Lakes performance targets:

Continue to implement and improve a prioritised State of the Environment (SOE) monitoring programme and monitor compliance with, and the effects of, the exercise of resource consents and regional plans by:

- Operating a region-wide water quality network for the measurement, recording and reporting of river, lake and groundwater quality trends – **ACHIEVED.**
- Report the results from the SOE monitoring programmes in the Annual Monitoring Report and make available on the council's website by 31 October each year – **NOT ACHIEVED (loaded four weeks late).**

Key points 2010-2011

Of the 28 lakes monitored during 2010-2011:

- Three were graded as oligotrophic (low nutrients);
- Seven were mesotrophic (medium nutrients);
- 14 were eutrophic (high nutrients);
- Three supertrophic (very high nutrients);
- One hypertrophic (extremely high nutrient levels);
- Five lakes have declined in water quality since 2009-2010; and
- Three lakes have improved water quality since 2009-2010.

Lake Mokeno on the Poutō Peninsula.

Northland has a large number of small and generally shallow lakes. The majority of these were formed by dune activity and are therefore called 'dune lakes'. However, some – such as Lake Ōmāpere – were formed by volcanic activity, or were artificially made.

Northland's lakes are a valuable economic, social, cultural and environmental resource.

The Northland Lake Water Quality Monitoring Network (LWQMN) was set up by the council in 2005 as a means of collecting information on water quality in the region's lakes, and monitoring change over time.

The programme includes 28 lakes in the Kai Iwi, Aupōuri, central/Karikari and Poutō lake groups. These lakes are sampled every three months to test for a range of properties including temperature, nutrients and water clarity.

Lake water quality

Lakes are graded using the Trophic Level Index (TLI), which gives a measure of the amount of nutrients in the water and an indication of a lake's overall health. The lower the score the better the lake's overall health.

Aquatic plants need many types of nutrients, including nitrogen and phosphorus, for growth. However, increased levels of nutrients can encourage excessive plant growth, particularly of pest plant species, and can also lead to algal blooms.

High levels of nutrients in the water most often come from agricultural runoff and urban wastewater. Exotic aquatic plants generally require more nutrients than native plants. The risk of extensive weed growth and algal blooms increases once a lake becomes eutrophic (high nutrients).

At the end of the monitoring season, lakes are given a TLI grade from ultra-microtrophic (very low nutrient levels) to hypertrophic (saturated) depending on their nutrient levels. The map overleaf shows the TLI grades for the lakes that form the Lake Water Quality Monitoring Network (LWQMN). For more information, go to **www.nrc.govt.nz/lakedata**

Lake water quality trends

The LWQMN has been running for more than five years which means there is enough data to carry out trend analysis on water quality.

Twenty-five out of the 28 lakes in the network had significant trends. Improving trends were recorded in chlorophyll a (a specific form of chlorophyll), clarity, ammoniacal nitrogen, total nitrogen and trophic level index for Lake Ōmāpere which is consistent with the findings from the National Lakes Report (2010).

Positive trend results were also recorded for lakes Carrot, Kahuparere, Waiporohita and Wainui. Declining trends have been seen in lakes Kai Iwi, Morehurehu, Ngatu, Rotoroa, Rototuna and Waipara. These deteriorating trends are likely to be a result of pressures from surrounding land use such as forest harvesting, and increasing numbers of septic tanks. These trends will be further investigated. For more information, go to **www.nrc.govt.nz/lakedata**

Lake Owhareiti.

Lake Trophic Levels 2010-2011
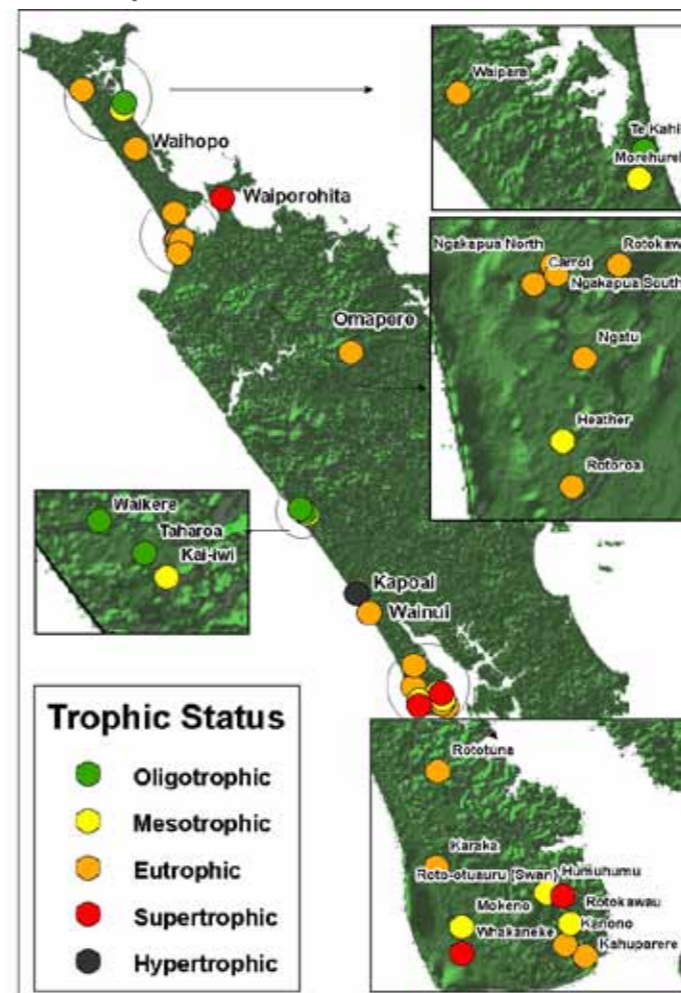
Ecological monitoring

Ecological monitoring is also undertaken of 85 lakes in the region on a rotational basis by the National Institute of Water and Atmospheric Research (NIWA). In 2010-2011, eight lakes were monitored as part of this programme.

Lakes in the programme are ranked according to their ecological value, i.e. how many native or endangered plant and animal species they contain, the absence of pest species and how close the lake is to its natural state.

Of the eight lakes monitored only two had changes to their ranking both of which were degrading ranks (lakes Midgley and Waro). These changes will be further investigated. For more information visit **www.nrc.govt.nz/lakedata**

CASE STUDY: Lake Ōmāpere

Lake Ōmāpere is located north of Kaikohe and feeds the Utakura River, which flows into the Hokianga Harbour. It is a large, shallow nutrient-rich lake which is prone to blooms of toxic algae that affect downstream water quality.
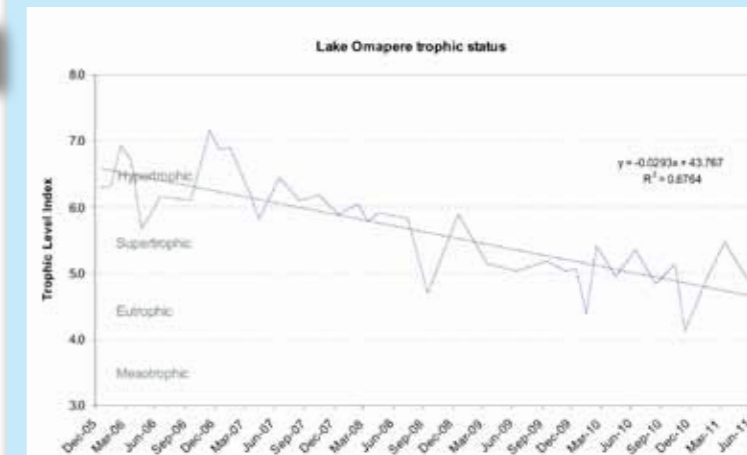
The council and the local community have been working closely for the last two decades to improve water quality in the lake, through active management and regular monitoring.

Blue-green algae levels have generally remained low over the past year with algae levels reaching a record low of two algae cells per millilitre. However, a blue-green bloom appeared in late March this year and reached a concentration of 10,985 cells per ml. The bloom was short lived and was a likely result of environmental conditions as blooms were detected in other Northland lakes in the same month (lakes Karaka and Whakaneke).

Over the last year there have been positive signs that the lake is continuing to improve. The TLI grade for Lake Ōmāpere was 4.87 in 2010-2011, which was an encouraging result considering the previous year's grade was 5.06 (which had also decreased from 5.32 the year before). See graph below.

Since regular monitoring began, nutrient levels within the lake have steadily decreased with the lake initially graded hypertrophic in 2005-2006, but now graded eutrophic in 2010-2011.

While it is encouraging to see that Lake Ōmāpere water quality is improving, water quality is still poor and ongoing land management changes are required to continue to improve water quality.

Fencing around Lake Ōmāpere.