



Exploring and Monitoring the Wairarapa Moana Ramsar Site

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Exploring and Monitoring the Wairarapa Moana Ramsar Site

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Table of Contents

Glossary	iv
Abstract.....	v
Meet the Team.....	v
Executive Summary	vi
Background	vi
Methodology	vii
Results	vii
Conclusions	x
Chapter 1: Introduction	1
Chapter 2: Literature Review.....	3
2.1: Wairarapa Moana: A Wetland Worth Protecting	3
2.2: Community Impact of This Work.....	5
Māori Perspective and Conflicts with Land Management.....	6
Conservation Efforts of Government Agencies	7
Farm and Livelihood Perspectives on Conservation Efforts.....	7
2.3: Convention of Wetlands and Ramsar Status.....	8
Criteria for Ramsar Consideration.....	8
Mission and Efforts of the Convention of Wetlands.....	9
Ramsar Status Designation of the Wairarapa Moana	9
2.4: Natural Solutions	10
2.5: Case Studies	10
Case 1: Pollution Monitoring.....	10
Case 2: Montreux Record.....	12
2.6: Summary.....	12
Chapter 3: Methodology	14
3.1: Document Current Attributes of the Lake.....	14
3.2: Identify Areas that Need More Attention or Deeper Monitoring.....	15
3.3: Assess Community Response to the Ramsar Status	16
3.4: Project Stages.....	16
Chapter 4: Results	17
4.1: Foundations	17
4.2: Biological Analysis	19
4.3: Farming Unsustainability	20

4.4: Broken Promises	21
4.5: Mourning and Restoring What Has Been Lost.....	24
Chapter 5: Suggestions	25
5.1: Preface	25
5.2: Framework Map.....	25
5.3: Goals and Milestones	26
5.4: Monitoring Approach	27
5.5: Engagement Suggestions	29
5.6: Conclusion	30
References	31
Appendices	35
Appendix A: Sample Interview Questions.....	35
Appendix B: Consent Forms.....	37
Appendix C: Element Map.....	39
Appendix C1: Community Health Goals	40
Appendix C2: Ramsar Criterion.....	41
Appendix C3: Elements	42
Appendix C4: Ideally Monitored Elements	43

Glossary

Māori	English
Wairarapa Moana	“sea of glistening water including Lakes Wairarapa and Onoke and the section of the Ruma-hanga river joining the lakes”
Aotearoa	New Zealand
kaitiakitanga	resource guardianship
rangatiratanga	absolute sovereignty
tūpuna	ancestor
mātauranga	Māori knowledge
tuna	eel
te ao Māori	the Māori world view
whenua	land
whānau	extended family
rohe	region
whakapapa	personal connections and genealogy
mahinga kai	the gathering of food/resources and the areas that produce them
te reo Māori	the Māori language
tātai	genealogies
kōrero	stories

Abstract

The health of the Wairarapa Moana has rapidly degraded and has achieved Ramsar international conservation status. We have gathered information and perspectives from local Māori and other community members in order to assess and monitor the health of the lake. We found overarching community goals for the lake and created a framework which physically demonstrates the interrelation between mauri, Ramsar criterion, community goals and elements of the Wairarapa Moana.

Meet the Team



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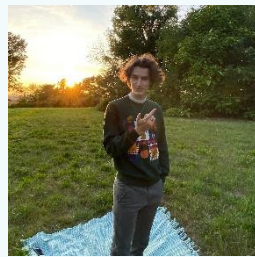
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Executive Summary

Background

Wairarapa Moana, located in Wellington, New Zealand, faces precarious status as a wetland, and in 2020, the Moana was awarded Ramsar status, a designation given to wetland sites that are crucial to maintain for global biodiversity. For communities bordering the Moana, the region is an essential part of local history, a recreational destination, a cultural landmark, and a rich local habitat that supports local farms as well as way of living. Ecosystem health plays a critical role in communities of Aotearoa [New Zealand], given the fragile balance of habitat and biodiversity in the island nation.



Figure 1: A Native Tūi perched on a Kōwhai Tree (Native Tūi, 2019)

Wetland habitats are essential in a well-functioning ecosystem, acting as water filters, providing flood and erosion control, and furnishing food and homes for fish and wildlife (US Department of Commerce, n.d.). The array of wetland environments within the Wairarapa Moana allows the ecosystem to support a variety of diverse species. This area is home to

over 50 rare and threatened species, as well as an abundance of other native species. By working with regional communities to monitor and protect the wetland, we can protect the environment as well as important spiritual, social, and practical elements of people's lives that depend on the Moana for many reasons.

Therefore, the goal of this project is to suggest a framework, including mātauranga Māori and principles of western science, that will assess the Ramsar characteristics of the Wairarapa Moana. For this goal, we have identified three objectives. Our first objective documents the attributes of the lake as they exist now. Our second objective assesses community response to the Ramsar status. Our final objective identifies areas that need more attention or deeper monitoring.

We hope that these processes will generate a solid foundation for monitoring and ecosystem well-being.

Methodology

For data collection, our team reviewed previous records and interviews with Wairarapa community members that have been conducted in recent years. This included press and media accounts, as well as interviews conducted by previous teams working with this wetland. We also conducted interviews and focused our interview questions about Māori genealogical stories and the environmental health of the Wairarapa Moana, to learn how current attributes and associations with the lake, both positive and negative, have changed with time. These interviews were supplemented with reports drawn from the Māori lake stories websites.

There are several different models of ecosystem health that can be used to help guide decision making processes when it comes to environmental management (Harmsworth, 2013). In accordance with Māori cultural values, the models often include social health wellbeing of the community as directly tied with environmental health. When interviewing stakeholders and area residents, we asked questions that would allow us to evaluate their perception of the Moana in terms of these models. This included questions about the mauri of land and people as well as how sustainable certain practices in the area have been in terms of ecosystem health.

There were two main stages of the project to collect and analyze data. The first stage focused on research of Wairarapa Moana site characteristics, interviewing of community members on their opinions regarding cultural and personal meaning to the well-being of the wetlands and interviewing environmentalists who are experts on wetland characteristics. The second and final stage of the project organized the qualitative data collected to build the Wairarapa Moana wetlands monitoring framework.

Results

Prior to the introduction of the Ramsar classification, Wairarapa Moana held a smaller amount of public attention. The roads go around Lake Wairarapa, making public accessibility difficult. In addition, the wind funnels through the valley, making swimming dynamic and a bit too cold for recreational activity. Despite being a fraction of its original size, the wetlands are a habitat

for an overwhelming variety and population of birds that are a major part of the region's significance.

Currently, there are many groups working to monitor and protect Wairarapa Moana who have made strides and accomplishments, but there is more work to be done. While the support for conservation and growth seen during the pandemic has been widely welcomed, many expressed a few pointed shortcomings of the current approach. The general sentiment also felt that ideas adopted from mātauranga Māori are quickly dropped without efforts to adapt them to the modern landscape. Our interviewees felt that many of the approaches being used are too narrow and lacked the foundation of the generations of knowledge in the region.

When looking at the health of the Wairarapa Moana, one of the most important qualities to analyze is the water. The Wairarapa Moana's water can be seen as less than perfect for a variety of reasons. First the water is considered super trophic which is caused the sediment being deposited in the Moana, especially when it becomes suspended. This sediment is rich in phosphorus and nitrogen.

Over the last few decades there has been a noticeable decrease in “Tuna” and other native fish and an increase of exotic fish (Perch, Rudd, and Trout) which are taking valuable and scarce resources within the ecosystem.

Another serious threat is myrtle rust, a disease caused by the exotic fungus *Austropuccinia psidii*, which can be identified by yellowish spotting on plants.

Farming is one of the major contributors to the New Zealand Gross Domestic Product and thus is heavily integrated in New Zealand and the Māori way of life. From an economic standpoint, farming and conservation ideals conflict with one another. Most farming practices are implemented with the sole goal of maximizing sales and profit so, some have proved consequential to the wetlands and surrounding wildlife.



Figure 2: Plant Affected by Myrtle Rust (*Myrtle Rust* Discovered in Palmerston North, 2018)



Figure 3: New Zealand Farmland (Royan, 2006)

As the region is coming to be managed more jointly between local government and local Māori leaders, we had a lot of discussion on changes that are brought about by the state management, many of which are in direct disregard to the Treaty of Waitangi and the contractual rights involved in the sale of the land. The first and most glaring examples of regional mismanagement is the removal of the Ruamahanga river from Lake Wairarapa, allowing it to progress more directly to the ocean. Another direct cultural loss comes from the introduction of game fish into the region. Perch, rudd, and trout were brought into the lake and rivers to supplement the local fish species and provide more options for the strong sporting culture in New Zealand. There are also consequences from efforts to modernize the region in a way that doesn't work with the natural way of life. The introduction of barrage gates to normalize the water flow in the region has severely inhibited the motion of flounder and has led to floundering (the fishing practice) dying out entirely. The last element that was addressed several times was the lack of regionally oriented education.

For ages, the Wairarapa Moana provided sustenance for the community. Unfortunately, the current health status of the region and the resources available cannot sustain the life of the people it once did. This international support is praised, although many feel the roots to a solution could be found on a more individual level. The expressed key to progress to restore this self-sufficiency is the personal connection community individuals feel to the wetlands.

Conclusions

To have a strategy for monitoring Wairarapa Moana that assesses both the Ramsar criteria and all the regional elements that affect them, we believe that the best approach combines mātauranga and western science. Our goal is to provide insight into how the Ramsar convention supports the local goals of health, and suggestions on how current strategies can be used to support the mission of conservation and preserve the Ramsar classification.

Whakapapa is the traditional Māori knowledge where everything is connected, and all things build upon each other, so when looking at the overall health of the Wairarapa Moana, it must be emphasized that the overall health is only as good as the worst part of the lake or worst evaluated characteristic. The Māori framework of interconnectivity also extends to the community surrounding the lake and wetlands, so the progression of health can also be monitored by tracking the goals for well-being of the surrounding communities. It is important to understand that with any ecosystem with such interconnectedness as this, the goals and milestones for the lake's improvement will usually be achieved in unison and over time, but individual goals may be accomplished more quickly.

To measure the health of the region, Wairarapa Moana will need to expand its current data collection regimen to include more comprehensive information from a broader information base to get a holistic picture of health. Therefore, we propose the adoption of cultural metrics as well as general environmental factors that aren't included in the base Ramsar factors. Firstly, we look at the factors that are expressed as being key indicators of the health of the Māori population. We would also like to recommend some additional quantitative factors adapted from the Handbook for Monitoring Wetland Condition, as well as regular hydrological testing, which is a simple and easily repeatable indicator of issues.

It is key in this process that the local community is highly invested and involved. One of the indications of a healthy community is that the Māori community can act as the kaitiaki effectively. The current conservation efforts and academic community is doing highly involved work that place substantial strain on the organization and resources of the Māori. As such they should be able to see the benefits of their work in terms of economic recompense as well. The second suggestion is to take steps towards increasing the local knowledge of the cultural and historical significance of Wairarapa Moana.

Overall, we believe that bringing together the benefit of the Ramsar status with regional practices will be able to improve and maintain the health of the region. While it is not a perfect cure it is a fantastic step towards the goal of conservation and a return to form for Wairarapa Moana. Our hope is that the ideals of the original caretakers of the land will gain some traction and mesh with the perspectives of the rest of the community of Wairarapa. There are a variety of cultures and people in the area, but we firmly believe that regardless of background, a healthier landscape is an absolute necessity.

Chapter 1: Introduction

Ecosystem health plays a critical role in communities of Aotearoa (New Zealand), given the fragile balance of habitat and biodiversity in the island nation. For local area residents, the landscape carries cultural and economic significance that is tied to a sustainable sense of place. Wairarapa Moana, located in Wellington, New Zealand, faces precarious status as a wetland used for recreational activities such as swimming and fishing. For communities bordering the Moana, the region is an essential part of local history, a recreational destination, a cultural landmark, and a rich local habitat that supports local farms as well as way of living. With climate change impacting the health of the wetland's ecosystem, the populations of species and how they interact are ever changing and could threaten the well-being of protected and limited resources.



Figure 4: Western Shore of Lake Wairarapa (Ontarget, 2005)

In 2020, the Moana was awarded Ramsar status, a designation given to wetland sites that are crucial to maintain for global biodiversity. This status title holds implications for assessing the ecosystem to maintain this designation status. Direct human interaction from residential communities, farmers, recreational groups, and local and regional government with the lake is common and could be impacted by Ramsar status. Another issue facing the Wairarapa Moana and Aotearoa in general is climate change. There have also been significant and concerning losses in

wetland habitats (Robertson et al., 2019), and so protecting this site will help contribute to the ensured wellbeing of an important and fragile ecosystem.

By working with regional communities to monitor and protect the wetland, we can protect the environment as well as important spiritual, social, and practical elements of people's lives that depend on the Moana for many reasons. Fortunately, there is a wealth of information and experience that can be utilized to create a monitoring plan.

Therefore, the goal of this project is to suggest a framework, including mātauranga Māori and principles of western science, that will assess the Ramsar characteristics of the Wairarapa Moana. For this goal, we have identified four objectives. Our first objective documents the attributes of the lake as they exist now. Our second objective assesses community response to the Ramsar status. Our third objective identifies areas that need more attention or deeper monitoring. Our final objective ranks priority actions by sorting the criteria we have discovered to present for further initiatives. We hope that these processes will generate a solid foundation for monitoring and ecosystem well-being.

Chapter 2: Literature Review

In order to provide a greater context for the work, we need to focus on the Wairarapa Moana characteristics, subtopics of Ramsar status, the environment and its history, its importance, and the stakeholders involved with the site that could be affected by this work. The history of the Convention of Wetlands, their mission and efforts, as well as what Ramsar status provides is crucial in understanding how the future well-being of the Wairarapa Moana can be maintained, even improved with the international title.

2.1: Wairarapa Moana: A Wetland Worth Protecting

Meaning “sea of glistening water” in Māori language, Wairarapa Moana is a culturally significant wetland located in Aotearoa’s North Island. It consists of diverse wetland environments including the third largest lake on the island (Lake Wairarapa Moana), freshwater swamps and marshes, rivers and streams (Ruamahanga River), an estuarine lake (Lake Onoke), and coastal swamps and marshes as seen in Figure 1 below (*Wairarapa Moana Wetland | Ramsar Sites Information Service*, 2020).



Figure 5: A geographical map of the Wairarapa Moana Wetlands (Keane, 2007)

Wetland habitats are essential in a well-functioning ecosystem, including acting as water filters, providing flood and erosion control, and furnishing food and homes for fish and wildlife (US Department of Commerce, n.d.). The array of wetland environments within the Wairarapa Moana

allots the ecosystem to support a variety of diverse species. This area is home to over 50 rare and threatened species including the freshwater bittern (*Botaurus poiciloptilus*), the nationally threatened mistletoe (*Korthalsella salicornioides*), the nationally vulnerable torrent fish (*Cheimarrichthys fosteri*), and the “at risk” longfin eel (*Anguilla dieffenbachii*) (*Wairarapa Moana*, n.d.).



Figure 5. *Botaurus poiciloptilus* (Hodge, 2009)

BOTAURUS POICILOPTILUS

The *Botaurus poiciloptilus*, a freshwater bittern, is found in New Zealand and New Caledonia as well as throughout New South Wales, Victoria and Tasmania to southern Queensland and eastern South Australia, also the south-west corner of Western Australia. It also can be found in New Zealand and New Caledonia with a population of only about 2500 mature individuals (Communications, 2014).

CHEIMARRICHTHYS FOSTERI

The *Cheimarrichthys fosteri* is a fish with a large flat head and belly with an arched back. It grows to a maximum length of about 8 inches but is usually closer to about 4 - 5 inches in length and eats aquatic invertebrates. This fish is threatened by a variety of factors including erosion of bank due to grazing by livestock, goats, and deer (*Torrentfish (Cheimarrichthys Fosteri) • Rare Species*, n.d.).



Figure 6. *Cheimarrichthys fosteri* (Haplochromis, 2010)

ANGUILLA DIEFFENBACHII

The *Anguilla dieffenbachii* is New Zealand's only endemic freshwater eel. These eels are unique to New Zealand and are very culturally significant to the Wairarapa Moana region. These eels take 30 or more years to reach sexual maturity and lay their eggs way out in the Pacific Ocean (*Longfin Eel (Anguilla Dieffenbachii) • Rare Species*, n.d.). They live for a very long time, with some females living over 100 years. The decline of longfin eels can be attributed to several factors including overfishing, drainage, hydro development, and water pollution (*Longfin Eels*, n.d.).



Figure 7. *Anguilla dieffenbachii* (Sullivan, 2016)

The Wairarapa Moana's recent Ramsar status has made the wetland the seventh site in Aotearoa to hold that title. This international designation recognizes the ecosystem as important for biodiversity and recognizes the value of the region for the wellbeing of surrounding communities. For the Ramsar status to be upheld, measurable criteria indicating the condition of the lake must be maintained and preferably improved.

Aotearoa has an environmentally progressive approach to land stewardship. It was the first country to grant legal personhood and rights to nature as Te Urewera was granted personhood in 2014 (Barrett et al., 2020). Māori cultural values furthermore refer to kaitiakitanga, a form of resource guardianship which encourages conservation and protection (Kawharu, n.d.). The practice of the term is ever evolving, but the general meaning remains the same over time and contributes to a sense of responsibility for the land. The site is quite large, with a surface area of about 70 square kilometers and the whole catchment measures about 3500 square kilometers. Therefore, implementation and monitoring systems have the potential to be quite expensive (Trodel et al., 2016). Since Ramsar is internationally recognized, the status increases regional and global awareness that could result in federal funds provided for conservation efforts.

Like many other parts of the world, Aotearoa is currently experiencing the effects of climate change. The original Wairarapa Moana wetlands have largely been drained. The remaining wetlands may be threatened by climate change becoming drier and or threatened by sea level rise.

Although most local residents are environmentally oriented, opinions are ever changing especially with the perceived idea that the Ramsar status is restrictive. For example, some fishermen may prefer to use the lake to fish like they always have in the past and some who would want the lake protected. All in all, Ramsar status may generate controversy as the conservation process unfolds and the ecosystem faces new threats over time.

2.2: Community Impact of This Work

The land surrounding Wairarapa Moana is home to a variety of communities from different groups and identities, and each have perspectives to understand.

Considering the land and its elements as an entity with personhood has been used to grant legal protections elsewhere in Aotearoa (Kramm, 2020), it is an important benchmark to consider

ensuring that regional expectations and rights are respected. Wairarapa Moana is one of the most heavily polluted wetlands in the nation (*Govt Funds for Multi-Million Freshwater Clean-up - ProQuest*, n.d.) and could see a significant change in its condition in the coming years as work to protect it continues. The wetland has no autonomy but benefits from the guardianship of Māori stewards and other legal protections put in place. Moreover, there are several animal species that are vulnerable or endangered that call the wetlands their home (Beadel et al., 2000). These inhabitants of the Moana are a central element of Ramsar classification and are a vital part of the ecosystem and its well-being.

Māori Perspective and Conflicts with Land Management

These wetlands and Wairarapa Moana are very important to many communities within the region who see and use the water in a variety of ways. Local Māori residents have fished eels from these lakes for generations and have used them as a source of food. Regional farmers and local fishers want to preserve the lake for livelihood purposes. In te ao Māori [a Māori worldview], the health of animals, humans, and the environment is intimately connected. If the whenua is not healthy, every dimension of whānau wellbeing suffers (*Land and Te Ao Māori | Ministry for the Environment*, n.d.). This virtue supports the preservation and restoration of wetlands of Wairarapa Moana to ensure long-term balance within their communities.

The Treaty of Waitangi signed in 1840 between Māori chiefs and the British Crown attempted to uphold Māori authority, sovereignty, and laws. However, this treaty among others was not respected and the government stole the land. Currently, a proposal that will grant 2% of lost value will be given back to the Māori is under consideration. Furthermore, in keeping with Māori environmental management, local stewards want control of both the lake and tributaries flowing into and out of the lake since the waterways are essential to improve and maintain the health of the lake.

In recent years, critical steps have been taken to allow the Māori rights of rangatiratanga [absolute sovereignty] by returning the environmental management back to them (Grace, 2010). The lake holds significant cultural and practical value and has for many years. It is seen as a tipuna [ancestor] and being central to their fishing trade due to the pervasiveness of tuna in the area (*Ko Ngā Kōrero Taketake o Wairarapa Moana Ancient Stories of Wairarapa Moana*, n.d.). In particular, Ngāti Kahungunu ki Wairarapa and Rangitāne o Wairarapa are the local communities working with the New Zealand government on resource management in the area (*About the Project*, n.d.). Additionally,

mātauranga Māori will provide the guiding principles used in our study and monitoring of the lake as it provides a generational knowledge that is crucial to utilize.

Conservation Efforts of Government Agencies

In addition to the traditional keepers of the land, the government of New Zealand is contributing to the work on the Moana. Together Māori groups, the New Zealand Department of Conservation (DOC), the Greater Wellington Regional Council, and the South Wairarapa District Council are working on the Wairarapa Moana Wetlands Project (*Wairarapa Moana Wetlands | Greater Wellington Regional Council*, n.d.). This collaborative conservation effort is attempting to restore the wetland's health and is responsible for resource management in the area (*About the Project*, n.d.). Any future actions that could come from the framework we establish would likely be managed by this trust. They serve as the primary protectorate of the land and will be responsible for the future success of conservation efforts in the region, with key participants mapped in Figure 5 below.

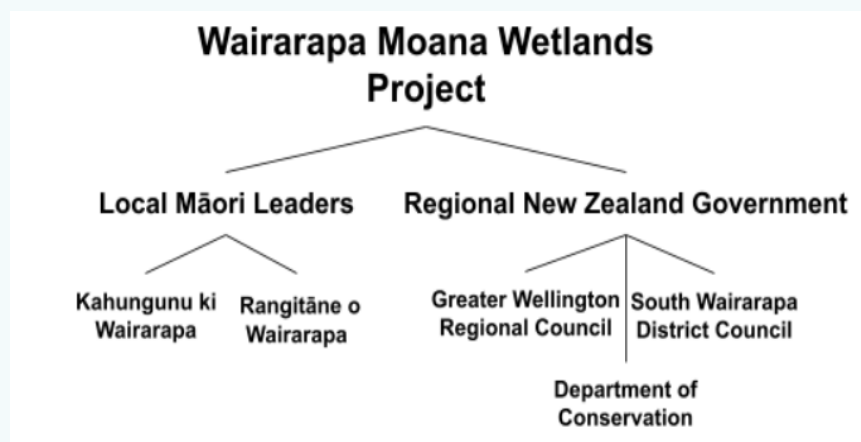


Figure 8: Chart of organizations working on conservation

Farm and Livelihood Perspectives on Conservation Efforts

Cultural and historical values are not the only attributes at play in the area. The wetlands provide irrigation and land for farmers who must balance their desires for conservation with the challenges of high production agriculture (Botha & Roth, 2011). A study of Aotearoa New Zealand farmers found that the support for adopting sustainable farming practices varied based on a wide variety of criteria (*Spatial Dependence and Determinants of Dairy - ProQuest*, n.d.). People are more willing

to accept the inconvenience of environmentally sound practices if they are young, well-educated, or if their neighbors are also in support of the practice. Additionally, the study found that farmers who lived in proximity to a body of water (like those in the area of the Moana) were much more overwhelmingly in support of efforts to protect water quality. However, one of the biggest setbacks to support for conservatory practice was the cost that it could impose on farms. If the perceived setbacks from the program outweigh the benefits, then it will not receive as much popular support (Botha & Roth, 2011). Despite these differences, both studies found that most farmers in Aotearoa support the mission of conservation and its necessary sacrifices.

2.3: Convention of Wetlands and Ramsar Status

As one of the oldest modern global intergovernmental environmental agreements, the Convention on Wetlands was formed from a negotiated treaty in the 1960s based on the growing concern of loss and degradation of wetland habitat for migratory waterbirds. In 1971, the first convention was held in Iran in the city of Ramsar and the treaty was signed (*History of the Ramsar Convention*, n.d.). The Convention created a list of wetland sites designated to be of international importance to conserve global biological diversity.

Criteria for Ramsar Consideration

If a site qualifies under any of the nine criteria, it is deemed to have “Ramsar status” that could potentially bring economic benefits to the area towards conservation efforts. The only condition involved with a site earning this international status is that it must maintain qualification and uphold criteria met. As an international organization, these criteria are based on modern western science ideals. Therefore, it is important to recognize that the well-being of the wetland region as defined by this international status does not necessarily mean that Māori and other community members have the same well-being criteria.

Mission and Efforts of the Convention of Wetlands

While the Convention doesn't directly implement restrictions, it sets a framework for intergovernmental cooperation on wetland issues and ensures effective management. The mission statement of the Convention is to uphold "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world" (*The Convention on Wetlands and Its Mission*, n.d.). This is mainly achieved through local, national, regional, and global partnerships with governments, non-governmental organizations, private sectors, and other Conventions through treaties and formal agreements (*Partnerships*, n.d.). This structure of collaboration guides a global initiative to improve and maintain the well-being of shared wetland systems and species critical for global biological diversity.

Ramsar Status Designation of the Wairarapa Moana

Today, there are 2,433 Wetlands of International Importance spanning a total of 254,652,471 hectares within Africa, Asia, Europe, Latin America, North America, and Oceania regions (*Ramsar Sites Information Service*, n.d.). Aotearoa New Zealand was first recognized by the Convention in December 1976 and currently is home to seven Ramsar sites. The Wairarapa Moana wetland was the most recent addition to these sites, designated as site number 2,432 on August 20, 2020, and spanning 10,547 hectares (RSIS V.1.6, 2020). Under designation, it fulfilled eight of the nine possible criteria to be considered a Ramsar site. Within the application for the wetlands to be granted

RAMSAR SITE CRITERIA

1. If the wetland is a representative or rare example of wetland type
2. Supports endangered or threatened species or ecological communities
3. Supports species that are crucial to maintain biodiversity
4. Supports species at critical life cycle stages or provides refuge during adverse conditions
5. Regularly supports 20,000+ waterbirds
6. Regularly supports 1% of individuals in population of species or subspecies of waterbirds
7. Supports significant proportion of indigenous fish subspecies or species, specie interactions, populations that represent wetland benefits in order to promote global biodiversity
8. Important source of food for fishes, nursery and/or migration path within wetland
9. Regularly supports 1% of individuals in a population of species/subspecies of land animals that depend on the wetland

(The Ramsar Sites Criteria, n.d.)

the title, it was indicated that the Wairarapa Moana serves hydrological significance to the surrounding area, supports and provides refuge for endangered waterbird and fish species crucial for biodiversity within the ecosystem, and provides many nutritive resources to such populations. Unfortunately, there was not enough data to support the ninth criteria in which the wetlands must regularly support 1% of individuals in a population of species/subspecies of land animals that rely on the wetland (Gunn, 2014).

2.4: Natural Solutions

Nature-based Solutions (NbS) are defined by IUCN as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” (IUCN, 2016). The benefit of natural based solutions is how they can address ecological problems, like as seen in the Wairarapa Moana, by focusing on cultural and societal values of local communities. As well natural based help to limit the possibility of drastic changes in biological and cultural diversity caused by the solution. These solutions are determined by site-specific natural and cultural contexts that include traditional, local and scientific knowledge, allowing local communities to be connected and play an important role in the continual monitoring and solving of the ecological problem (IUCN, 2016). (Image in here?)

2.5: Case Studies

Case studies of relevant and similar examples can provide insight into what steps are and are not important to take when undergoing a project of this sort. We looked at how a Ramsar site in Costa Rica set up their analysis and risk assessment program as well as the urgent restoration of another site in India. These cases were chosen to help learn how to approach our solution strategy and what to avoid during the process.

Case 1: Pollution Monitoring

In 1991 Costa Rica received a Ramsar status for the Caño Negro wetland. The site is surrounded by farmlands and is in a basin that collects significant runoff and pesticides. However, the site was not closely studied until several years ago (Fournier et al., 2018). As such this case is similar in context of working with a wetland basin that faces threat from upstream pollution, but it

also explores the question of which characteristics and approaches to assess risk would be most helpful. The team first identified the biggest risk factors for the basin are, and then described why those factors were harmful to the environment. This study looked at both pesticide pollution and aquatic populations of vegetation and fish both of which are of primary concern in the Wairarapa region.

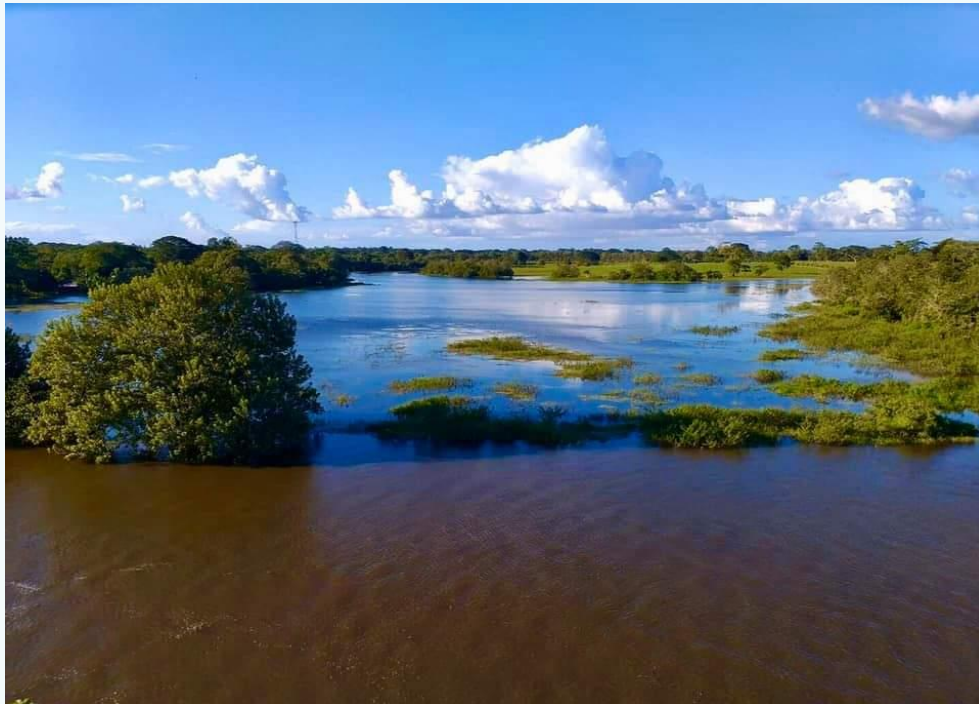


Figure 9: Caño Negro Wetland (NINO010101, 2019)

There are key takeaways from this study. Firstly, it is critical to monitor with regularity to ensure that the environmental regulations are being upheld. This baseline has not been tested for decades and many of the pollutants were found to be in excess of the legally permissible values. The frequency of testing must be great enough that farms and companies in the area cannot grow comfortable disregarding the rules. Secondly, from the study it is important that once certain variables are found to have negligible results on the health of the environment there is less of a need to monitor them. For example, they found that pH was the only water parameter that they could associate with macroinvertebrate diversity in the water. In order to preserve the limited time and resources available to conservation efforts it is important that any sort of testing stays a dynamic body. Removing extraneous procedures or adopting new ones will prevent the study from becoming redundant or ineffective.

Case 2: Montreux Record

While there is not any evidence of a Ramsar status being revoked, there is a separate list that includes sites that are of critical importance that are under imminent and significant ecological change. This list is called the Montreux Record and it encourages the site community, government officials, and scientists to prioritize the site under high concern for the immediate conservation and well-being of the ecosystem (Marine Affairs Institute, 2021). One of the first Ramsar sites established in India, the Chilika Lake, holds significant support for the livelihood for local fishermen and acts as drainage for the Mahanadi River basin. Overtime, the mouth of the basin was shifting and caused subsequent reduction of seawater into the lake, which consequently affected the biodiversity of the ecosystem and the local economy. The site was added to the threatened list in 1993 to warrant urgent action to restore the 4,000-year-old lake (IANS, 2020). To respond to the changing ecosystem, monitoring strategies were promptly created using satellite remote sensing data to track how the rapid shoreline erosion developed overtime (G et al., 2019). The monitoring programs were ultimately successful and proper action was able to be taken to help the Irrawaddy dolphin populations and benefit over 200,000 fishermen. Because of the restoration success, the Chilika Lake was removed from the Montreux Record in 2020, the first site to ever do so within Asia (IANS, 2020).

Based on this event, a key takeaway that could be applied to the future of the Wairarapa Moana is to prevent the well-being of the lake to become as urgent of a priority as the Chilika Lake was. Even though this was a fortunate success story, the rapid change of an ecosystem causes significant domino effects that could be very difficult to reverse. However, if the ecosystem happens to change rapidly due to an unforeseen circumstance, then the Montreux Record could be an option to help restore the health of the site.

2.6: Summary

The historical and more recent factors that affect the Wairarapa Moana Ramsar Status, as well as understanding the interests of key stakeholders, played a crucial role in this project. To develop a comprehensive scope for the framework, we needed to research and understand the viewpoint of all groups including, government agencies, international efforts, western science, and the community of Wairarapa Moana. We have identified vital criteria and attributes of the Wairarapa

Moana wetlands, including information that has guided our process as we moved into the methodology and approach.

Chapter 3: Methodology

This project's goal was to suggest a framework with which to assess the health characteristics of the Wairarapa Moana to preserve its Ramsar Status in conjunction with mātauranga Māori. Our work can be split into three objectives:

- Document the attributes of the lake as they exist right now
- Identify areas that need more attention or deeper monitoring
- Assess community response to the Ramsar status

These objectives are designed to provide a better picture of the wetlands as they stand and how its health is currently affecting the community around it. The Ramsar criteria represent only a few aspects of the health of the lake, and a more holistic vision of health requires a wider understanding of wellbeing and community engagement.

3.1: Document Current Attributes of the Lake

To begin, we established a baseline point of reference for study. Our first objective focuses on documenting the attributes of the lake and the wetlands as they exist right now focusing on not only scientific environmental measurements, but also focusing on how the attributes are characterized in the Wairarapa community. This was done through a variety of research, but mainly through analyzing interviews with Wairarapa community members.

To achieve this objective, we reviewed previous records and interviews with Wairarapa community members that have been conducted in recent years. This included press and media accounts, as well as interviews conducted by previous teams working with this wetland. These archived interviews provide personal insights about the region's culture (Ward, 2019).

We also conducted interviews and focused our interview questions about Māori genealogical stories and the environmental health of the Wairarapa Moana, to learn how current attributes and associations with the lake, both positive and negative, have changed with time. These interviews were supplemented with reports drawn from the Māori lake stories websites. Together they created a picture of current attitudes about the qualities of the lake such as the strength of Māori autonomy in the area and how actively the area engages in building a sense of community.

Furthermore, these interviews asked questions on what aspects of the lake's environmental health should be of concern right now. Organizations, such as DOC and the other governmental agencies involved in the management of natural resources regularly publish report on a wide variety of relevant information that can support our research (Beadel et al., 2000). Finally, online sources such as google maps were used to provide a visual analysis of the lake which altogether with the other methods will create our view of the current wellbeing of the Wairarapa wetlands.

3.2: Identify Areas that Need More Attention or Deeper Monitoring

Not every characteristic of the lake needs equal monitoring. There are certain areas that are more prone to have critical risk factors that make them severe problem areas. The health of the animals, the people, and the land are all interconnected, and if something goes wrong for one it will permeate through to the rest. To approach this objective, we identified elements of the Moana that require more granular attention to avoid problems in the future. To get an idea of where Wairarapa Moana has historically seen ecological difficulty, we once again relied on the combination of site data and interviews to provide not just the baseline but also to flag potential issues of more recent concern.

There are several different models of ecosystem health that can be used to help guide decision making processes when it comes to environmental management (Harmsworth, 2013). In accordance with Māori cultural values, the models often include social health wellbeing of the community as directly tied with environmental health. We interviewed stakeholders and area residents to evaluate their perception of the Moana in terms of these models to address this objective. This included questions about the mauri of land and people, as well as how sustainable certain practices in the area have been in terms of ecosystem health.

The original Ramsar application uses DOC and environmental reports extensively to support its claims about ecological factors in the wetland (Gunn, 2014), and these reports can also help provide insight into characteristics of note. Often these reports are completed with the intent of conservation which means that they are already framed from the perspective of how to preserve the lake for future generations using western scientific metrics. They were foundational in our response specifically with how to keep Wairarapa Moana in consideration for Ramsar status.

3.3: Assess Community Response to the Ramsar Status

The Ramsar status comes from an international organization that is not necessarily in direct alignment with local values. To ensure the work being done is working to emphasize both, we need to assess the community response to Ramsar. We will use specific questions within individual interviews to assess public opinion and gain data on all portions of this objective.

3.4: Project Stages

There were two main stages of the project to collect and analyze data. The first stage focused on research of Wairarapa Moana site characteristics, interviewing of community members on their opinions regarding cultural and personal meaning to the well-being of the wetlands as well as community perception of Ramsar status, and interviewing environmentalists who are experts on wetland characteristics. The final stage of the project organized the qualitative data collected to build the Wairarapa Moana wetlands monitoring framework. After both stages were completed, final conclusions and recommendations were determined to propose future work on the subject.

Chapter 4: Results

Analyzing the Wairarapa Moana from a scientific point of view is essential in creating a full view of the lake and its current condition. Throughout this paper, it is our goal to explore a variety of personal accounts and descriptions of the lake to develop a framework to analyze the lake and surrounding wetlands. Furthermore, exploring biological data and a western scenic approach can be beneficial in understanding the lake on a deeper level, allowing for direct comparisons to be drawn to the personal accounts and descriptions.

4.1: Foundations

To form a complete understanding of challenges facing the region, we asked locals for stories and experiences of Wairarapa Moana. This helped provide a foundation to identify critical problems and what needs to be done to solve them.

Prior to the introduction of the Ramsar classification, Wairarapa Moana held a smaller amount of public attention. Many of the people we talked to noted that the international interest had sparked an increase in local admiration and media presence. This is understandable as the wetlands have a quite different modern use than it did generations ago. The roads go around Lake Wairarapa, making public access difficult.

In addition, the wind funnels through the valley, making swimming a bit too cold for recreational activity. Since the Ruamahanga was diverted, the lake has also taken on a brown coloration from the amount of sediment that is suspended in it. Even with its muddy appearance, the air still smells clear and free of swampy murk. Despite the natural losses in the region, many expressed its present beauty and it remains full of life that goes largely unnoticed by the general public. If you can find a day where the wind is still, the water reflects a beautiful blue sky that shows what the lake looked like years ago. Despite being a fraction of its original size, the wetlands are a habitat for an overwhelming variety and population of birds that are a major part of the region's significance. With some patience, the Royal Spoonbill can still be found and is becoming more



Figure 10: Royal Spoonbill by Waterside (Sherony, 2016)

prevalent in the region. Similar to this species, many other seabirds are seeing a growth in population or awareness. These birds are one of the critical aspects that has seen the lake gain its internationally protected status. The local plant life is quite healthy where it has been allowed to flourish, but there are large gaps that can be seen to need directive planting where farming or clear cutting has removed large swathes of flora.

While the many groups working to monitor and protect Wairarapa Moana have made strides and accomplishments, there is still more work to be done. From philanthropic organizations to academic researchers to government agencies, there is a constant influx of interest in the status of Wairarapa Moana. Groups such as the New Zealand Department of Conservation or local universities are working to build huge baselines of quantitative data on the health of the region and the hydrological quality of the lakes and rivers. A common sentiment expressed was that the state environmental work is a strength of the region and does a good job maintaining the area, but that it is lacking in scope. Major improvements could be made with more growth by blending the ideas of kaitiaki and insights from mātauranga Māori. Some past actions include, surveys of wetlands vegetation, non-targeted fish species monitoring, water quality sampling, shorebird population tracking, and recently kakahi monitoring.

*“MĀORI
PEOPLE
WORK A JOB
AND A HALF
BUT ONLY
GET PAID FOR
ONE”*

- Anonymous

While the support for conservation and growth seen during the pandemic has been widely welcomed, many expressed a few pointed shortcomings of the current approach. Many of the agencies involved in the conservation require access or assistance from the local Māori authority. This work is always welcome and wanted by community members; however, the lack of central direction means there is a feeling that Māori work a job and a half to manage it all. The general sentiment was that ideas adopted from mātauranga Māori are quickly dropped without any sincere effort to adapt them to the

modern landscape. Our interviewees felt that many of the approaches being used are too narrow and lacked the foundation of the generations of knowledge in the region.

4.2: Biological Analysis

The quality of the water itself is a crucial component to the region's overall health and wellbeing. The Wairarapa Moana's water can be seen as less than perfect for a variety of reasons. First the water is considered super trophic which means the lake is fertile and saturated with excess phosphorus and nitrogen and is often associated with poor water clarity. This is caused by suspended sediment which is caused by the strong winds and loose sediment on the sides of the water body. This sediment is rich in phosphorus and nitrogen due to cows on farms that surround the wetlands, and fecal matter left from bird species such as the invasive Canadian geese. A common solution to holding more loose sediment on edges of the waterbody is the planting of plants and trees in these areas.

Maintaining a lush and vibrant plant life is essential to the future preservation and upkeep of the Wairarapa Moana. Plants play an important part in sustaining the lake and surrounding wetlands by providing for local wildlife and helping to sustain the ecosystem. However, these plants are facing a variety of threats that need to be continuously monitored. First the strong winds that blow through the Wairarapa Moana move soil and make it harder for plants to grow in some areas. Another

serious threat is myrtle rust, a disease caused by the exotic fungus *Austropuccinia psidii*, which can be identified by yellowish spotting on plants. This disease is projected to impact Wairarapa Moana within the next year and could take out entire plant populations. This could be extremely threatening to plants such as Kuta which is a native weaving plant used by the Māori.

Maintaining the water quality of the Wairarapa moana is also extremely important to preserve the water life and bird populations that are native to the area. Over the last few decades there has been a noticeable decrease in “Tuna” and other native fish, alongside an increase of exotic fish (Perch, Rudd, and Trout) that use up valuable and scarce resources within the ecosystem. This includes macrophytes, which are aquatic plants growing in or near water, and phytoplankton and zooplankton, which are foundational species that are essential to the food. Also, the loss or deprecation of certain links in the food chain have effects on the entire ecosystem. This can be seen in the kakahi, which are a freshwater mussel which is a valuable mahinga kai resource for many Māori (kakahi 2009). The kakahi are only being found in late or early stages of development. This means they are not being found in the adolescent stage which shows that the food chain has some disconnect. The loss of kakahi affects the whitebait population, and this trend continues to ripple throughout the ecosystem. Wairarapa Moana is also home to a variety of threatened bird species that use the wetlands as breeding grounds. A variety of ecological factors as well as threats such as vehicles, dogs, and waste left by visitors pose a threat to the variety of birds species that call Wairarapa Moana home.

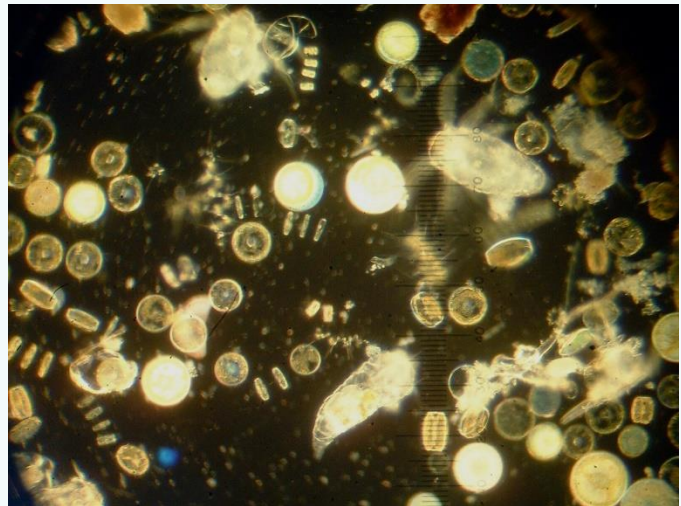


Figure 11: Mixed Phytoplankton and Zooplankton (Dick, 2001)

4.3: Farming Unsustainability

Farming is one of the major contributors to the New Zealand Gross Domestic Product and thus is heavily integrated in New Zealand and Māori way of life. The Wairarapa Moana is no different and is also heavily impacted by the farmers and farmland surrounding the lake. Unlike for

the rest of the country, farming ideals and practices have been physically and economically detrimental to the conservation and preservation efforts of the Wairarapa Moana.

From an economic standpoint farming and conservation ideals are in a conflict with one another. Most farming practices are implemented with the sole goal of maximizing sales and profit. Because farming is such a major stimulant for the economy, farmers will strategize without initial consideration of the sounding environment. In the past, farmers have straightened the river flowing into the Wairarapa Moana, ultimately causing the water in the lake to become much more stagnant than before. Farmers also use pesticides whose excess pollutes the water and interferes with the health of necessary bacteria and wildlife that use the lake as a home.

In modern times, the wetlands have been subjected to economic benefit when it offers so much more:

***“[WAIRARAPA
MOANA] ONLY
BENEFITS A
MINORITY AT THE
MOMENT WHEN IT
COULD BENEFIT A
MAJORITY”***

- Anonymous

Because overall farming ideals tend to conflict with conservation efforts, some practices caused negative consequences on the wetlands and surrounding wildlife. With that being said, invested resources for farming often amounts in disinvestment to the environment. Not only are resources being allocated elsewhere than conservation efforts, but they are being allocated to practices that are actively damaging the lake.

4.4: Broken Promises

As the region is coming to be managed more jointly between local government and local Māori leaders, we had a lot of discussion on changes that were brought about by the state management, many of which were in direct disregard of the Treaty of Waitangi and the contractual rights involved in the sale of the land. These changes are not all able to be quickly reverted without consequence and there is some nuance to their place in Wairarapa Moana.

The first and most glaring example of regional mismanagement is the removal of the Ruamahanga river from Lake Wairarapa to allow the river to progress more directly to the ocean. This change was implemented as part of a flood prevention effort (*Ruamahanga*, 2018) and dramatically changed the habitat. Historically the flooding was a major element of the region as it provided shallow areas for birds to feed in, was a part of the regional fishing strategy, and allowed the water to cycle through the lake to avoid having settled or suspended material. Without the river the landscape has become much more hospitable to the local farmers. This move was initially a major political move garnering support by hoping to prevent crop loss to the floods. Reverting this move or reintroducing flooding at all would see a major element of local Māori culture return but would mean political backlash since the initial removal happened in recent history.



Figure 12: Wairarapa Moana Before and After the Removal of the Ruamahanga River (Diltz et al., 2016)

The other direct cultural loss comes from the introduction of game fish into the region. Perch, Rudd, and Trout were brought into the lake and rivers to supplement the local fish and provide more options for the strong sporting culture in New Zealand. However, the exotic fish have few if any predators and have come to far outnumber the local fish. Not only do they outnumber the endemic species and overwhelm the resources, but they also benefit from strenuous hunting laws limiting the amount and type that can be fished regularly. So, while there are more of them in the region, they have more protection than the fish that are part of the natural environment. This change came about so recently that one of the people we talked to had recollection of the Prime Minister of the time specifically promising to keep Lake Wairarapa free of any introduced elements.

This broken promise has seen the local tuna population see critically low levels. Commercial fishing for tuna still occurs, but since they have a massively increased competition for resources the lake is unable to support the large population that is needed for a successful commerce to be based off of them.

There are also consequences from efforts to modernize the region in a way that doesn't work with the natural way of life. The introduction of barrage gates to normalize the water flow in the region has severely inhibited the motion of flounder and has led to flounder fishing dying out entirely. Flounder, among other fish, will get stuck on the gates while trying to move through the area; then, being unable to migrate effectively, their life cycle is severely inhibited.

The storm water drainage system and wastewater disposal are also both areas that have seen community measures take a massive toll on Māori practices specifically. The roads and towns in the area have storm drains that lead to the river, and the wastewater treatment will dump into the river as well. In addition to the health oppositions of having human waste in the water, the Māori place significant cultural value on having water without human waste. These practices magnify the spiritual significance of the water and are intended to be benign community improvements but are done without regard to the experience of the original inhabitants or their approaches previously. These are all elements of the region that our interviewees were hopeful could be addressed by the rise of credence given to the ideas of kaitiaki and the increasing voice of Māori in politics.

Lastly, many of our interviewees were deeply concerned by the lack of regionally oriented education. The pakeha population is almost entirely unaware of the historic or cultural elements of the region, but there was concern for even the young Māori's awareness as well. The schools and policy focus primarily on the colonial population's history and culture, and it is believed that this gap contributes to the damaging usage of the lake resources. The school curriculum is drawing the focus away from the region, and the Māori cannot be responsible for teaching the entire community the depth of history in Wairarapa Moana or anywhere in New Zealand. Colonial education degrading the cultural knowledge of a region is not exclusive to Wairarapa Moana. A common sentiment we found was that understanding of the ancestral relevance of Wairarapa Moana as well as what the region was like before colonial influence would make the conservation efforts more personally important to current and future generations. If the education could inspire pride in people that their

home is worth protecting it might lead to more motivation for the protection of its natural resources.

4.5: Mourning and Restoring What Has Been Lost

With the reduction in quality within the lake over the past few decades, there has been an increased feeling of loss among the locals. Mātauranga provides historical recollection of what the wetlands used to feel, smell, and look like for current living Māori. For example, many interviewees mentioned stories of how swimming used to be a pleasant experience, decades ago. However, the current experience is quite the opposite with excess sediment in the water system. Since the region has so many stories of Wairarapa Moana's previous vibrance, they mourn the state it is in now and the natural beauty that has been lost. Local or historical knowledge provides an optimistic insight on what could be restored and gives the community an ultimate goal to work toward.

*“WITHOUT
RAMSAR WE
WOULDN'T BE
WHERE WE
ARE TODAY”*

- Anonymous

For ages, the Wairarapa Moana provided sustenance for the community. Unfortunately, the current health status of the region and the resources available cannot sustain the life of the people as it once did. Interviewees had many positive thoughts towards Ramsar support in the hopes it can help conserve the resources left and restore those lost. This international support was praised, although many felt the roots to a solution could be found on a more individual

level. The expressed key to progress to restore this self-sufficiency is the personal connection community individuals feel to the wetlands. There have been some community initiatives toward conservation including school children using water testing kits within the local academic curriculum, university students engaging in walkway and boat launch design projects, and the reintroduction of native plants in replacement of introduced species. With the COVID-19 pandemic, more people have started to recognize the environment and spend more time immersing themselves within it. However, many participants felt that this is not enough to promote full awareness and appreciation of the wetlands.

Chapter 5: Suggestions

5.1: Preface

To have a strategy for monitoring Wairarapa Moana that assesses both the Ramsar criteria and all the regional elements that affect them, we believe that the best approach combines *mātauranga* and western science. While the Ramsar criteria require quantitative knowledge that can be measured by the western methods, the Māori approach provides a broader insight guided by local knowledge passed down through generations. To this end we borrow strategies from the Māori models of health (Harmsworth, 2013) and *The Handbook for Monitoring Wetland Condition* (Clarkson et al., 2003) which was formulated in part to assess New Zealand wetlands for Ramsar. Our goal is to provide insight into how the Ramsar convention supports the local goals of health, and suggestions on how current strategies can be used to support the mission of conservation and preserve the Ramsar classification.

5.2: Framework Map

Whakapapa is the traditional Māori belief that everything is connected, and all things build upon each other. The relationships between humans and the rest of nature are described in *tātai* (genealogies) and *kōrero* (stories). This framework of connection is the basis for how we model the element of health for Wairarapa Moana. When one aspect is damaged or diminished, the entire system becomes unbalanced. Therefore, all issues pertaining to the Wairarapa Moana ecosystem are crucial to understand and resolve to help restore the region to its natural balance. When looking at the overall health of the Wairarapa Moana it must be emphasized that the overall health is only as good as the worst part of the lake or worst evaluated characteristic. Each Ramsar criterion is necessary to track to follow the trends and behaviors of the region, but the actual metric of health is holistic. A “good” measurement implies that the wetlands are currently in good standing based on the Ramsar characteristic being evaluated, and the overall health of the Wairarapa is improving. A “bad” measurement implies that wetlands are currently not meeting the Ramsar characteristic or are degrading in that area.

From the interviews we were able to compile a non-comprehensive list of elements that affect the health of the region and how they connect to the Ramsar classification (Appendix C).

From this you can see how the variety of perspectives involved in conservation intertwine and support each other. From this you can also visualize the connection between environmental and social issues. Having a healthy and economically prosperous society that cares about its natural resources can help prevent some of the core issues that afflict the Wairarapa region. Social, communal, and economic mauri are towards the bottom, not because they are less important, but rather because they are foundational to the rest of the circumstances. It is also important to note the connection between the Ramsar criteria and the specific goals of community health. The mission of Ramsar is integrally tied in with conservation, but it is important to maintain the perspective on not simply meeting the metrics but creating a strong and vibrant environment. Simply maintaining the Ramsar criteria does not necessarily guarantee a healthy wetland but failing to meet the criteria could indicate an unhealthy one.

5.3: Goals and Milestones

The framework of interconnectivity also extends the community surrounding the lake and wetlands, so the progression of health can also be monitored by tracking the goals for well-being of the surrounding communities. This means that as part of the work to track the health of the Wairarapa Moana it is also essential to track the health of Wairarapa. As such we feel that it is important to include the important goals that our interviewees wanted to see the region reach. The value of these goals and milestones is that they give us a concrete way of measuring progress within the greater Wairarapa region. Some will be more visible in the improvement of the wetlands, while others will be less noticeable as they pertain to social improvement or subtle ecological characteristics. However, it is important to understand that with any ecosystem such as this that all things are connected, so these goals and milestones will usually be achieved in unison and over time, but individual goals may be accomplished more quickly.

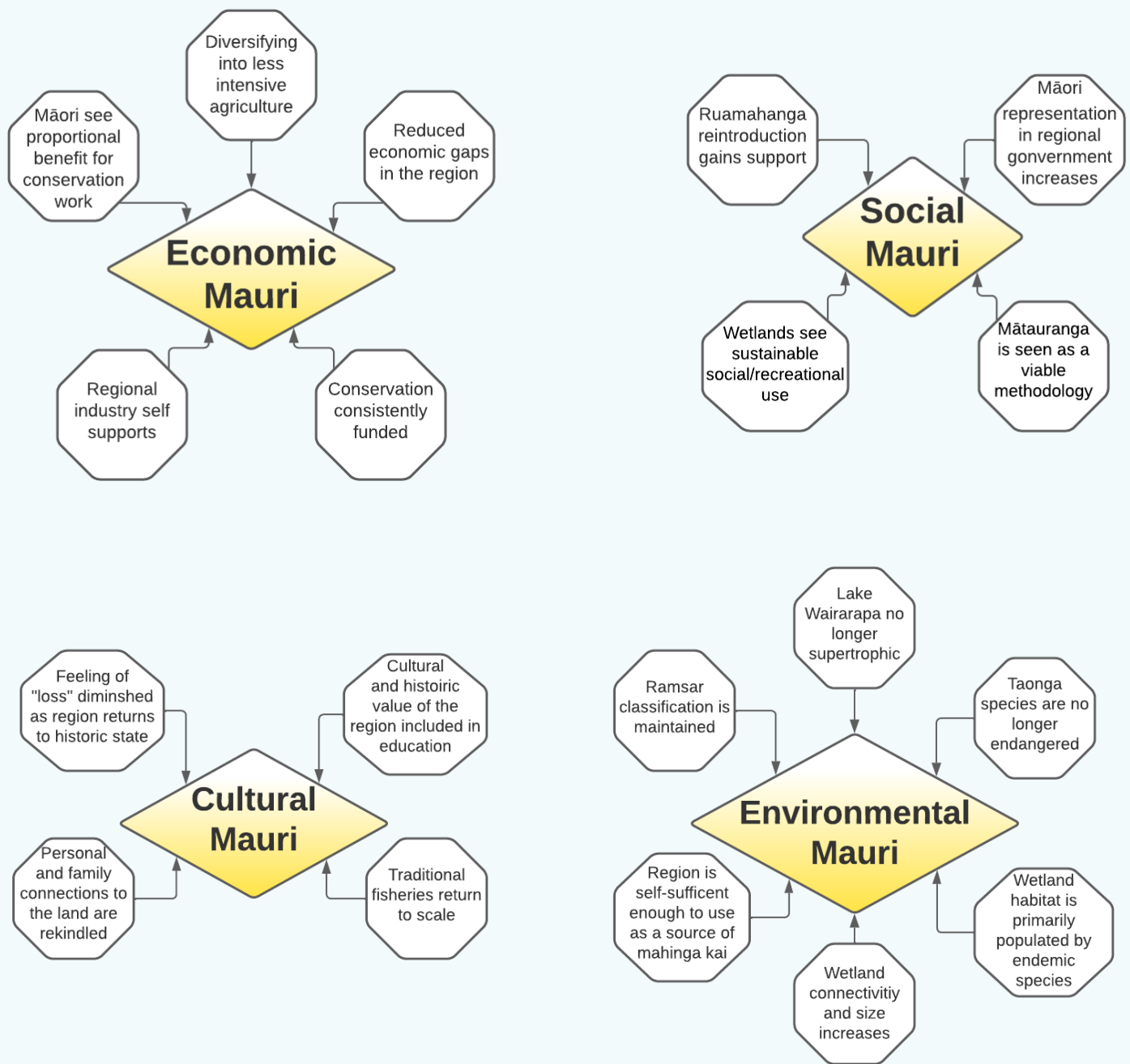


Figure 13: Categorized goals for regional health

5.4: Monitoring Approach

To measure the health of the region, Wairarapa Moana will need to expand its current data collection regimen to include more comprehensive information from a broader information base to

get a holistic picture of health. The state environmental program currently performs assessments like water quality tests, visual avian population assessments, and more recently has seen an involved kakahi monitoring process that has gained a higher profile in the region. We have recommendations for content of what to add to be able to track the state of the wetlands and their standing within the Ramsar criteria. Just to maintain the status the managers involved in monitoring Wairarapa Moana will have to report and monitor the criteria currently met (1-8). In addition to this information, we would propose the adoption of cultural metrics as well as general environmental factors that aren't included in the base Ramsar factors.

Firstly, we look at the factors that were expressed as being key indicators of the health of the Māori population. These factors fit broadly into several categories of personal connection, Māori representation, and protection for their way of life. Of these we can break down the categories into smaller more measurable metrics that can indicate trends that affect social, cultural, and economic mauri. Personal connection pertains to how invested and closely involved with Wairarapa Moana the local population is. Elements that can be measured include the number of Māori working in conservation efforts, the community awareness of the significance of the region historically and culturally, and the amount of usage that the wetlands see. If there is a large population that is personally invested in the wetlands and its usage, that is a good indicator that the area is healthy enough to sustain its people. Next is the amount of Māori representation in terms of the major sectors of politics and economics. This refers more to the usage of the ideals found in Māori culture more so than concrete personal representation which is addressed in the previous category. The use of less intensive agricultural practices, more even economic distribution, and the use of mātauranga Māori when managing the natural resources are all ways to measure the representation of Māori thought processes in decision making. The last major category of note is the amount of legal protection given the Māori perspective. It is a historically neglected viewpoint, and as the Māori renaissance continues its key to measure the amount of formal status given to it. This includes overfishing protection of taonga species (tuna namely), anti-dumping legislation in the rivers and lakes, and land use management that would prevent unsustainable agribusiness practices. Hopefully this is a non-comprehensive list of the elements that would be monitored, but rather additions that we would make to existing strategies already that look at elements such as land ownership or the prevalence of traditional practices and te reo Māori usage.

We would also like to recommend some additional quantitative factors adapted from the Handbook for Monitoring Wetland Condition. Resources permitting the whole strategy proposed could be utilized, but there are certain elements that we feel are more critical to our specific site. Regular hydrological testing is a simple and easily repeatable indicator of issues. If human structures (barrage gates, drains, dams, etc.) are having an increased effect, this will be the first clue. Next, we suggest area and connectivity measurements. These measures will be very low initially, as the wetlands are a fraction of their original size. Any reduction will be increasingly critical to the already much reduced wetland area. However, if there is any growth or major areas of reclamation for the habitat it is important to be able to measure the rate of return to the original form of the region. Lastly, we would like to measure the habits of the fauna in Wairarapa Moana. The domestic livestock and both the regional fish are the two primary areas to consider. If there are major changes to the habits or access of grazing animals that could indicate a worsening habitat as a result of soil damage and vegetation loss. Tracking the endemic fish species is already included in the Ramsar convention but tracking the populations of the introduced fish will also be able to provide insight to advise the environmental management efforts. Large groups of non-native fish can lead to algae blooms or other troubling conditions.

5.5: Engagement Suggestions

It is key in this process that the local community is highly invested and involved. One of the indications of a healthy community is that the Māori community can act as the kaitiaki effectively. To meet this goal, we have two key suggestions that do not tie directly in with assessing Ramsar but would benefit from the publicity associated with the convention. The first is that the monitoring research and management jobs should be Māori as much as possible. The current conservation efforts and academic community are doing highly involved work that place substantial strain on the organization and resources of the Māori. As such they should be able to see the benefits of their work in terms of financial recompense as well. Since many of the jobs involved in preservation of the regions filled with Māori community members will see a huge benefit to the economic well-being of the community as well as providing more access for connection with the lake that would otherwise be lost. In addition to being a major boon to invest in locals to do environmental work, it is also a key indicator of the amount of personal connection that the region has with its natural

resources. If the people who live in the region are motivated to work on the wetlands it can measure how significant it is to local perception.

The second suggestion is to take steps towards increasing the local knowledge of the cultural and historical significance of Wairarapa Moana. The new Ramsar classification has provided a major increase in visibility for the region and provides concrete proof of its importance. This is a great start but needs to be supplemented to maintain the momentum for conservation efforts. By including information about the Ramsar convention and why Wairarapa Moana has earned its protection in schooling, there will hopefully be an increase in awareness that can start to bridge the gap between the historic knowledge of the region and the new generation. This could be in the form of programs of the lakes and rivers about their importance or by adding local history to basic science education.

5.6: Conclusion

Overall, we believe that bringing together the benefit of the Ramsar status with regional practices will be able to improve and maintain the health of the region. While it is not a perfect cure it is a fantastic step towards the goal of conservation and a return to form for Wairarapa Moana. Our hope is that the ideals of the original caretakers of the land will gain some traction and mesh with the perspectives of the rest of the community of Wairarapa. There are a variety of cultures and people in the area, but we firmly believe that regardless of background, a healthier landscape is an absolute necessity.

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Appendices

Appendix A: Sample Interview Questions

- What does well-being mean to you/How do you measure the health of the region?
- What are elements cultural or environmental that you think are strengths of the region?
- What does the lake normally look/smell/sound like? Has this changed recently and are there any other characteristics that you associate with the good health of the lake?
- Are there practices in the area that you feel are unsustainable?
- Do you know of types of pollution getting into the lake? If so, do you know where it primarily come from?
- Are you familiar with the Ramsar status of the Wairarapa Moana or any other protective legislation? If so, do you feel that the mission of Ramsar is aligned with the local perspective, and what elements of each are supportive of the other?
- Do you know how tūpuna interact(ed) with the lake? Has this changed, and if so, how, and why?
- Where were populations of _____ (tūva/harakeke/other plants and animals)? Has their distribution changed in the past compared with the present?

- Do you know how the food sources for all the animals being managed? Is there enough to continue to support the populations of all the wildlife? Are there any elements that take up more than a supportable amount of the local resources?
- Do you know of taonga species in this area, and how are they currently being monitored?
- What changes in the usage of the wetland do you feel could improve its health?
- Do you feel like the area is self-sufficient currently? If it is not, what elements is it lacking to reach self-sufficiency?
- Where do you foresee difficulties in the conservation of the wetlands?
- What would you like the wetland to look like in several years?

Appendix B: Consent Forms



We are a group of students from Worcester Polytechnic Institute (WPI) in the United States. We are conducting interviews to learn more about the experience and perceptions of Wairarapa Moana. Your participation is voluntary.

Do we have your permission to record this interview?

Yes | No

Do we have your permission to include your photo?

Yes | No

Will you allow us to include your name and other identifying information?

Yes | No

Sign:

Print:

Date:

Informed Consent Agreement for Participation in a Research Study Wairarapa Moana

Investigators and contact information:

- Yunus Telliel (ydtelliel@wpi.edu)
- Group alias (gr-nz22-ramsar@wpi.edu)

Purpose: The purpose of this study is to understand the impact of potential monitoring techniques

Procedures to be followed: This survey will ask you reflect on your personal connection with Wairarapa Moana. We may ask for additional information including some demographic information about your relationship with the region.

Record keeping and confidentiality: By clicking "next", you are consenting to helping us learn about this experience and its impact on the health of the lake. You should feel free to answer to any level to which you wish to disclose. Your responses will come to us as anonymous entries. We may have a sense about who completed it but cannot tie the data back to particular participants. We will also be sharing this information with our advisors for evaluation purposes anonymously. This survey is not a mandatory and your consent is given freely of your own choice.

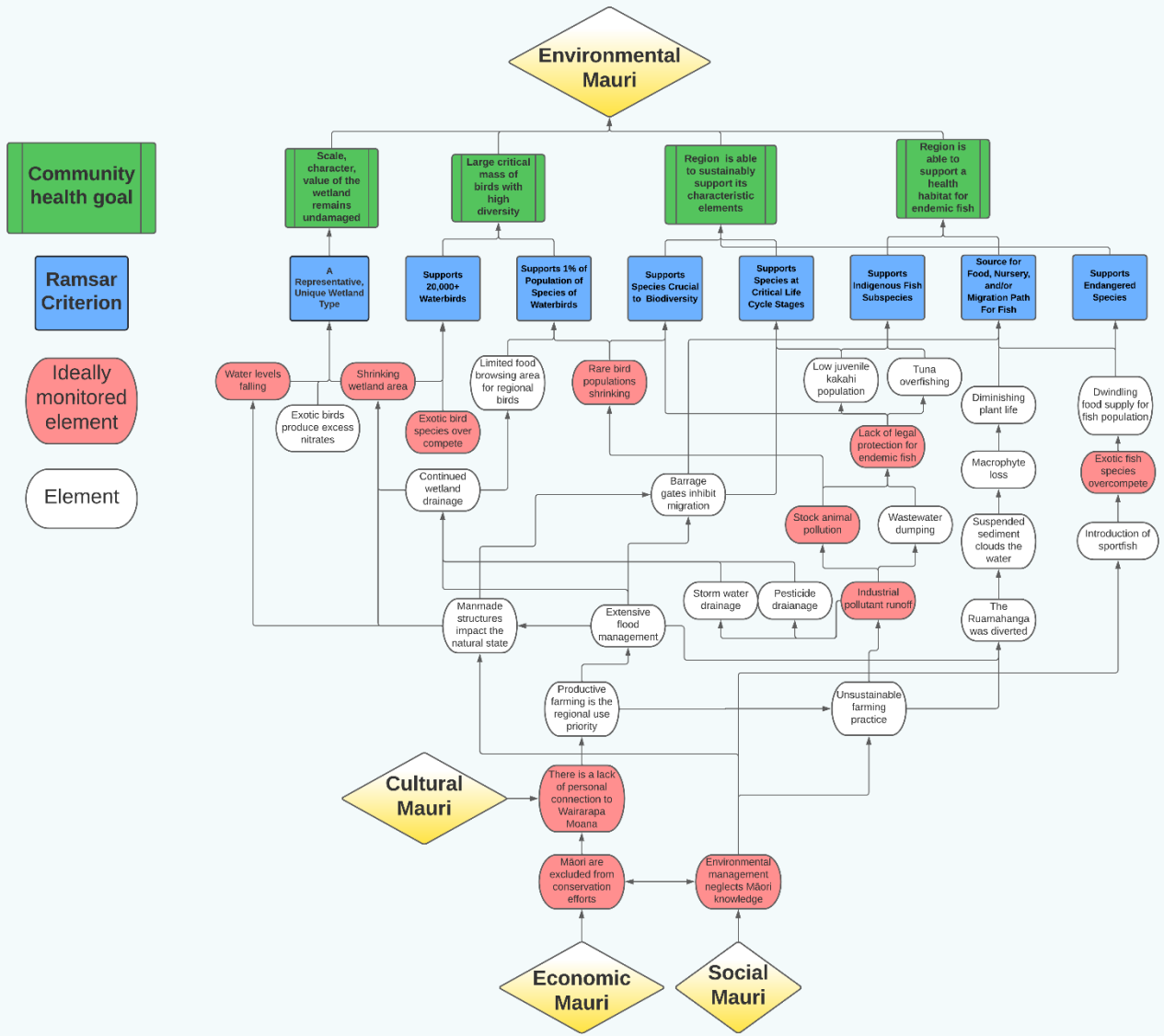
Any publication or presentation of the data will not identify you unless you agree to be identified.

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

Your participation in this research is voluntary. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

By clicking "next" below, you acknowledge that you have been informed about the study and wish to consent to participate. You will be asked again after completing the survey for your consent as a matter of respect for your right to change your mind.

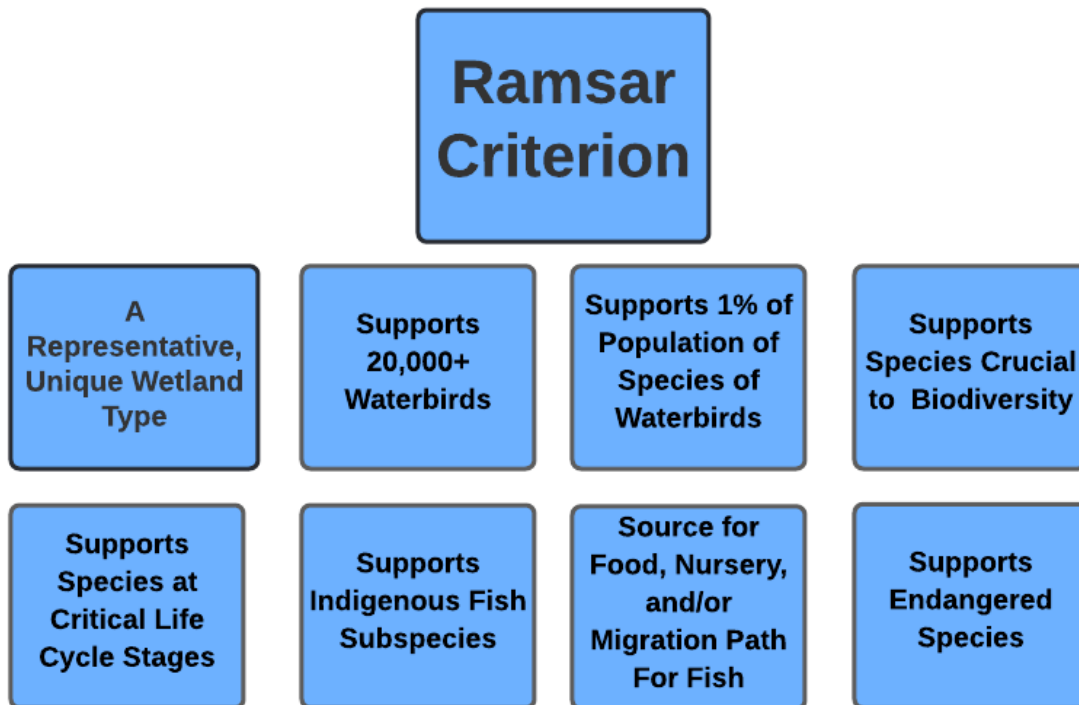
Appendix C: Element Map



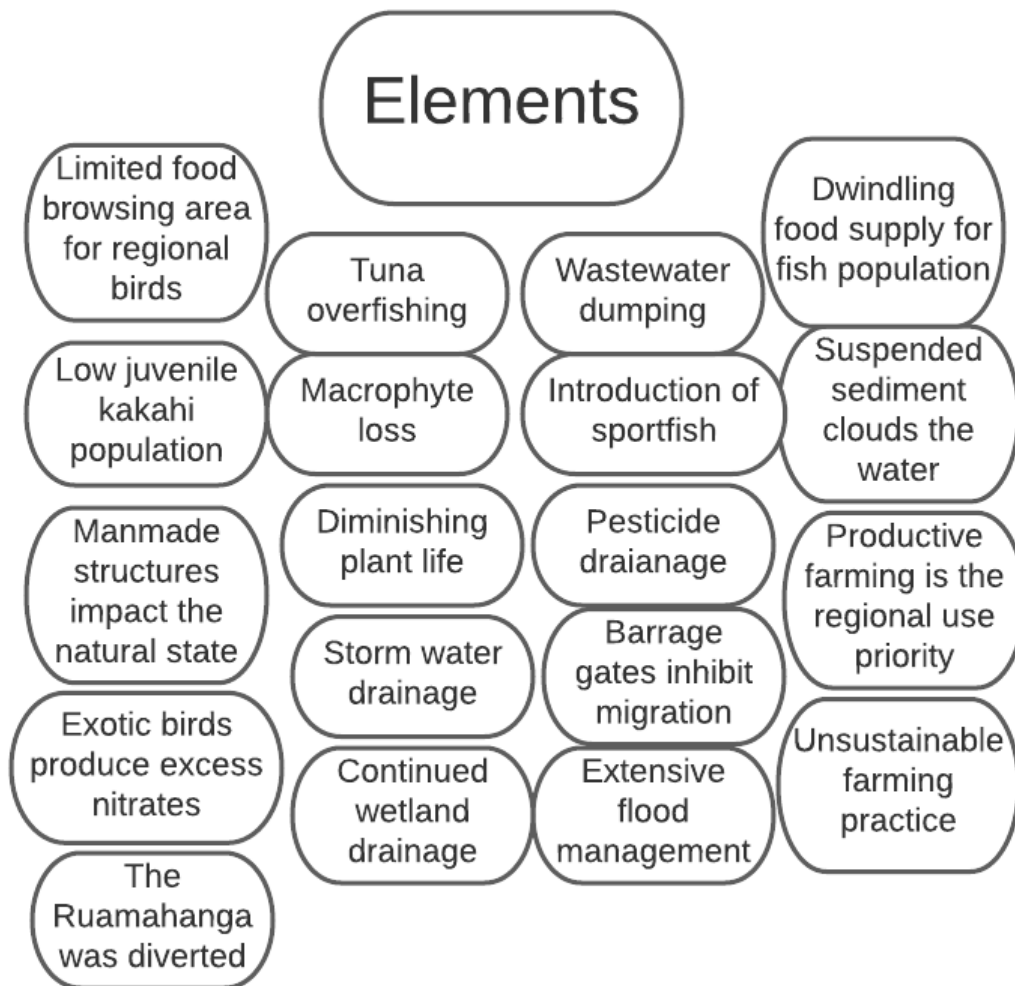
Appendix C1: Community Health Goals



Appendix C2: Ramsar Criterion



Appendix C3: Elements



Appendix C4: Ideally Monitored Elements

