LAKE MONITORING

The large number of small and generally shallow lakes and wetlands in Northland are a precious resource to our region. Many of these are small dune lakes near the coast of which Lake Taharoa north of Dargaville is one of the largest with a few larger volcanic lakes inland such as Omapere and Owhareiti.

These lakes and wetlands provide important habitat for a range of plant and animal species, many of which are regionally or nationally significant. Many of these lakes are also valuable for recreational users, cultural reasons, as water supplies and for their own natural beauty.

Performance targets

- Operate a region-wide water quality network for the measurement, recording and reporting of lake quality trends

- Water quality, weed and algae monitoring of Lake Omapere and associated community liaison and advice, including the ongoing development and co-ordination of a lake catchment management plan

Outcomes for 2004-2005

- A detailed assessment of 65 lakes throughout northland by Regional Council, National Institute of Water and Atmospheric Research and Department of Conservation staff (Refer to page 2). The findings of this survey have been used to rank these lakes and identify which lakes require ongoing monitoring. From this the Lake Monitoring Network has been developed and will be implemented in the 2005-2006 financial year.

- Ongoing monitoring of water quality, algae, fish and plants in Lake Omapere has been carried out as part of the Lake Omapere Restoration and Management Project (Refer to page 15).

Northland Lakes Assessment

In the 2004-2005 financial year, Northland Regional Council engaged the National Institute of Water and Atmospheric Research (NIWA) to assist the council with gathering information to determine the status of 65 lakes throughout Northland. This included information on the extent and diversity of lake vegetation, the Lake SPI method of assessing lake condition, records of water birds, fish and invertebrates and water quality assessments.

The lakes surveyed can be split into four main geographical areas: Aupouri Peninsula in the Far North, Karikari Peninsula (Far North) and central lakes (Mid North), Kai iwi and North of Dargaville lakes and Pouto Peninsula (Kaipara). The first two areas were surveyed in November 2004, while the latter two were surveyed in March 2005.

Detailed information on the following is available in this report:

The photo below shows one of the Aupouri Peninsula dune lakes, which remains in a relatively pristine state with entirely indigenous aquatic vegetation and a riparian buffer strip of native shrub and dune vegetation.

Aquatic vegetation

Aquatic vegetation surveys were carried out on all 65 lakes, in most cases full surveillance of emergent and submerged vegetation, while a few were only a reconnaissance survey. From these results the LakeSPI index was calculated for all lakes that had full surveillance. The LakeSPI index score is a measure of how close a water body is to its potential un-impacted state i.e. the closer the LakeSPI score is to 100% the less impacted or more pristine the lake is.

In the 2004-2005 surveys, NIWA found there were very few lakes that had entirely indigenous vegetation remaining. The select few, with their LakeSPI index score shown in parentheses if available, included the following lakes; Pretty (95%), Te Paki dune (97%), Wahakari (80%), Waipara (N/A), Kai iwi (83%), Humuhumu (81%), Kahuparere (88%), Karaka (83%), Mokeno (83%), Wainui (80%), Wairere (N/A) and Whananeke (N/A).

The photo below shows NIWA staff carrying out dive surveys of the lake vegetation in Lake Ngakapua on the Aupouri Peninsula

Native vegetation

Some of the significant indigenous vegetation found included the following nationally threatened (endangered) plants; the submerged plants; *Utricularia australis*, *Hydatella inconspicua* and *Isolepsis fluitans*, the emergent *Myriophyllum robustum*, the pondweed *Stukenia pectinatus*, the swamp fern *Thelypteris confluens* and the tussock *Carex secta*. There were also several regionally significant (rare) plants recorded during the survey including the turf species *Triglochin striata*, emergent plant *Gratiola sexdendata*, bog plant *Empodisma minus* and the submerged plant *Myriophyllum votschii*.

Exotic vegetation

During these surveys and others 24 alien aquatic weed species have been recorded in Northland's lakes, of which 12 have been identified as being a significant threat to our lakes and therefore require eradication or control. These 12 invasive species were found throughout 38 lakes in total and include the following five submerged plants; *Ceratophyllum demersum*, *Egeria densa*, *Lagarosiphon major*, *Vallisneria spiralis* and *Utricularia gibba*; and seven wetland/emergent plants; *Zizania latifolia*,

Alternanthera philoxeriodes, *Myriophyllum aquaticum*, *Iris pseudacorus*, *Ludwigia peploiedes* ssp. *montevidensis*, *Glyceria maxima* and *Osmunda regalis*.

Recommendations for management of these 12 species range from manual removal, control using herbicides, removal using grass carp, suction dredging and bottom lining right through to prohibiting boat access to high value lakes. Some of these management recommendations have already been investigated and implemented, while others will be assessed to determine the best option. There will be ongoing pest plant surveillance and lake condition monitoring at several lakes, see the **summary** section (page 12) for more detail.

These invasive exotic plants and others pose a serious risk to Northland's aquatic ecosystems, particularly our unique and important dune lakes. If these pest plants reach any of Northland's pristine dune lakes, they will quickly take over the lakebed, choking out native plants and potentially leading the lake to collapse.

To avoid the spread of these weeds, check

- **digger machinery**
- **boat propellers**
- **anchor chains**
- **boat trailers**
- **fishing nets and hinaki**

for plant fragments before using them in lakes or streams that flow into lakes.

All plant material must be removed to prevent the spread of invasive weeds.

Summary of fish records

There were 295 fish records in NIWA's New Zealand Freshwater Fish database (NZFFD) for Northland lakes and wetlands from 1980 to July 2004. This included the following species as shown in the table below.

Common name	Scientific name	Percent of sites where found
Native species		
Shortfin eel	*Anguilla australis*	40.7
Longfin eel	*Anguilla dieffenbachii*	5.1
Banded kokopu	*Galaxias fasciatus*	9.8
Dwarf inanga	*Galaxias gracilis*	4.1
Inanga	*Galaxias maculatus*	10.2
Crans bully	*Gobiomorphus basalis*	0.3
Common bully	*Gobiomorphus cotidianus*	22.0
Giant bully	*Gobiomorphus gobioides*	1.7
Redfin bully	*Gobiomorphus huttoni*	1.4
Black mudfish	*Neochanna diversus*	20.0
Northland mudfish	*Neochanna heleios*	13.9
Common smelt	*Retropinna retropinna*	1.0
Introduced species		
Catfish	*Ameiurus nebulosus*	1.0
Goldfish	*Carassius auratus*	3.4
Koi carp	*Cyprinus carpio*	2.0
Mosquito fish	*Gambusia affinis*	24.7
Rainbow trout	*Oncorhynchus mykiss*	1.7
Dart goby	*Parioglossus marginalis*	1.9
Rudd	*Scardinius erythrophthalmus*	3.4
Tench	*Tinca tinca*	0.3

Native fish
There were 12 native fish recorded of which short fin eels were the most common, recorded at 41% of sites, followed by common bully at 22% of sites and black mudfish at 20%. Two species of national significance were identified, the dwarf inanga and the Northland mudfish, which are both only found in Northland and have restricted distributions. Only six sites were identified as having a fish community with a diversity of native fish and no introduced species.

Introduced fish
Of the eight introduced fish species recorded in Northland lakes and wetlands in the last 24 years, mosquito fish are the most common, recorded at 25% of sites, with the rest occurring at less than 4% of the sites. There is also two other introduced fish species known to be present in Northland, caudo (*Phalloceros caudimaculatus*) and perch (*Perca fluviatilis*), which were not recorded on the NZFFD.

Mosquito fish are probably the most undesirable, as they attack and damage other fish species and can easily populate new areas. Other introduced fish species in Northland include goldfish, koi carp and catfish. Goldfish are also reasonably widespread throughout Northland but probably have the least impact on the environment, while catfish and koi carp are only found in a few places, they can have detrimental impacts. Catfish feed heavily on koura (freshwater crayfish) and other lake invertebrates, while koi are prolific breeders and can degrade lake habitats at high densities by increasing turbidity and reducing macrophytes (aquatic plants).

Water Quality Results

Of the 65 lakes assessed 37 had water quality sampling carried out. Field measurements of lake level, temperature, dissolved oxygen, conductivity, pH and water clarity (using a secchi disc) were taken at each lake. A temperature and dissolved oxygen profile was carried out on each lake to determine whether the lake was thermally stratified and samples were collected for testing the following parameters; suspended solids (both total and volatile), chlorophyll *a* (as an indicator of algal biomass), total phosphorus and total nitrogen.

The life supporting capacity of a lake can be estimated by using the trophic level index. The four variables that are used to obtain the trophic status of a lake are water clarity, chlorophyll *a*, total phosphorus and total nitrogen as shown in the table below.

Trophic status	Total Nitrogen (mg/m^3)	Total Phosphorus (mg/m^3)	Chlorophyll α (mg/m^3)	Water clarity (m)
Oligotrophic	<200	<10	<2.0	>10
Mesotrophic	200 - 300	10 - 20	2 - 5	5 – 10
Eutrophic	300 - 500	20 - 50	5 - 30	1.5 – 5.0
Hypertrophic	> 500	> 50	> 30	< 1.5

A summary of the results for each lake sampled in the four geographical areas is available in this report:

- **Aupouri Peninsula lakes** (pages 7 and 8)
- **Karikari Peninsula and Central lakes** (page 9)
- **Kai iwi and North of Dargaville lakes** (page 10)
- **Pouto Peninsula lakes** (page 11)

However care should be taken when interpreting these results as they are mostly based on a one of sampling event, especially as there is no historical data for many of these lakes. Stronger conclusions can be made when several years' data is obtained for the lakes that will be sampled as part of the **Lake Monitoring Network** (refer to page 14).

The photo below shows riparian planting that has been done around Lake Rototuna on the Pouto Peninsula by the local school and community, to prevent sediment and nutrients from reaching the lake.

Aupouri Peninsula lakes

Lake Carrot
The secchi disk reading indicates low water clarity. The lake was stratified, with moderate deoxygenation of bottom water and slightly higher nutrient concentrations compared to the upper water column, with moderate algal biomass. Current nutrient concentrations are lower than previous records. The data suggests a eutrophic status.

Lake Heather
Thermal stratification was not detected. The secchi disk reading indicates moderate water clarity. Water clarity, nutrient, and algal measurements suggest a mesotrophic to eutrophic status.

Lake Kihona
The lake was stratified with anoxia of bottom water and a higher concentration of nutrients in relation to the upper water column. Secchi disk reading indicates low to moderate water clarity. Water clarity, nutrient, and algal measurements suggest a mesotrophic to eutrophic status.

Morehurehu
Thermal stratification was not detected. Secchi disk reading indicates moderate water clarity. Current water clarity, nutrient, and algal measurements suggest Morehurehu is in a mesotrophic state.

Lake Ngakapua (North Basin)
Secchi disk reading indicates low water clarity. The lake was stratified with moderate deoxygenation of bottom water and slightly higher concentration of nutrients in relation to the upper water column. Data suggests a eutrophic status.

Lake Ngakapua (South Basin)
Secchi disk reading indicates low water clarity. The lake was stratified with moderate deoxygenation of bottom water and slightly higher concentration of nutrients in relation to the upper water column. Secchi disk, nutrient and algal measurements suggest a eutrophic status.

Lake Ngakeketa
Thermal stratification of the lake was not detected. Secchi disk readings indicate poor water clarity. Secchi disk, nutrient and chlorophyll *a* (algal biomass) measurements suggest a eutrophic status.

Lake Ngatu
Thermal stratification was not detected at the time of sampling. The recent secchi disk reading indicates moderate water clarity, which is better than previous readings. Secchi disk, nutrient, and algal measurements indicate a mesotrophic to eutrophic status.

Lake Ngatuwhete
The lake was not stratified at the time of sampling. Secchi disk reading indicates moderate water clarity. Water clarity, nutrient, and algal measurements suggest a eutrophic status.

Lake Pretty
The lake was stratified at the time of sampling with a thermocline noted at 4 metres. Secchi disk reading indicates moderate water clarity. Secchi disk, nutrient and algal measurements suggest a mesotrophic to eutrophic status.

Lake Rotokawau
The secchi disk reading exceeded the recorded lake depth at the sampling point. Stratification of the lake was not observed. Water clarity, nutrient and chlorophyll *a* (algal biomass) measurements suggest a mesotrophic to eutrophic status.

Lake Rotoroa
Thermal stratification was not observed. A secchi disk reading of 4 metres indicates moderate water clarity. Current water clarity, nutrient and chlorophyll *a* measurements suggest a mesotrophic status.

Lake Te Kahika
The water clarity of this lake is excellent with a secchi reading in excess of 10.8 metres (the maximum recorded depth). Nutrient and chlorophyll *a* measurements suggest an oligotrophic to mesotrophic status. The water is unusually acidic and contains high, and potentially toxic, concentrations of dissolved aluminium and sulphate.

Te Paki Dune Lake
A small lake south of Te Paki Stream it had low water clarity. Water clarity, nutrient and algal measurements suggest that this lake is in a eutrophic state.

Lake Wahakari
The lake was not stratified. Secchi disk reading indicates good water clarity. Secchi disk, nutrient and algal measurements suggest a mesotrophic status. Previous secchi disk readings were lower than the current reading indicating an improvement in water clarity.

Lake Waihopo
Thermal stratification was not observed in this lake. Secchi disk reading indicates moderate water clarity. Water clarity, nutrient and chlorophyll *a* measurements suggest a eutrophic status.

Lake Waipara
Secchi disk reading indicates low water clarity. The lake was stratified with moderate deoxygenation of bottom water and higher concentrations of nutrients in relation to the upper water column. Water clarity, nutrient and algal measurements suggest a eutrophic status.

Lake Waiparera
Stratification was not detected in this lake at the time of sampling. The secchi disk reading indicates poor water clarity. Secchi disk, nutrient and algal measurements suggest a eutrophic status.

Karikari Peninsula and Central lakes

Jack's Lake
Secchi disk reading of 2.4m indicates poor water clarity. The lake was stratified with moderate deoxygenation of bottom water and higher concentrations of nitrogen but not phosphorus compared with the upper water column. Water clarity, nutrient and chlorophyll *a* (algal biomass) suggest a eutrophic status.

Lake Manuwai
This lake was not stratified at the time of sampling. Current nutrient and algal measurements suggest a eutrophic status. Previous secchi disk readings indicate poor water clarity.

Lake Rotokawau East
The lake was not stratified at the time of sampling. Secchi disk reading indicates very low water clarity. Secchi disk, nutrient and chlorophyll *a* (algal biomass) measurements and a high proportion of volatile suspended solids suggest a hypertrophic status.

Lake Rotokawau West
Thermal stratification of the lake was not detected. Secchi disk reading indicates very low water clarity. Secchi disk, nutrient and algal measurements and a high proportion of volatile suspended solids suggest a hypertrophic status.

Lake Waingaro
The lake was stratified with deoxygenation of the bottom water and higher concentrations of nutrients in relation to the upper water column. This data suggests a mesotrophic to eutrophic status. Previous secchi disk readings indicate low to moderate water clarity.

Lake Waiporohita
Thermal stratification of the lake was not observed. Secchi disk reading indicates very low water clarity. Secchi, nutrient and chlorophyll *a* measurements and the high proportion of volatile suspended solids suggest a hypertrophic status.

Kai Iwi and North of Dargaville lakes

Lake Kai Iwi
Secchi disk readings indicate good water clarity. The lake was stratified with deoxygenation of the bottom water and higher concentrations of nitrogen but not phosphorus in relation to the upper water column. The data suggests a mesotrophic status.

Midgley's Lake
Secchi depth reading indicates low water clarity. The lake was not stratified at the time of sampling. Secchi disk, nutrient and chlorophyll *a* measurements suggest eutrophic status.

Lake Taharoa
Secchi disk readings indicate excellent water clarity. Thermal stratification of this lake does occur but was not detected on the recent visit. Nutrient and algal measurements suggest an oligotrophic to mesotrophic status.

Lake Waikere
Secchi disk readings indicate moderate water clarity. The lake was stratified with moderate deoxygenation of bottom water and higher concentrations of nitrogen but not phosphorus in relation to the upper water column. The data suggests a mesotrophic to eutrophic status.

The photo below shows the green discolouration of the bottom water in Lake Waikere as a result of a higher algal biomass.

Pouto Peninsula lakes

Lake Humuhumu
Secchi disk reading indicates good water clarity. Thermal stratification was observed with anoxia of bottom water. Nutrient and chlorophyll *a* measurements suggest a mesotrophic status.

Lake Kanono
Secchi disk reading indicates moderate water clarity. The lake was stratified with deoxygenation of the bottom water and higher concentrations of nutrients in relation to the upper water column. Water clarity, nutrient and algal measurements suggest a mesotrophic status.

Lake Karaka
Secchi disk reading indicates moderate water clarity. The lake was stratified with anoxia of bottom water and high concentrations of phosphorus in relation to the upper water column, however algal biomass was low. The data suggests Lake Karaka is in a eutrophic state.

Lake Mokeno
Secchi disk reading indicates low to moderate water clarity. This lake was stratified with anoxia of bottom water and very high concentrations of nutrients in relation to the upper water column. Water clarity and nutrient measurements suggest a eutrophic status.

Lake Rotokawau
Secchi disk reading indicates good water clarity. The lake was stratified with deoxygenation of bottom water and a higher concentration of nutrients in relation to the upper water column. Clarity, nutrient and algal measurements suggest a mesotrophic status.

Lake Rototuna
Secchi disk reading indicates poor water clarity. The lake was stratified with deoxygenation of bottom water and a higher concentration of total nitrogen in relation to the upper water column. Data suggests a eutrophic status.

Lake Roto-otuauru/Swan
A thermocline at 4 metres with black water below was present; and therefore the secchi disk reading was 4 metres. The lake was stratified with anoxia of bottom water with elevated concentrations of nutrients. Nutrient and chlorophyll *a* measurements suggest a mesotrophic to eutrophic status.

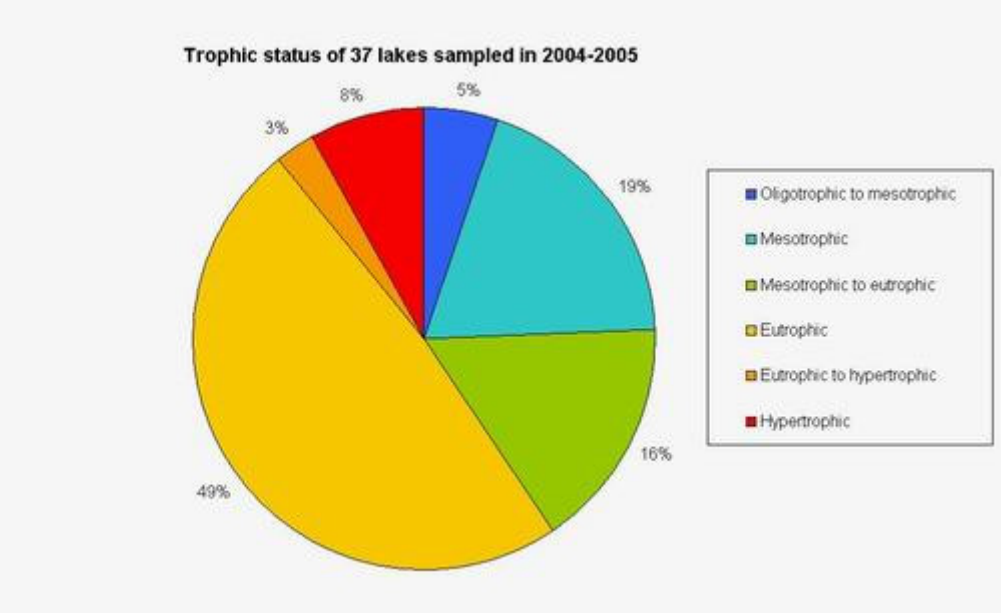
Lake Waingata
The lake was not stratified at the time of sampling. Nutrient and algal measurements suggest a eutrophic to hypertrophic status.

Lake Wainui
Secchi disk reading indicates low water clarity. The lake was stratified with deoxygenation of bottom water and higher concentrations of nutrients in relation to the upper water column. Secchi disk, nutrient and algal measurements suggest Lake Wainui is in a eutrophic state.

Summary

Water quality

The water quality results indicate that 59% of the 37 lakes sampled are in a eutrophic state or worse as shown in the graph below, meaning that they are likely to have high algal biomass, nutrients and sediment and low water clarity.



Lake rankings

The water quality results and available ecological information (including vegetation, fish, water birds and aquatic invertebrates) was used to rank the lakes. The rankings from best to worst are; outstanding, high, moderate to high, moderate, low to moderate and low. Lakes ranked "low" were either devegetated with poor water quality or severely impacted by exotic pest species (including fish and plants). Outstanding lakes are nationally important, containing a diverse indigenous biota with sustainable populations of endangered species.

Of the 65 lakes surveyed, 25 were ranked low or low to moderate, 16 moderate or moderate to high and 24 were ranked high or outstanding. These 24 high value and at risk lakes are the majority of the lakes recommended for water quality monitoring as part of the Lake Monitoring Network (shown in italics with asterisks in the table below) and for ongoing Lake Condition Monitoring of vegetation or pest plant surveillance (also shown in the table below)

Aupouri Lakes

Lake name	Ranking	Lake Condition monitoring	Pest weed surveillance
Austria	Moderate		
Bullrush	Low		
*Carrot**	High	5 yearly	
Forest Headquarters	Low		
Half Mile Lagoon	Low		
*Heather**	High	5 yearly	
Katavich	Low		
Kihona	Low		

Mini	Low		
*Morehurehu**	Outstanding	5 yearly	
Morehurehu South	Moderate – High		
*Ngakapua (North & South)**	Moderate – High	5 yearly	
Ngakeketa	Low		
*North of Ngakeketa**	High	3 to 5 yearly	
*Ngatu**	Outstanding	Annually	Annually
Ngatuwhete	Low		
Pretty	Moderate		
*Rotokawau**	Moderate – High	5 yearly	
*Rotoroa**	High	5 yearly	
Salt	Low		
Te Arai Ephemeral Wetland	Moderate		
*Te Arai lake**	Moderate – High	5 yearly	
*Te Kahika**	Outstanding	5 yearly	
*Te Paki dune**	High	5 yearly	
Te Werahi Lagoon	Low		
*Wahakari**	Outstanding	5 yearly	Annually
*Waihopo**	Outstanding	5 yearly	
Waimimiha North	Low		
Waimimiha South	Low		
*Waipara**	High	5 yearly	
*Waiparera**	Moderate – High	5 yearly	
*West Coast Rd**	High		

Karikari Peninsula & central lakes

Lake	Ranking	Lake Condition monitoring	Pest weed surveillance
Jacks	Low		
Roadside pond, Matai	Low		
Manuwai	Low		
Omapere	Low		
Owhareiti	Low		
Rotokawau East	Moderate		
Rotokawau West	Moderate		
Rotopokaka	Moderate		
Waingaro	Low		
*Waiporohita**	Outstanding	5 yearly	Annually

Kai iwi & north of Dargaville lakes

Lake	Ranking	Lake Condition monitoring	Pest weed surveillance
Freidrich's	Low		
*Kai iwi**	Outstanding	5 yearly	Annually
McEvoy	Low		
*Midgeley**	Moderate – High	5 to 10 yearly	
Shag	Low		
*Taharoa**	Outstanding	5 yearly	Annually
*Waikere**	Outstanding	5 yearly	Annually

Pouto Peninsula lakes

Lake	Ranking	Lake Condition monitoring	Pest weed surveillance

Grevilles Lagoon	Moderate		
*Humuhumu**	Outstanding	3 to 5 yearly	Annually
*Kahuparere**	High	5 yearly	
*Kanono**	Outstanding	Every 1 - 2 yrs	Every 3 – 5 yrs
*Kapoai**	Low – Moderate	5 yearly	
*Karaka**	High	5 to 10 yearly	Every 5 – 10yrs
*Mokeno**	Outstanding	5 yearly	5 yearly
Parawanui	Low		
Phoebe's	Low		
*Rotokawau**	High	5 yearly	Annually
*Rototuna**	High	Every 2 – 3 yrs	
Swan	Moderate		
Waingata	Low		
*Wainui**	Moderate – High	5 yearly	
*Wairere**	Moderate – High	5 yearly	
*Whananeke**	High	5 yearly	

Lake Monitoring Network

From the preliminary water quality results and the findings of the aquatic plant survey, NIWA has identified 32 lakes throughout Northland for ongoing water quality monitoring. These 32 lakes will form the Lake Monitoring Network, which will be implemented in 2005-2006.

Each one of these lakes will be monitored four times a years for the same parameters sampled in 2004 – 2005, except with the additional testing of dissolved nutrient levels including nitrate nitrogen, ammoniacal nitrogen, organic nitrogen, dissolved reactive phosphorus and organic phosphorus. With regular monitoring a good database can be established, which can be used to detect seasonal patterns and long-term trends in water quality for each lake.

NIWA has also recommended ongoing pest plant surveillance on 11 lakes, which involves inspections around access points to the lake usually on an annual basis, and lake condition monitoring of 32 lakes, which is based on the 'LakeSPI' protocols and in most cases is carried out five yearly.

Lake Omapere

The Lake Omapere Trust and Northland Regional Council are working in partnership on the Lake Omapere Restoration and Management Project funded by the Ministry for the Environment's Sustainable Management Fund. The overall aim of this project is to improve water quality and the overall health of Lake Omapere in the long term.

The project includes:
- The development of a lake management strategy,
- Water quality monitoring,
- Enhancement of indigenous biodiversity including terrestrial and aquatic plants, freshwater mussels and fish,
- Surveillance monitoring for the invasive aquatic weed, *Egeria densa*
- Working with landowners to reduce nutrient inputs into the lake
- Community involvement in planting days
- Relationship building between Lake Omapere trustees, key stakeholders (including the Regional Council, Far North District Council, Te Runanga a iwi o Ngapuhi, Department of Conservation and the Ministry for the Environment), landowners and the community (including local schools, landcare and iwi groups)

The following report is purely a summary of the water quality monitoring carried out in Lake Omapere since September 2003. More information on the work being carried out as part of the Lake Omapere Restoration and Management Project is available on the Regional Council website.

Water Quality Monitoring

Water quality sampling is carried out monthly at two locations on the lake, each with two sites (75 and 25% depth), and at the lake outlet. Field measurements of temperature, dissolved oxygen, conductivity and water clarity (using a secchi disc) are taken at these five routine sites and samples are collected for analysis of suspended solids (total and organic), chlorophyll α (indication of algal biomass), pH, nitrogen, phosphorus and algae identification. Since December 2003 extra samples have been collected to determine the number of cyanobacterial (Blue-green algae) cells and cyanobacterial toxin levels, from one lake site and the outlet.

The results from September 2003 to June 2005 are summarised below. A full report is available on the Regional Council website.

Summary of results

Water quality in Lake Omapere from September 2003 to June 2005 has been very poor. Chlorophyll α, total nitrogen, total phosphorus and secchi measurements are indicative of a lake in a hypertrophic state, meaning it is highly enriched with poor water clarity and frequent algal blooms and surface scums, as shown in the table below.

Parameter	Total Nitrogen (mg/m^3)	Total Phosphorus (mg/m^3)	Chlorophyll α (mg/m^3)	Secchi depth (m)	Suspended solids (g/m^3)
Average values for Lake Omapere for 2004-05	1967	187	79	< 0.4	60
Typical value for Hypertrophic lake	> 1500	> 100	> 30	< 0.5	-

The water quality monitoring is closely linked to the other components of the Lake Omapere Restoration and Management Strategy. The integrated catchment component, enhancement of the freshwater mussel population and re-establishment of native aquatic plants are all vital in improving water quality in Lake Omapere. However, the freshwater mussels and native aquatic plants are also dependent on water quality improving, particularly clarity, before successful enhancement can occur.

Lake Omapere Trust and Northland Regional council are aware of the significant downstream impacts the algal blooms in Lake Omapere have on the Utakura River and Hokianga Harbour. As water quality in Lake Omapere may take several years to improve it is proposed as part of the Lake Omapere Restoration and Management project, to investigate methods of reducing the downstream impacts in the short term.