In New Zealand, 60% of our freshwater streams and river are polluted by human activities and processes, lowering the water quality and harming the surrounding environment. The health of our rivers is crucial to the life of all other organisms in the country. Without clean water to drink and consume, the ecosystems that rely on our rivers would not persevere. In the Mangawhero River, the snowmelt fed river running from the peak of Mount Ruapehu, the same issues affect it's health, as it passes through Ohakune. The main issues come from runoff, from roads, farms, and industrial developments, affecting the organisms living in the rivers and the characteristics of the water itself, such as clarity, and pH levels. However, to combat this, organizations such as Ngati Rangi and Horizons employing strategies to keep the awa clean and healthy.

The key science ideas that shape the understanding of freshwater ecosystems are biodiversity, as well as macroinvertebrates, which are important for signalling how healthy rivers are, through the variation of species living in the water. By observing the population of "indicator species" which is a category of macroinvertebrates that has a low tolerance for pollution and a high sensitivity to change in their environment. A key example of an indicator species in the Mangawhero River are mayfly species. This is because they are extremely sensitive to pollution and changes in the water's health. According to Horizons scientists, when a river starts to decline in health, mayflies are often the first to disappear, having a adverse impact upon the biodiversity of the river.

Another important perspective to consider when investigating the health of the Mangawhero River is the point of view of the local iwi, Ngati Rangi. They were brought up on the river, and their tupuna (ancestors) relied upon the river to provide them with food and water to sustain their life. They learned that, for the river to continue providing the environment and their people with mauri (life essence) they had to respect it, by not polluting it with waste, and not taking too much from it. From their perspective, for the river to provide for it's people, they had to maintain a balance by caring for and nurturing it. A way that the Ngati Rangi people can determine the balance of the Mangawhero river's health, is through the Tuna population in the awa. When there is no Tuna found in the river, all living things that rely on the river are affected, signalling an imbalance in the river's health. Ngati Rangi's connected perspective influenced by their cultural learnings relating to the health of the Mangawhero River is important to include when looking for solutions to the issues of the river's health.

On an investigation into the river's health on the fifteenth of May 2025, we explored the differences between two sites on the Mangawhero River. Site 1 was situated at the base of the Mountain Road, where the water is largely unpolluted from outside sources. The second site was located at the end of Burns Street, once the river has passed through the urban development of Ohakune and past some of the farms surrounding the town. The results of this investigation show that the Mangawhero River's water quality and health lowers dramatically after travelling 5 kilometers downstream from site 1 to site 2.

To understand this issue and prevent the water quality from degrading further with a science informed response, monitoring of certain aspects of the water and biodiversity in the river is required, to gain insights into what is negatively impacting the health of this river. One of these is the water clarity. At site 1 it was found that the water clarity was upwards of 100 centimeters, whereas at site 2, it was reduced significantly, at 73 centimeters. The method used to acquire these measurements was with a clarity tube. A sample of the water was taken, and a magnet was slid from the near end of the one meter long tube to the far end, while recording at what length the magnet was no longer visible. This was repeated 3 times,

and the average was recorded to get the highest possible measurement. Low water clarity means that the river contains high levels of loose sediment, which blocks sunlight from reaching organisms and aquatic plants that require sunlight for photosynthesis. Another measurement of the water quality was the pH level, which measures how acidic or alkaline a liquid(usually water) is. At site 1, the pH was found to be 8.07. This is on the alkaline side of the scale, but still well within the healthy limits of water. At site 2 however, the pH was 8.12. In such a short distance, this is a fairly large change, especially for the native organisms that live in the Mangawhero. Indicator species such as mayflies were also found in lower quantities at site 2 when compared with site 1. These changes are almost entirely caused by human activity on the banks and surrounding area of the river. As mentioned earlier, this includes farming, industrial use, and roads.

To prevent further degradation of the health of the Mangawhero River, taking actions informed by scientific information is required. Some options to improve water clarity and biodiversity are;  Riparian planting, to limit runoff from farms, industry and other human activities that cause reduction in water quality. Riparian planting achieves this by reducing erosion by increasing the bank's stability with roots. This improves water clarity, allowing more aquatic plants to grow and increasing biodiversity in the river. Riparian planting also reduces runoff from farms and roads by binding the bank tighter with the roots, preventing infiltration through the soil, and absorbing the nutrients that could lead to algae blooms in the river. Another benefit of this solution is that it can increase macro-invertebrate indicator species populations by making the water more tolerable and balanced, with the addition of shade from the planting along the riverbanks. Another response to improve the overall health of the river, including water quality and biodiversity in the river is by ensuring that all disposal of waste and sewerage is contained further away from the river. Currently the sewerage ponds are located next to the river, further upstream from site 2 (Burns Street). Due to this, much higher levels of Escherichia coli, found in human faeces, were found at site 2 (140 MPN/100ml) when contrasted to site 1 (12.4 MPN/100ml). This indicates that some pollutants are from the sewerage ponds into the Mangawhero. To stop this, the sewerage ponds can be moved away from the river.

Another way to increase water quality and river health would be ensuring that stormwater is either prevented from draining into the awa, or adding more filtering to the drains before they reach the river. By making these changes, chemicals and pollutants, such as nitrate and phosphorus will not find their way into the river. These pollutants can trigger algae growth through the process of eutrophication, which can cause the choking out of native aquatic plants. This response links back to the perspective of Ngati Rangi, where they are the kaitiaki of the Mangawhero River.

This response to the issues surrounding the health of the Mangawhero River considers both scientific and Ngati Rangi perspectives. These solutions make sure no pollutants make it into the awa, help the native aquatic plants to thrive, and limit erosion, while maintaining the crucial tiakitanga perspective held by local iwi, and employing scientific information and knowledge relating to freshwater ecosystems to understand how to help the river best.

It is extremely important to consider all perspectives relating to taking care of our environment, when formulating a scientific response to an issue. This is because different groups that have responsibility over maintaining the health of, here, the river have different opinions on how to look after and take care of it. For example, Horizons, the regional council and group that monitor the river's scientific attributes, and Ngati Rangi who are the cultural guardians as mentioned earlier. Both are kaitiaki of the Mangawhero, and both have different ways and reasons for protecting the river. Ngati Rangi protect the river because it has always provided for their people and they have to respect the river for it to continue to do so. Horizons, and other scientific organizations that monitor the Mangawhero on the

other hand, maintain and protect the river's health because it is an important part of the ecosystems in and around the river, and can affect the health of people living around the river as well. Between these 2 differing perspectives on keeping the awa clean, there are common goals that are shared by both, alongside their differences. This is why it is important to consider all perspectives when making decisions on the health of the awa, to ensure that all groups that care about it are happy with the methods being used to protect and preserve the river, while maintaining its ecological and cultural balance in the local environment.