LAKE HOROWHENUA ACCORD AND CLEAN-UP FUND – PROGRESS REPORT

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Abstract:

Lake Horowhenua is a vital taonga, highly valued by local iwi for a range of reasons including the provision of significant fishery. The lake has the potential to be a considerable recreational asset for the southern part of the North Island.

Water quality in Lake Horowhenua is degraded. Based on the tropic level, Lake Horowhenua was ranked the 105 worst out of 112 monitored lakes in New Zealand in 2010. Efforts to clean-up up the lake have been ongoing for several decades and include the establishment of a full native planting buffer strip around the lake and a formal catchment management strategy being established by the Regional Council. However, these efforts have not curbed the decline in water quality and further significant water quality interventions are necessary.

Alongside the science and restoration efforts, several key partners have developed and signed the Lake Horowhenua Accord in August 2013. This development was led by Horowhenua District Council and draws together: the Lake Horowhenua Trustees (who represent the beneficial owners of the Lake); the Lake Domain Board; Horowhenua District Council; the Department of Conservation and Horizons Regional Council.

In February 2014, Minister for the Environment Hon. Amy Adams announced a funding injection of $540,000 from Central Government towards the Lake restoration. This complements $730,500 of funding from HRC, HDC and industry. This presentation will show the scientific background to the selection of projects for funding and how they complemented other work in the catchment. Further it will report on the progress of the projects to date.

Introduction:

In pre- European times, Lake Horowhenua was a clean-water supply and valued fishery for the Muaūpoko iwi who lived in the coastal forest that surrounded the lake. Clearance of coastal forest, draining of swamps, intensification of land use, urban expansion, and disposal of treated sewage effluent in the lake between 1962 and 1987 has lead to significant degradation of Lake Horowhenua. After the input of treated sewage stopped in 1987, water quality within the lake started to improve. However, a decade later, water quality began to decline again and in 2010 Lake Horowhenua was ranked 105 worst out of 112 monitored lakes in New Zealand. Lake Horowhenua is regularly closed for recreation in summer due to the presence of toxic cyanobacteria. This is related to the large amounts of nutrient and sediment entering the lake combined with large amounts of sediment and nutrients already present in the lake.

Efforts to clean up the lake have been ongoing for several decades and include the establishment of a full native riparian buffer strip around the lake and a formal catchment management strategy being established by the Regional Council. However, these efforts have

not curbed the decline in water quality and further significant water quality interventions are necessary.

In 2011 and 2012 Horizons Regional Council undertook two scientific reports with NIWA to help understand the degradation issues regarding Lake Horowhenua and address restoration options. The key issues that were identified include:

- Poor water quality from historic and current nutrient input.
- High sediment input from inflowing tributaries which is also contributing to infilling of the Lake.
- Excessive lake weed
- Toxic Cyanobacteria blooms
- Reduced fish passage to the Lake and a declining fishery.

Lake Horowhenua Accord:

Alongside the science and restoration efforts, several key partners developed and signed the Lake Horowhenua Accord in August 2013. This development was lead by Horowhenua District Council and draws together: the Lake Horowhenua Trustees (Who represent the beneficial owners of the Lake); the Lake Domain Board; Horowhenua District Council; the Department of Conservation and Horizons Regional Council.

In August 2014 the Lake Horowhenua Accord Action Plan was released. This action plan provides 15 key management actions which the accord signatories have committed to contribute to the restoration of Lake Horowhenua.

Lake Horowhenua Clean-up Fund:

In February 2014, Minister for the Environment Hon. Amy Adams announced a funding injection of $540,000 from Central Government towards the restoration of Lake Horowhenua as part of the Fresh start for Freshwater Clean-up Fund. This compliments $730,500 of funding from Horizons Regional Council, Horowhenua District Council and industry which has already been committed to the restoration of Lake Horowhenua.

Eight projects are currently being undertaken as part of the Clean-up Fund (Figure 1). These are:

1. Undertaking lake weed harvesting
2. Provision of a boat wash facility in Levin
3. Riparian fencing and planting
4. Treating stormwater entering the Lake through the Queen Street Drain.
5. Creating a sediment trap and treatment wetland on the Arawhata inflow to the Lake.
6. Creating integrated drainage and sediment control plans for cropping farms along the Arawhata sub-catchment.
7. Creating sustainable milk production plans for dairy farms.
8. Construction of a fish pass at the weir on the Hokio Stream.

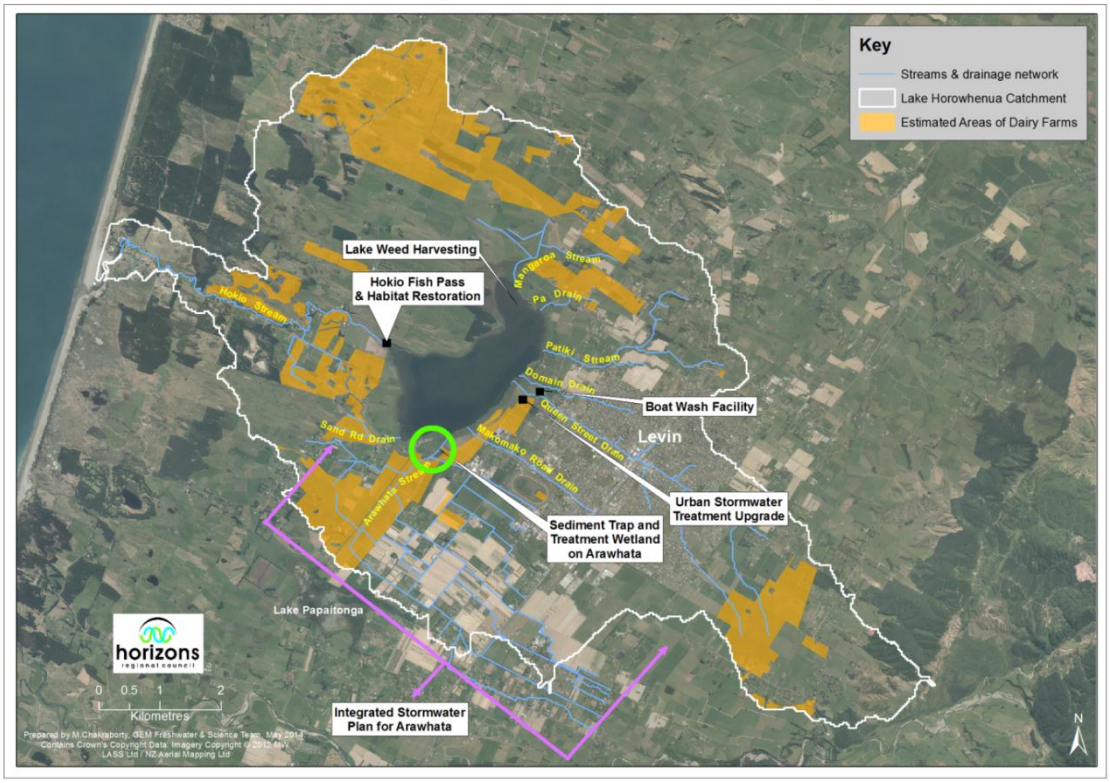


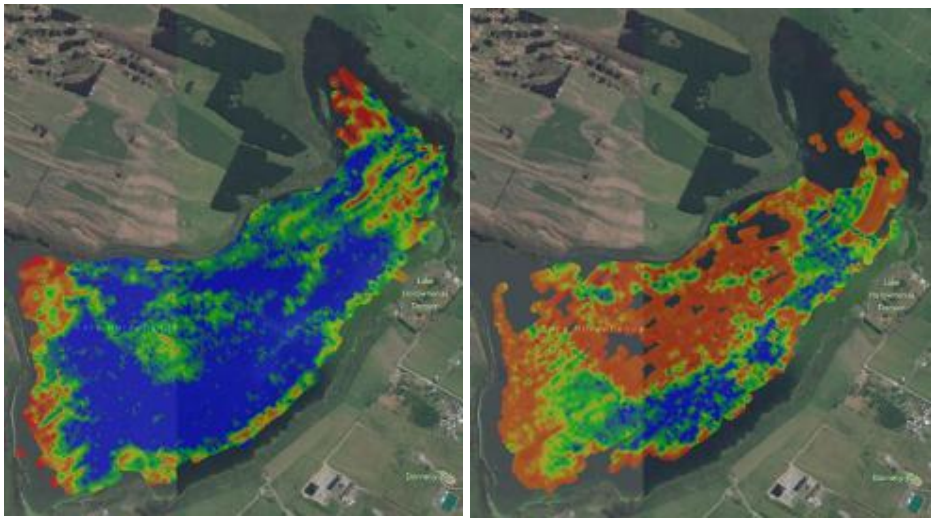
Figure 1: Map showing where each of the eight projects are going to take place around Lake Horowhenua.

Project 1: Lake Weed harvesting

Excessive lake weed causes problems for recreational users of Lake Horowhenua by creating a physical barrier for boats, creating a less desirable area for swimming and by driving cyanobacteria to bloom which regularly causes the Lake to close. A lake weed survey undertaken in January 2014 found the dominant weed present in Lake Horowhenua is a type of oxygen weed (*Elodea canadensis)* and secondly, curled pondweed *(Potomogeton crispus).*

Lake weed also has advantages as it dampens wave action, provides habitat for fish and removes nitrogen from the water. One restoration activity, recommended by NIWA, is to undertake lake weed harvesting. Weed harvesting will have the advantage of removing nutrients from the Lake and improving recreational use of the lake by reducing cyanobacteria blooms. Importantly the lake weed will not be fully removed, rather it will be cut to minimise the disturbance of the bed sediments, because if the bed sediment is disturbed it can release further nutrient into the Lake.

A) Winter B) Spring



C) Summer D) Autumn

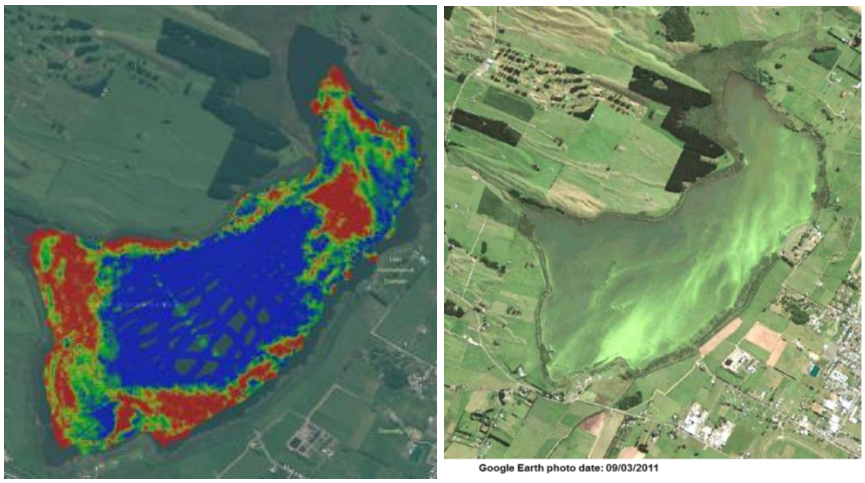


Figure 2: Maps showing Lake weed in different seasons. Red (dense weed), Green (Some weed), Blue (No weed). Note the Autumn map is a google image showing the cyanobacteria bloom in 2011.

Table1: Table showing the area of Lake Horowhenua covered in lake weed in different seasons and the estimated wet weight of this weed which could be harvested using the Lake weed harvester.

	Winter	Spring	Summer
Weed area (Hectares)	0.7 ha	118 ha	49 ha
Weight (Tonnes)	2.4 t	402 t	166 t

Monitoring of the amount of lake weed present in different seasons was undertaken for Horizons Regional Council by NIWA (Figure 2, Table 1). The harvesting recommendations from NIWA was 9 days per month in Spring and 3 days per month in summer. This level of harvesting is expected to remove 1,350 tonnes of wet weight lake weed in spring and 600

tonnes in summer. This removal of lake weed is estimated to remove 5.2 tonnes of nitrogen and 0.8 tonnes of phosporus from Lake Horowhenua annually. Work to refine the harvesting strategy and determine the end use of the weed is ongoing.

Project 2: Boat wash facility

Introduction of exotic lake weeds not currently found in Lake Horowhenua (e.g. *Egeria densa* or hornwort) are a risk to water quality in the lake. Lake weeds could irreversibly change the water quality and character of the lake. Many lake weeds can be spread by fragments broken off the main weed bed and fragments can survive considerable periods of time out of water. Lake weed can easily be transferred on boat trailers and leisure activity equipment. *Egeria* and hornwort are present in lakes within the Horizons Region but are not present in Lake Horowhenua. Provision of a boat wash facility is a preventative measure to guard against further weed introductions that could impact on lake ecology and water quality. The boat wash facility was installed in July 2014 as part of the Lake Horowhenua Clean-up Fund project and reduces the likelihood of aquatic weeds entering the lake on recreational equipment (Photo 1).

Photo 1: Minister Guy testing out the new boat wash facility built as part of the Lake Horowhenua Clean-up Fund.

Project 3: Riparian Fencing and Planting

Lake Horowhenua has high levels of nitrogen, phosphorus and sediment and is currently classified as hypertrophic (Trophic Lake Index 6.7). Riparian fencing and planting has benefits that include stabilising stream banks, intercepting sediment and nutrient runoff, shading streams and reducing water temperature fluctuations as well as creating habitat for fish and invertebrates. Riparian planting and fencing is a standard component of most water quality restoration packages. Around Lake Horowhenua a lot of good work has already been completed including over 250,000 plants being established in a fenced riparian buffer around the lake. Further work is required on the inflowing tributaries and to place plants into the lake water edge to intercept groundwater inflows.

Project 4: Storm water treatment

Stormwater inflow from the Levin Township is a source of contamination for Lake Horowhenua. While many of the stormwater inflows do not flow permanently into the lake, when they do they can contribute significant loads of nutrient and sediment. Slowing stormwater down prior to entering the lake provides an opportunity for sediment in the stormwater (including some of its associated nutrient and other contaminant load) to settle out before reaching the lake (Figure 3). Further work to identify options for stormwater treatment within the network is underway by Horowhenua District Council.

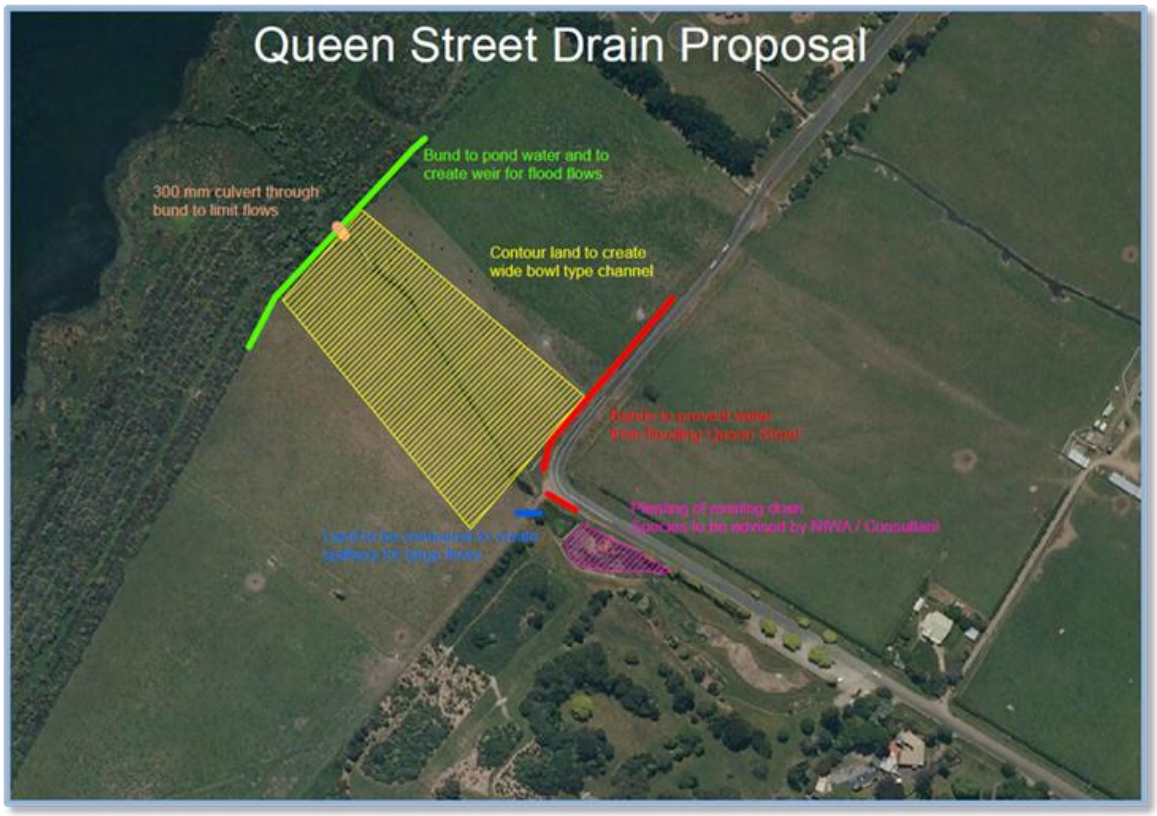


Figure 3: Draft design proposal to filter stormwater from the Queen street drain before it enters Lake Horowhenua.

Project 5: Sediment trap and treatment wetland on the Arawhata stream

Sediment is a natural component of any river or lake and can enter waterways as the result of human activity. Excess sediment can cause a range of issues, as it:

- Discolours water making it unattractive for swimming and other water-based activities;
- Clogs up habitat for insects and fish;
- Reduces visibility for fish that use sight to catch food and; and
- Carries nutrient into the lake and can cause infilling of the lake.

A report by Max Gibbs in 2011, identified that large sediment loads entering Lake Horowhenua are causing the Lake to infill at a rate of 3.3mm per year and up to 10cm per year in the center. The report noted the weir installed on the Hokio Stream has played a part in reducing the lakes natural flushing ability. Currently under the ROLD Act 1956 Horizons

Regional Council must maintain the lake level at thirty feet above mean low water spring tides.

The Arawhata Stream is a small intensively farmed catchment and has the largest surface inflow. The Arawhata is the most consistent contributor of sediment and is the largest single source of nitrogen to the lake (Photo 2). Recent data suggests that the Arawhata Stream may become anoxic at night and enhance oxygen depletion in the lake. The sediment trap and treatment wetland will reduce the speed of water flow, allowing sediment and associated nutrients to settle out before entering the Lake.

Photo 2: Sediment in the Arawhata Stream following rainfall.

Project 6: Integrated drainage and sediment control plans for cropping farms along the Arawhata sub-catchment.

A high proportion of the sediments and nutrients entering the Arawhata stream is from flood waters and overland drainage from cropped land. Horizons Regional Council has engaged Dan Bloomer from LandWise to work with growers to identify problem areas on their farms (Figure 4). These are often areas where flood waters from ineffective drainage networks are causing blow outs and large amounts of sediment are being lost to the Arawhata Stream. Dan Bloomer is also working with growers to reduce on farm ponding and improve on farm drainage. The integrated catchment drainage and sediment control plans for growers has the potential to increase farm profitability while decreasing the loss of sediment and nutrients to Lake Horowhenua.

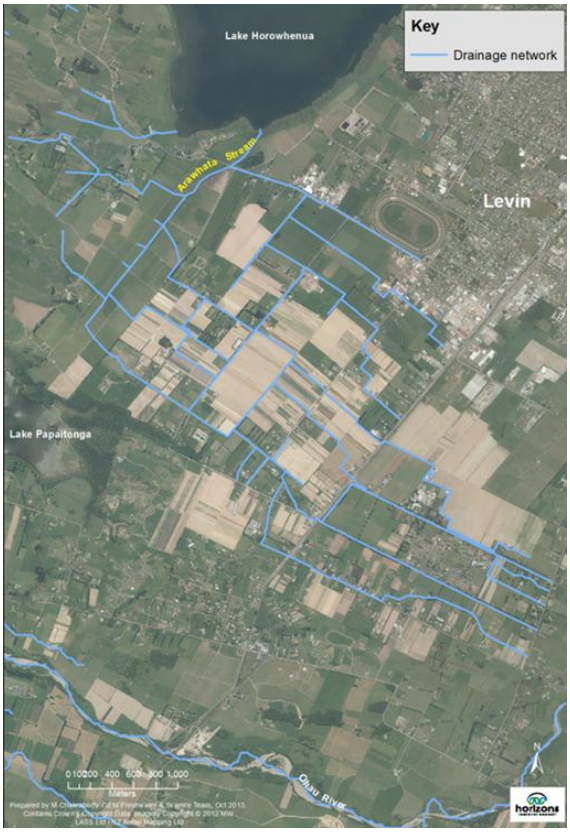


Figure 4: Map of the Arawhata sub-catchment showing the intesively farmed areas and the drainage network.

Project 7: Sustainable milk production plans for dairy farms

There are ten dairy farms within the Lake Horowhenua catchment. Dairying accounts for approximately 1430ha of the catchment with about 1020ha being milking platform (Figure 5). Horizons Regional Council One Plan has established regulatory requirements for these farmers to manage their sediment and nutrient inputs to Lake Horowhenua. Horizons Regional Council and Dairy NZ are working with farmers within the catchment to produce sustainable milk production plans for each farm. These plans include compelting detailed soil mapping, completing nutrient budgets and assessing effluent management to identify opportunities to reduce sediment and nutrient run-off and reduce nutrient leaching.

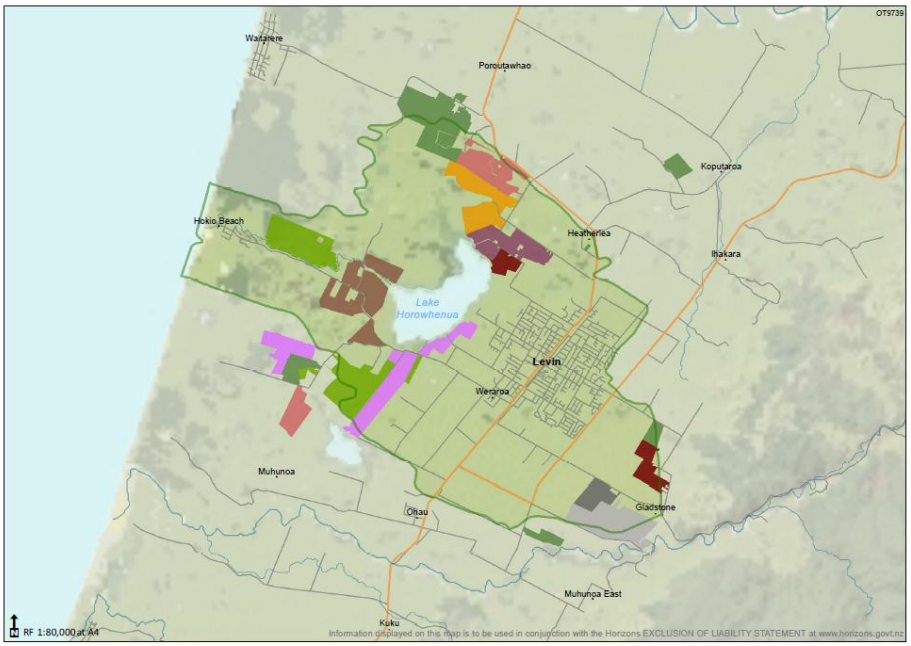


Figure 5: Map showing the ten dairy farms identified in the Lake Horowhenua Catchment. Each colour on the map represents a different farm owner.

Project 8: Creation of a fish pass at the weir on the Hokio Stream

Pre-European times, Lake Horowhenua was a clean-water supply with abundant native fish and was a valued fishery for the Muaūpoko iwi.

Current perceptions are that Lake Horowhenua is depleted of native fish and is no longer a valued fishery site. However, a fish survey undertaken by Horizons Regional Council and The University of Waikato in collaboration with the Lake Trustees and other Accord partners in 2013, found six native fish species within Lake Horowhenua. These species were: common smelt, common bully, inanga, grey mullet and short and long fin eels. Nevertheless, black flounder and yelloweyed mullet were absent.

A weir historically installed on the Hokio stream restricts upstream migration of species such as grey mullet and flounder (Photo 3). This weir is the most likely reason for the reduced number of some types of native fish species and it has been recommended that this be addressed by installing a fish pass. The weir is a key piece of infrastructure for the lake enabling water levels to be managed to achieve legislated requirements. The fish survey undertaken in 2013 also found a high abundance of tuna (eel) in Lake Horowhenua. However, tuna greater than 1 kg in size were nearly absent and tuna average weight was only 191.4g, well below the minimum commercial size limit of 220g set by the Ministry for Primary Industries. These findings may be consistent with tuna populations that have been overfished, although there could be other reasons for these findings and more research is needed.

Photo 3: Weir along the Hokio Stream which impedes fish migration from the ocean to Lake Horowhenua.

Summary

Lake Horowhenua was once a clean-water supply and valued fishery for the Muaūpoko iwi who lived in the coastal forest that surrounded the lake. Currently the water quality of Lake Horowhenua has declined to a hypertrophic state and is ranked 105 worst out of 112 monitored lakes in New Zealand. Current restoration efforts aim to halt the degradation of Lake Horowhenua and ensure the Lake holds pride of place in the Horowhenua community. Collaboration between the Lake Horowhenua Accord members, Ministry for the Environment, Industry, Landowners and the public is essential for the restoration of Lake Horowhenua to be successful. The eight key projects outlined in this report highlight the great collaboration which is already taking place. However, restoration of the Lake will take time and continued monitoring and reporting will help to see the progress made over the coming years. For more information on the restoration of Lake Horowhenua and to keep up to date with current restoration projects visit Horizons website:
http://www.horizons.govt.nz/managing-environment/resource-management/water/freshwater/lake-horowhenua-accord/

References

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