that done. Where in the dairy industry to fence off waterway is a few wires and every now and then a few posts in a year. To fence sheep off is quite different, in hill country it's a different issue."

Anonymous farmer

1. "To enhance wetland management, processes would be educate and assist land owners to better understand, create partnerships and better incentives for landowners to restore, preserve, protect wetlands as opposed to using regulatory tools which…often create destructive outcomes. To me,

that education that partnership that support is going to achieve much better outcomes over a longer term than putting some rules in place."

2. "There are grants available to assist landowners with wetland protection, and enhancement. I don't think that expansion of those grounds are the most important things to achieve better outcomes in terms of growth or protection or reestablishment of wetlands. The most important things is guidance, education, and support. We're running commercial businesses and we should see opportunities in protecting our natural resources, better utilizing and better protecting our natural resources. And those opportunities do exist there, and therefore we should know the commercial outcomes that we get, less externalities, for example. So, the education and knowledge and information around that and support is better than just providing people with a lot of dollars without people understanding what's the greater outcome for your business and community."
3. "There is a significant, I suppose, breaks of understanding amongst landowners. There's a few that have very high understanding, and there is a lot that have very little to, just, small amount of understandings, to those that have no understanding. Again, the great opportunity is to raise the awareness and create those relationships and partnerships."
4. "The farmers are blamed, and that is and, often, the blame comes from a significant of lack of understanding and self-responsibility. It becomes a very emotionally damaging process for, especially, rural communities and NZ it's been…the whole process has been pretty appropriate and not and…the blame comes from very polarized views…and significant lack of understanding. So that have huge impacts on how rural communities…and it created issues by where the division and there is policy, policy regulations that becomes very very unfixable, and very hard for anybody to operate within, including restricting the opportunities for innovation, because one of our greatest opportunities to get better on farm implement outcomes and our community and people is innovation. So when people don't understand the innovation, and almostl threatened by it, and without understand the wider context, why certain things have been done, they blame the people and put regulations in place which restricts any further innovations to achieve better outcomes. So yeah, it's been quite, uh, farmers has been blamed, it affected them significantly, affected the process by which they can operate, significantly restricts innovation, and yeah, it's a pretty destructive process."
5. "Currently there is somebody running around saying there should be no more nitrogen fertilizer and it's going to give everyone bowel cancer, and the media is just picking up on that. We know that it's affect, the use of synthetic fertilizers has saved more lives over the last century than any other innovations, given it's created. Doesn't mean it hasn't created other problems, we have to be innovative to figure out how we move forward in that space. The point is , nobody is running around and saying, if we stop using synthetic fertilizers we will create famine around the world."
6. "I'm involved in a lot of the restoration projects on farms, but we also have a catchment community that's doing significant amount of waterway and wetland restoration within the Ruamahanga catchment…in terms of governance, in terms of being involved with that, and those restoration projects, and the key part is about a lot of that is bring people together to see and be a part of a common vision and creating common, better outcomes, and what is like to being involved in those…It's incredibly fulfilling and probably beyond fulfilling. It's about making sure that those who come after us will have the same, if not better opportunities, than we have right

now, and see our community pulling together to do better things is almost a greater life purpose….It's incredibly fulfilling."

7. "The key part is to make sure we are sustainable financially and I suppose environmentally within our business going forward, over a longer term…how does that impact decision making and processes. We strongly believe that better environmental outcomes are based on the prosperity of our community so therefore as we grow our community we want to ensure prosperity and from that we can be a lead contributor to our local catchment community, which is got government funding but now we are saying whenever we grow, we can sustainably fund, and take government funding out of our catchment community and as a community of farms we continue to farm and all the environmental works and can ensure catchment thrive through the next generation."
8. "Wetlands were previously just wet areas of part of the farms, you know, there're a lot of wetlands that've been drained now farmed, then the wet areas were left were just included as parts of paddocks and weren't considered important parts managed. With our bits of understanding we had grown to look at those as key areas to protect..."
9. "Wetland policies have been quite a significant debate around our region and it's becoming across NZ. And I think that the issue we that we've faced is the lack of understanding between those who write those policy regulations, lack of understanding around what is actually happening on the ground and the implications on the ground, so most of the regulatory or policies, frameworks, all policies that have been suggested have probably has, well yeah, in my opinion, being quite heavily involved in the process have a negative impact on the restoration of wetlands, and the reason for that is that they so significantly impact a farm business or how some of the land managers manage their land that they do not want anybody coming on to their farm, helping them identify what is a wetland and where it should be protected. In fact, they do everything that they can do to avoid anything being identified as a wetland because of the regulatory impact. The way to get a beneficial outcomes would be how could the policy frameworks work to create partnerships whereby wetlands seen as a significant asset to the land manager or land owner or farmer Therefore there is a strong willingness from the land owner to want to protect and enhance the wetland areas. And at this point in time policy framework achieved the opposite, which to me is destructive."
10. "To enhance wetland management, processes would be educate and assist land owners to better understand, create partnerships and better incentives for landowners to restore, preserve, protect wetlands as opposed to using regulatory tools which…often create destructive outcomes. To me, that education that partnership that support is going to achieve much better outcomes over a longer term than putting some rules in place."
11. "We believe that that those that come before us have given us a significant opportunity to live the life and have the opportunities that we do, so we have the strong responsibility to provide the same opportunities to future generations and live for those that come before us and that's all based, everything we do is based around our land and our community. So, the focus on kaitiakitanga [guardianship and conservation] and those values, we're not, we're are just part of a of a process, that's all we operate our business and how we work with our land in our community to ensure that those of future generations have the same opportunities that those before us have provided us."

12. “Wetlands also provide a great place for our kids and our families to actually play in, although it does get frustrating when the kids come back with the clothes and down boots and everything covered in mud. But it creates an important part of what you say, recreational or farm life.”
13. “I think farmers bring several things to the table. One is passion, and one is often forgotten, is farmers don't do what they do because they want become millionaires. Often, farmers don't make a lot of money and work seven days a week for 365 days a year. The reason they do that is for their land, their family, and the community, and so therefore often when a farmer does something wrong, it's because there's something missing from the understanding and there is something missing from their life. Every farmer is for those same values and that brings their passion and commitment and vision. What help projects move forward is not often the most structural things it's often the most emotional things and that's what those connections and passions that farmers can bring.”
14. “A lot of farmers in our region are becoming intergenerational…a lot of the commitments now is to become intergenerational land owners and land managers or land stewards and guardians. Their values and commitments have almost seem to change in more recent times, and that then gives the opportunity to focus on much longer term horizons which create huge environmental benefits when you are not thinking about how much you can sell your land for and how can that make for your family now, and how do you ensure that's sustainable through future generations including how they can be sustainable with your resources.”
15. “A second most important thing that farmers bring is an understanding of the land and the environment, which is matched of those who might worked on restoration projects for the wetland. They take all those over years and read some pieces, whereas farmers, they live with the land, their environment, 24/7, 365 days of the year, so the actual understanding of how their environment works and interacts had often achieved the adversity outcomes can be old schooled within a farmers knowledge and experience and I think that's crucial.”
16. “Economics is a significant factor…the key is to think about economically what does it mean across the lifetime of the business. This is where I think is an important piece of work. Farmers will make decisions based on long term economic outcomes for their business. Better understanding of that help us make decisions.”
17. “Maori are significant landowners and farmers in NZ as well. Now the values are very very close, but there is a gap of understanding and often the way the Maori world operates compete the way rest of NZ operate…can be very very different. And obviously iwi will have different ways of operating from iwi to iwi as well. The key part is how do you consider we are all trying to achieve the same thing, we all genuinely hold the same value sense, the key part of this is the understanding, how do you bridge those gaps, that's the key.”
18. “...the best possible economic outcome that we can identify is one, slowing down the water and water storage for sheep can be utilized, utilized in many different ways for our community. The other part in terms of economic value is decrease our or create filters for our nutrients and decrease our nutrient losses of our commercial businesses.”
19. “…it created issues by way of the division and there is policy, policy regulations that becomes very, very unfixable, and very hard for anybody to operate within, including restricting the opportunities for innovation, because one of our greatest opportunities to get better on farm implement outcomes and our community and people is innovation. So when people don't understand the innovation, and are almost threatened by it, and without understand[ing] the wider

context, why certain things have been done, they blame the people and put regulations in place which restricts any further innovations to achieve better outcomes. So yeah, it's been quite, uh, farmers have been blamed, it affected them significantly, affected the process by which they can operate, significantly restricts innovation, and yeah, it's a pretty destructive process."

20. "Wetlands also provide a great place for our kids and our families to actually play in, although it does get frustrating when the kids come back with the clothes and down boots and everything covered in mud. But it creates an important part of what you say, recreational or farm life."

Esther Dijkstra

1. "The people in those catchments wanted to make decisions on their own, rather than having rules imposed on them. So, they want to make a difference on water quality in their catchments."

Kolja Schaller

1. "The mindset has definitely shifted and the understanding of how wetlands can play a role in the ecosystem to remove sediment and nutrients and kind of support the wellbeing of the ecosystem is something that they're [farmers] slowly learning."
2. "I work in the part of the council that incentivizes good behavior and there's the other part of the council that has the 'stick'. It's about getting that balance right between using the stick when and if needed, but most of the time we try to incentivize that good behavior and good management practices and getting things on the right track. If you use the stick too much, then you frustrate the farming community and that doesn't help the situation."
3. "We don't really actively advertise those grants, but generally farmers that are interested will call us. A lot of farms in the region have farm environment plans so I work with about 60-70 farmers down in South Wairarapa and there's a bunch more land management advisors like myself who have similar farm plan portfolios. So those people that we work with typically know about the opportunities around funding availability, but if you're outside and not part of that farm plan program then it's harder to know about what the opportunities are to get funding to do that type of environmental work."

Rawiri Smith

1. "International recognition is pretty important but it's kind of out there as opposed to an outcome community …we need to move from international recognition national recognition…and just recognition at home."
2. "we could do is, turn towards our land and our environment, and have a space to do that in, and then we see the environment, we can see each other a bit, a little bit of what about how the lake save people, both save Maori and the wider community through the environment, the way of weaving people, weaving and connecting our relationship as neighbors."
3. "You need to have the conversation about money."
4. "And so, one of the things that we want to do with a bit all of our herbal medication to prove herbal medication that it can buy that stores on the same footing in the receive its true value and mean so part of our true valuing is valuing the money to things like education in So now, if we step back and see. Now what's the value of the secret that we've we can have a whole range of other connections to, we can have a whole range of other conditions."

5. “Sometimes [wetland restoration] is about convenience. One of the things about money is that it pays people to be inconvenient…of you, if we're relying on volunteers, we might not always have the opportunity to be relevant to them.”
6. “What if the timetable was looking at the life of a river? So now what's the timetable? Whole lot of ecological things are at tipping points. We are doing repairable damage…for those in the waterways their population are at a crisis…they can't breathe in the water anymore.”
7. “[The farmers] are really usually pretty good at environmental things, they want to do the right thing but they're in an industrial model.”
8. “So, you know that that's the bottom line, they might be, want to be an agricultural model. But, you know, that two minutes on the agricultural bottle and distress point is industry.”
9. “The community going into like what are they looking for fresh water muscles…there's an age difference. So there's lots of old ones, but no baby…the fish need fresh water to survive. And now, the habitat is become smaller. So, now at a tipping point.”
10. “It was, it was like, I think the experience was, and other and other places like just walking through thinking, going through the wetland. And, we might be on a farm or something but it just thinking that it felt different…a lot of the ones that I remember we went through, went through there were trees around, so it's that theme, that kind of feeling that I reflect that are a little different.”
11. “My mom is also someone who's bought us herbal medicine and Maori traditional plants and traditional medicine.”
12. “So we go there to gather, things that are going to be important in terms of working and display of weaving, into terms of medicinal plants and drinks, plants go into drinks.”

Raihania Tipoki

1. “But for the whole farm we’d like to go, you know, we'd like to incorporate more of the regenerative practices. And I don't think policies at the moment you know, policies, governance policies at the moment, don't make it. Yeah, it's still easier to be a conventional family farmer.”
2. “Yeah, I think we're very, we're still very much a capitalist society. That, in, and we’ve become hyper individualistic. I think most people still just care about themselves and what they can get from the world or from, you know, from wherever they are. Yeah, we were driven by the market still everything's very much, you know, yeah the markets driving, driving us and our values, you know the western values, we don't really talk about what we value, enough. But when you look around and you look around the place. Money is absolutely still at the top. Absolutely still at the top, we might say, you know, you go to these schools and there they have all these beautiful Maori terms, saying what their values are but when you actually look at the curriculum. They're really just out there to get to ensure that their students are performing the best, you know the optimum...”
3. “...there's three types of Māori... There's Māori.... stuck in those cycles or kind of at the bottom. If you'd like or stuck in poverty in that they, they really probably don't think too much at all They, they probably know that that's just not right. But they probably don't know why it's not right, or how to make it right. Then there's Māori who, you know, I talked about inequality gap there are Māori who are doing really well for themselves, and they can probably be divided into 2 to those of us who do understand our history and want justice. And then there's others that are quite happy with the status quo, because they've been, you know, they've become capitalists and yeah doing

really well for themselves and don't really care about other Māori because they haven't, you know they don't understand the struggle that their ancestors went through to put them in a place of privilege. Yeah."

4. "As Māori own land that we lease...for the whole farm we'd like to go, you know, we'd like to incorporate more of the regenerative practices."

Stephanie Tomscha

1. "Are people becoming more aware? I mean I think that the more restoration people do, the more aware that they become...it's just a mix."
2. "I think it becomes kind of low on the priority list often...the farms that are able to restore are often wealthier farms...ones that maybe are less dependent on it for their income."

Ian Gunn

1. "So you've heard the farmers talk about the economics and productivity. And they, They, they, they don't like paying rates, but they also like to have some assistance. And the other part is monitoring. If you don't- now you're all doing engineering stuff, if you don't actually monitor how your engineering practice is operating or design or whatever, you don't learn anything. So there's a great. And, and there's a great challenge in terms of what do we monitor? How do we monitor? And do we look at what monitoring results tell us to actually make a change.
2. "Now if you design a car and we'll square and you know that something's wrong. But, what, what, in the environment area that's difficult because we're only appreciating how interconnected everything is. And so, should we for example, monitor just fish that might be found in any area rather than all the vegetation, because all of that different vegetation has an impact on the habitat of the fish. Now we don't know enough yet to do that. So, we've got a beast that we are trying to tame, and we only have a limited understanding of how to tame the beast. And you can pull money and more money and more money. But, as, as we've discussed today in and during the other things is, is how much does regulation inhibit or promote change, or is it cooperation, and so on. Yeah, The money. There's this thing, money, and innovation and sometimes the requirement to pay money results in a innovation. Because somebody says I can't afford that. So I go away and do something, and that's what the farmers do the farmers. See a challenge, and they go away and work at it. And often they're successful, not always, but they're very innovative people. So I, there will never be enough money Meng, ever."