

Having oxygen-rich and oxygen-poor micro-environments close to each other that promote nitrogen transformation.

- High plant productivity. The dense wetland plants take up nutrients and when dead, they provide organic matter to fuel the bacteria that transform nitrogen into nitrogen gas.
- Wetland plants have internal ventilation systems – “snorkels” – their stems transport oxygen down into the root zone and vent respiratory gases.

Assistance to establish or restore wetland areas

Environment Bay of Plenty land management staff provide a free advisory service for landowners who want to construct or restore wetlands. Many private wetlands are managed through the Environmental Programme property plan approach – a partnership between Environment Bay of Plenty and each individual landowner to promote sustainable farm management and reduced nutrient inputs to waterways.

Grants are available to cover some or all of the costs of wetland construction, fencing, pest removal and related works.

Design advice is also available on how to best construct the wetland for its intended purpose. Wetlands can be registered and covenanted under the Queen Elizabeth II National Trust or

Nga Whenua Rahui to protect them in perpetuity.

For information contact the Department of Conservation or visit www.nationaltrust.org.nz.

Sources of further information

Wetlands can be constructed around water bodies like streams and ponds, in low-lying damp areas to intercept farm runoff, or a large flat area to treat a stream flow. If you are interested in establishing a constructed wetland on your property, contact an Environment Bay of Plenty land management officer on freephone 0800 ENV BOP (0800 368 267). You can also visit our website: www.envbop.govt.nz

For further reading, try Environment Waikato's Wetland fact sheets:

- Wetland fact sheet #1: Wetland Restoration
- Wetland fact sheet #2: Wetland Wildlife
- Wetland fact sheet #3: Wetland Planting Guide
- Wetland fact sheet #4: Wetland Restoration – Information and Contacts
- Wetland fact sheet #5: Wetland Restoration – Case Studies

These fact sheets are free on request from Environment Waikato. Their website also contains useful information: www.ew.govt.nz.

Be aware that some of the content may not be applicable to the Bay of Plenty region. Fish & Game (Eastern Region) Council

can offer information on how to design wetlands for fishing and game bird hunting opportunities. The Department of Conservation (Bay of Plenty Conservancy) can help with information on appropriate native species for a wetland site. Other local conservation groups may also give some ideas.

More technical research

Tanner, Chris; Kloosterman, Vivian. (1997) *Guidelines for Constructed Wetland Treatment of Farm Dairy Wastewaters in New Zealand*. NIWA Science and Technology Series No. 48, June 1997.

Gibbs, M.M.; Lusby, F.E. (1996). *Lake Edge Wetlands: Their environmental significance to the Rotorua lakes*. NIWA Consultancy report BPR005/2, June 1996. Available from Environment Bay of Plenty.

Tanner, Chris. (2003) *Constructed wetland treatment of streams flowing into Lakes Rotoehu and Okaro – Preliminary assessment*. NIWA Project BOP03210, April 2003. Available from Environment Bay of Plenty.

For further information and advice, contact your local soil conservator at Environment Bay of Plenty:

Telephone: 0800 ENV BOP (368 267)
Facsimile: 0800 ENV FAX (368 329)
Pollution Hotline: 0800 73 83 93
Email: info@envbop.govt.nz
Website: www.envbop.govt.nz
Address: 5 Quay Street, P O Box 364, Whakatane, New Zealand

This fact sheet was last updated April 2005

Wetlands

What is a wetland?

A wetland is a collective term for permanently or frequently wet land, shallow water and land-water margins. It is characterised by a natural ecosystem of plants and animals that are adapted to wet conditions. Wetlands can be found in many different places: estuaries, lake edges, farm depressions, river and stream banks, drains, and around geothermal surface features.

Damp lands without wetland plants, like temporary ponds, low-lying land with patches of rushes, or temporary watercourses, are not wetlands. They may however be good places to restore or convert into a wetland.

Wetland areas are useful in helping restore the Rotorua Lakes. This is because they

can filter nutrients like nitrogen and phosphorus from water before the water enters our lakes and streams. These nutrients feed algal growth, which degrades water quality.

Nitrogen and phosphorus enter waterways through groundwater, surface runoff, effluent and by direct application. Research shows that wetlands remove up to 90% of nitrate from the water by denitrification. Denitrification is where anaerobic bacteria convert the nitrogen in the water to nitrogen gas, which is then released into the atmosphere.

By reducing the amount of nitrogen going into the degraded lakes, algae levels and the risk of algal blooms are also lowered.

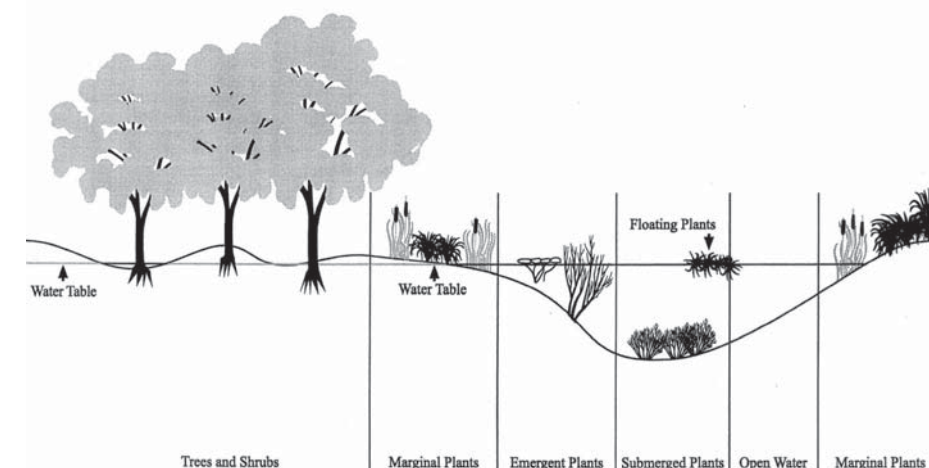
Wetlands maintain themselves, and are good for the environment generally. A large wetland is



A wetland in Lake Rotoma

The Rotorua Lakes Problem

- Many of Rotorua's lakes have too many nutrients, caused by activities such as farming and residential settlement.
- These nutrients (nitrogen and phosphorus) feed algal growth, which degrades water quality.
- The Rotorua Lakes Protection and Restoration Action Programme is initially tackling water quality problems in five lakes in the Rotorua district
- Some long-term solutions focus on land management and include new wetlands, restricting nutrients “outflows” from properties, and changes in land use.
- More urgent solutions include sewerage reticulation, structures to divert flows, and the use of mineral products to lock up nutrients.



A wetland may have any one, or a combination, of these areas

being built at Lake Okaro and others are being considered for other lakes under the Rotorua Lakes Protection and Restoration Programme.

Benefits from wetlands

Water absorption during wet periods

Wetlands soak up water like a sponge, lowering peak flows during a flood and reducing downstream erosion.

Water release during dry periods

Wetlands provide a more continuous water source, recharging streams and groundwater.

Stable banks

Stream edge wetland plants bind the soil under them, reducing bank erosion.

Sediment collection

Wetlands settle out sediment in surface flows from eroded patches, construction sites, tilled areas, farmland, and other land.

Water filter

Wetlands are a buffer between land uses and water bodies like lakes, rivers and streams. They are the “kidneys” of the landscape:

- They remove partly-combusted fuels (poly-aromatic hydrocarbons) in road runoff.
- They uptake and neutralise many toxins, heavy metals, pesticides and faecal microbes.



Blackberry and willow infested wetland

- They absorb dissolved nutrients and trap particulate nutrients e.g. phosphorus
- They oxygenate the water (healthier for instream fish and invertebrates).
- Bacteria around wetland plant roots convert up to 98% of nitrogen in the water into harmless nitrogen gas released to the atmosphere. This reduces algal blooms in waterways and keeps water healthy for stock to drink.

Aesthetically pleasing feature

Wetlands can enhance natural character and views. If a wetland is functioning well it can add market value to a property.

Home for rare and threatened native birds and plants, and a variety of insects

Wetlands are 2% of New Zealand's land area but are home to 22% of native land bird species and 30% of native freshwater fish.

There are 47 separate species of rush and 72 species of native sedge. Many are threatened or endangered.

Cultural values

Many Maori value wetlands for traditional flax harvesting and fishing. Wetlands can also contribute to the character and heritage of an area.

Recreational and educational values

Wetlands can be used for fishing, shooting, bird watching, board walking, research, education and water sports.

Wildlife corridors

Wetlands are node points for travelling native species, like tui and giant kokopu. Wetlands are essential breeding and feeding grounds for many bird and fish species.

Loafing area

Many wild fowl prefer to congregate in wetlands which prevents fouling of reserves and grassed areas.

What wetlands do not do

High nitrogen removal rates occur when water moves slowly and evenly through the wetland. Large water flows and channelised flows through the wetland do not provide the contact with organic rich soil and bacteria that help with nitrogen removal.

Because wetlands trap sediments, they will gradually “dry out” as mud flats and new soil is created. This is a natural process, but the higher the sediment load in water entering the wetland, the faster the wetland will fill up with

sediment. Therefore wetlands should not be used as a sediment trap, or to treat water flows with high sediment loads.

Dissolved phosphorus in water flows is not affected by wetlands, excluding a small amount absorbed by wetland plants. Constructed wetlands are used mainly as nitrogen-removal systems, and not for phosphorus removal.

Threats to wetlands and their wildlife

- Plant and animal pest infestations like willows, blackberry, rats, cats and possums.
- Lowering or raising of the water table by building drains or stopbanks.
- Vegetation clearance by heavy machinery or herbicide sprays.
- Changing water volumes, speed, sources, timing,

or direction through the wetland.

- Too much sediment, nutrients or toxic substances entering the wetland. There is a limit to how much pollution a wetland can remove.
- Heavy stock that graze and trample wetland plants, compact and erode soil, increase nutrient levels, and promote the spread of weeds by opening up areas and carrying seeds in their hooves, coat or dung.

If you are unsure how an activity may damage a wetland, contact Environment Bay of Plenty for assistance.

Creating and enhancing wetlands

Only three per cent of the original wetlands in the Bay of Plenty remain. As they are so rare yet so important for the environment, regional rules restrict any

activities that will harm or destroy a wetland.

Construction, maintenance or enhancement of a wetland is promoted.

Many enhancement works can be done as of right, but some may need a wetland management agreement or consent from Environment Bay of Plenty.

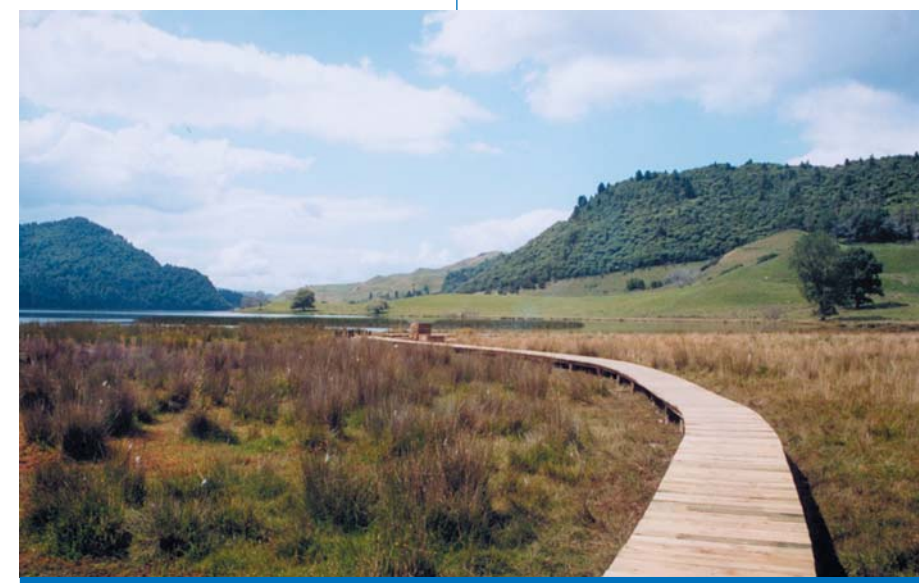
If you are intending to do some works that will affect a wetland, contact an environmental planner at Environment Bay of Plenty who will guide you through the relevant rules and processes.

Constructed wetlands

New wetland areas can be created for a number of reasons: waterfowl habitat, nutrient stripping, landscape enhancement and/or a more constant water supply. Some wetlands are created to remove nitrogen from farm runoff, streams, sediment and plant material.

Features that make a constructed wetland an effective nutrient removal system

- The water speed through the wetland is slow and spreads throughout the whole wetland area. Sediment settles out, and the water has time for proper treatment.
- Close contact between water, soil, plants, and microbial biofilms. The bacteria transform ammonia and nitrate (different forms of nitrogen) into nitrogen gas that is released to the atmosphere (denitrification).



Wetland at Lake Okareka

resource consent application. Consents may be granted if other nutrient mitigation measures are available in the same lake catchment, for example engineering or lake treatment options, or land retirement. Financial contributions will be required as part of a consent to pay for such measures.

Point-source discharges

Point-source discharges include sewage discharges, dairy shed effluent, and industrial discharges. A nutrient cap is also applied to point-source discharges. Any new discharge cannot increase the nitrogen or phosphorus level within the lake catchment. Where there is a change to an existing discharge, the change cannot increase nitrogen or phosphorus levels above levels already set in the resource consent unless the increase is offset in the catchment.

Resource consent applicants must identify what nutrient management measures will be used to fully offset any proposed increase within the same lake catchment.

Environment Bay of Plenty may decline the consent application if the applicant does not identify what nutrient mitigation measures will be used within the catchment to offset the effects of the discharge.

Frequently asked questions

Q Can I increase productivity on my property?

A Yes, but only if measures are taken to fully offset the increased loss of nitrogen or phosphorus from the land management change, either on the property or within the same lake catchment. For example, retiring riparian areas could allow for extra stock numbers.

Q Can I change the land use on my property?

A Yes, but only if the land use change is within the nutrient benchmark for the property, or any nutrient increase can be fully offset within the same lake catchment.

Q What happens if I sell my property?

A The nutrient benchmark still applies to the property. The new landowners should be made aware of the nutrient benchmark, and that any land use change or land management practices will have to remain within that nutrient benchmark.

Q What happens if I subdivide?

A The nutrient benchmark applies, but is split between the new properties. For example, the nutrient benchmark could be averaged amongst the new properties, or a higher percentage of the benchmark assigned to different properties. For example, new lifestyle blocks could have covenants requiring no stock is to be kept on the property (i.e. a low nutrient level), and the remaining benchmark allocated to other blocks.

For further information and advice, contact the Nutrient Assessment officer at Environment Bay of Plenty:

Telephone: 0800 ENV BOP (368 267)
Facsimile: 0800 ENV FAX (368 329)
Pollution Hotline: 0800 73 83 93
Email: info@envbop.govt.nz
Website: www.envbop.govt.nz
Address: 5 Quay Street, P O Box 364, Whakatane, New Zealand

This fact sheet was last updated August 2005



The major cause of lake water quality problems in the Rotorua lakes is excessive nitrogen and phosphorus from land use activities in the lake catchments.

What is Rule 11?

Many of Rotorua's lakes are declining in quality because they have too many nutrients.

Land use activities are part of the problem because they produce nutrients that leach into the lakes. More intensive types of farming tend to create more Nitrogen and Phosphorus because they have more stock per hectare and make more use of external "inputs" such as fertilisers.

In New Zealand, farming has generally become more intensive over the past decade, with a resulting impact on the country's waterways.

Because of this, land use management is a key strand of the Rotorua Lakes Protection and Restoration Action Programme.

Environment Bay of Plenty's Proposed Regional Water and Land Plan faces up to these issues. It includes proposals that will stop any further increases in the amount of nitrogen and phosphorus leaching off farmed land.

Rule 11

Rule 11 is a series of rules in section 9.4 of the proposed plan. They look at the loss of nitrogen and phosphorus from land use activities in the catchments of Lakes Rotorua, Rotoiti, Rotoehu, Okaro and Okareka.

Rule 11 puts a 'line in the sand' to cap the existing nitrogen and phosphorus loss from land use activities.

Farmers will have access to a model that calculates nutrient losses so they can make sure that any changes do not increase losses over their property's set benchmark.

They will also be given advice on how they can offset increases in production through practices such as using wintering stock off farm, planting stream margins and retiring marginal land.

The Rotorua Lakes Problem

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- These nutrients (nitrogen and phosphorus) feed algal growth, which degrades water quality.
- The Rotorua Lakes Protection and Restoration Action Programme is initially tackling water quality problems in five lakes in the Rotorua district
- Some long-term solutions focus on land management and include new wetlands, restricting nutrients "outflows" from properties, and changes in land use.
- More urgent solutions include sewerage reticulation, structures to divert flows, and the use of mineral products to lock up nutrients.



Farm land looking down towards Lake Rotorua.



Rule 11 is part of a package of regulatory and non-regulatory methods to improve lake water quality. The package includes:

- Development of Action Plans for each lake.
- Encouraging and funding the fencing and planting of riparian areas.
- Educating the community on appropriate nutrient management practices.
- Sewage reticulation and sewage plant upgrade.
- In-lake treatment options.
- Land retirement and identification of land use changes and land management options.
- Constructed wetlands.

Septic tank discharges

Environment Bay of Plenty's On-Site Effluent Treatment Plan contains rules that will require septic tanks in the catchments of the Rotorua Lakes to be upgraded to reduce nutrient discharges.

How does Rule 11 affect you?

Rule 11 currently only applies to activities in the catchments of Lakes Rotorua, Rotoiti, Rotoehu, Okaro, and Okareka.

Below is an explanation of how Rule 11 affects land use activities in these five lake catchments.

Areas with reticulated sewage systems

Permitted land use activities are those:

- Within an urban area or lakeside settlement which are connected to a reticulated sewage system; or
- In a rural area where the property is less than 0.4 hectares (4,000m²) AND connected to a reticulated sewage system.

This includes infill housing, development of bare sections, changes to commercial, trade or industrial uses. The effects of reticulated areas are managed through the control of reticulated sewage discharges and stormwater discharges. Appropriate treatment conditions are required for these discharges.

Small rural properties, and unreticulated lakeside areas

Land use activities in lakeside settlements and rural areas, where the property is less than 0.4 hectares (4,000m²) AND NOT connected to a reticulated sewage system, are permitted activities if there are low levels of nitrogen loss from the property. The limit is 10 kilograms per hectare per year, excluding the discharge from on-site effluent treatment systems (e.g. septic tanks) on the property.

This means that such properties can have any ONE of the following:

- (a) Horse, donkey or mule – maximum of one per property.
- (b) Sheep or goats – maximum of three per property.
- (c) Alpaca or Llama – maximum of two per property.
- (d) Pigs – a maximum of two weaners grown through to baconer stage; or one sow with a litter of piglets grown to weaner stage and one weaner subsequently grown to baconer stage. Pigs are to be kept in a sty with occasional free range, and no continuous free range.
- (e) A maximum fertiliser application of 10 kilograms of phosphorus per hectare per year (or four kilograms of phosphorus per 4,000m² per year). This equates to 300 kilograms of Potassic Super per hectare per year (or 120 kilograms per 4,000m² per year).

Landowners can also contact Environment Bay of Plenty for free advice on other low-nutrient land uses that will comply with the nutrient limit. For non-reticulated properties smaller than 0.4 hectares with more than 10 kilograms of nitrogen loss per hectare per year, a nutrient benchmark must be set for the property (see below for details).

All other land uses

A nutrient benchmark level will be set for all properties in the five lakes catchments that are not reticulated, or small rural properties with low nitrogen losses. The nutrient benchmark level for the property will be calculated as in the table above.

Setting a nutrient benchmark

- 1 Environment Bay of Plenty will send out an initial inquiry to all landowners to determine what land use activities are carried out on their property (or properties).
- 2 Environment Bay of Plenty will then help people work out the loss of nitrogen or phosphorus from their property (or properties), and supply relevant information based on their land use activities.
- 3 Environment Bay of Plenty will track who has supplied information to work out the nutrient benchmark, and follow up landowners or lessees who have not supplied information by the required date.

The Nutrient Assessment Officer will be available to work directly with landowners, especially those with large properties, or multiple land uses on one property.

Land Use Activity	Nutrient Benchmark Level
Land use activity has been changed from dry stock to dairying, or pastoral grazing to horticulture; and the change commenced between 1 July 2001 and 30 June 2004.	Average nutrient loss from property between 1 July 2004 and 30 June 2005. Nutrient benchmark information required by 31 December 2005, or when property is sold, whichever is the sooner.
The land use activity has been changed from forestry to dairying, forestry to pastoral grazing, or forestry to another land use; and the change commenced between 1 July 2001 and 1 January 2003.	Average nutrient loss from property between 1 July 2004 and 30 June 2005. Nutrient benchmark information required by 31 December 2005, or when property is sold, whichever is the sooner.
The land use activity has been changed from forestry to dairying, forestry to pastoral grazing, or forestry to another land use; and the change commenced between 1 January 2003 and 30 June 2004.	Appropriate nutrient benchmark will be set by Environment Bay of Plenty in conjunction with the landowner and an independent nutrient management adviser, to allow a fair and reasonable production level relative to the property characteristics and land use.
All other land uses	Average nutrient loss from property between 1 July 2001 and 30 June 2004. Nutrient benchmark information required by 31 December 2005, or when property is sold, whichever is the sooner.

For grazing activities, the type and size of stock will be taken into account when working out the nutrient benchmark.

Each stock type has a different nutrient output, for example, one sheep does not equate to one dairy cow based on their land use activity or activities.

Note: It is the responsibility of the person using the land to provide the nutrient benchmark information. Where the property is leased, it is the responsibility of the lessee to provide the information rather than the landowner.

Landowners will be able to carry out any land use on their property, providing the annual average nitrogen and phosphorus loss is within the nutrient benchmark for the property. It is possible

that a landowner could intensify their land use if they off-set an increase of nutrients by retiring riparian margins, using a feed lot in winter, using a different stock food, etc.

Some properties may already be intensively used, but by using more efficient land management practices the landowner could still increase their productivity. In this way the increase in nutrients is balanced by measures to reduce nutrient leaching so that there is no net increase in nutrient export from the property.

Forest harvesting is permitted, providing the area is replanted for production forestry or permanent retirement purposes. Note: forest harvesting is also subject to other rules in the Regional Water and Land Plan and district plans.

When is a resource consent required?

A resource consent is required when a land use change or land management practice increases the average export of nitrogen or phosphorus from the property above its nutrient benchmark, and no nutrient management options are available on that property. Resource consent applicants must identify what nutrient management measures will be used to fully offset the proposed increase within the same lake catchment.

For example, if a proposed activity will increase the nitrogen loss by 100 kilograms per year, the resource consent applicant must identify nutrient mitigation measures to reduce nitrogen within the same lake catchment by 100 kilograms per year.

Where a resource consent applicant wishes to use nutrient management measures on land within the same lake catchment (i.e. on land owned by another person), consent conditions will ensure agreements with other parties are implemented.

Where a landowner has multiple properties within the same lake catchment they may be jointly managed within a resource consent. This would allow a landowner to increase production on one property and apply offset measures on their other property.

Where there is a land use change or land management practice that increases the average export of nitrogen or phosphorus from the property, AND the resource consent applicant has not identified measures to fully offset the increase in nitrogen or phosphorus, Environment Bay of Plenty may decline the

Where can I get more information about the lakes?

- Websites – check www.envbop.govt.nz
- Telephone Environment Bay of Plenty on 0800 ENV BOP (368 267) to speak to someone or to obtain information brochures and newsletters.
- Call in at Rotorua District Council, 1061 Haupapa Street, Rotorua or Environment Bay of Plenty's Rotorua office at 1125 Arawa St, Rotorua.

For further information and advice, contact Environment Bay of Plenty:

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This fact sheet was last updated May 2005

Frequently asked questions and answers

What is an algal bloom?

An algal bloom occurs in a lake when the single-celled free-floating algae multiply to vast proportions. All species can form blooms. Blooms of diatoms and green algae frequently go unnoticed but are detected by analysis of samples. When cyanobacteria bloom (blue green algae), they create a health hazard because they can release chemicals into the water that are toxic to animals and humans. They are also noticeable because they can float on the surface where they can form slicks or scums.

Cyanobacterial blooms can be a nuisance for people because they restrict their activities on the lakes. Cyanobacterial blooms are usually associated with excess nutrient input to lakes but require warm calm periods of weather to allow their dominance of the water surface.

Have these algal blooms happened only recently?

Analysis of lake sediments show that cyanobacterial blooms have been present in our lakes for more than 100 years. In the 1960s, Lake Rotorua experienced severe cyanobacterial blooms that were like enamel paint floating on the lake surface. The government funded a large research effort to try to fix the lake.

The Bay of Plenty Catchment Board worked in the 1970s to

fence off and retire from grazing all the streams flowing into Lake Rotorua and other lakes. Landowner cooperation in these works was voluntary.

The other major avenue to clean up Lake Rotorua was a proposal to divert the city's treated sewage effluent from discharge to the lake. A scheme to pipe the effluent to the Kaituna River was stopped by a recommendation of the Waitangi Tribunal. In 1991, effluent was treated through a nutrient removal process and discharged to irrigation in Whakarewarewa Forest.

From 1995, algal blooms became annual events on Lake Rotoehu and Okawa Bay at Lake Rotoiti. In late 2002 and 2003, blooms covered the whole of Lake Rotoiti and in 2004 Lake Rotorua again suffered lake-wide blooms.

What has caused the lakes problem?

Some causes of the lakes problem are:

- too many nutrients, particularly nitrogen and phosphorus flowing into the lakes.
- an increased mass of algae in the lakes as a result of the nutrient increase.
- an increased rate of oxygen loss in the lake bottom waters.
- build-up of nutrients in lake sediments released during low oxygen conditions in bottom water.
- weather conditions.

How big is the problem?

Solutions to fix the problem are likely to cost more than \$150 million. There have been no human fatalities and few cases of sickness reported but the potential for this exists. Urgent action now will hopefully reduce costs in the future.

Whose fault is it? Farmers? Septic tanks?

One of the main problems is that there are too many nutrients and these come from a variety of sources including erosion, land use activity, fertiliser, animal

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waste, septic tanks, sewage, stormwater, geothermal, springs, rain and internal lake sediments. There is no single cause – all activities contribute.

How long have you known about the problem?

Methods of reducing the nutrient load on the Rotorua lakes have been put in place since the 1960s. These were successful in containing the problem until the late 1990s. Environment Bay of Plenty's Regional Water and Land Plan plans to contain the problem into the future. Unfortunately, while improved treatment of sewage reduced nutrient loads, the increasing nitrate load from aged groundwater has seen lake water quality decline again in some lakes.

Why hasn't anyone done anything about it before now?

Much has been done and now further nutrient reduction needs to be carried out.

How long will it take to fix?

Lake management issues are complex. In some cases, the problem may get worse before it gets better because of land use practices from many years ago and their delayed impacts on old age groundwater. Actions being undertaken now should help to improve the situation gradually over several years. Some actions will have a faster result than others.

What effect will the solutions have on my rates?

Everybody in the Bay of Plenty contributes to the solutions through their regional council rates. Rotorua residents also

contribute through district council rates and any targeted rates for new sewerage schemes. Central government is also helping with money to finance engineering works and sewerage systems. An ongoing partnership between central and local government is required.

Are we too late?

It is not too late to improve any of the Rotorua lakes. However, it will cost a lot of money and there are limits to how intensively we can use the land around lakes. Any use of the land that exports more nitrogen or phosphorus from the property may eventually lead to the lakes getting worse. Some current land practices will have to change. The lakes that are of lower quality will never be pristine, but the goal is that algal bloom problems will not occur.

How can I help?

- Maintain your septic tank well. Check Environment Bay of Plenty's on-site effluent treatment plan.
- Understand the issues. If you are a rural landowner learn about best management practices that can reduce nutrient leaching and implement them on your property.

What is happening now?

Work being carried out now includes:

- stream and lake edge protection fencing and planting,
- modelling of lake dynamics to find out the effects of suggested works on Lakes Rotorua and Rotoiti,

- implementation of engineering works, including sewerage reticulation and diversions,
- education on nutrient management for land owners,
- development of appropriate regulations,
- working parties to develop action plans for each lake,
- locking up of phosphorus in lake inflows with mineral products.

Who is doing what?

Environment Bay of Plenty, Rotorua District Council and Te Arawa Maori Trust Board have developed a strategy for dealing with the lakes' roles and responsibilities. They are also overseeing the development of action plans where community and organisation representatives become actively involved in working together to recommend actions to fix their lakes.



Algal Bloom

Do the scientists have the answer?

In essence, the answer is to reduce nutrient loads to the lakes. How to do that may be costly and may affect common activities. Therefore, the "answers" need to be put in context by community decisions within the available legal frameworks.

Is this happening to other lakes in New Zealand and the world?

This is common in other parts of New Zealand and the world because urban and agricultural development inevitably leads to an increased leaching of plant nutrients into the surrounding environment.

Why is the Purenga Stream black?

The lower Purenga Stream is turbid because of geothermal inputs in the Whakarewarewa area. During high rainfall, dark-coloured stormwater runs off the mill site into the Waipa Stream, which is a tributary of the Purenga Stream. Environment Bay of Plenty has required upgrading of stormwater on the mill site to reduce this problem.

How much do boat users contribute to the problem?

- There is minimal effect on lake quality if oil/fuel spillages and leakages are avoided. Sometimes fuel is spilt accidentally into the lake but this doesn't happen often and is usually cleaned up quickly.
- Boat owners can transfer pest weeds to lakes where particular species are currently absent if they travel from lake to lake without cleaning any debris from their boat trailer.

- Pest fish are absent from the Rotorua lakes at present but koi carp eggs could be transferred from infected waters by weeds on boat trailers.

Do wild birds pollute the lakes?

Swans and any wild fowl in large numbers can contaminate lake waters with excess bacteria making them unsuitable for bathing. Wild fowl are minor contributors to the overall nutrient load.

Do algal blooms affect fish?

Current research indicates that there are no adverse effects from eating fish from lakes affected by cyanobacterial blooms, however the organs should not be eaten as they absorb much higher toxin levels. Research on this is ongoing.

How will I know whether it is safe to swim in a lake?

- 1 Look for warning signs at lake boat ramps and jetties.
- 2 Listen to radio news broadcasts and check your local newspapers.
- 3 Phone Environment Bay of Plenty on 0800 ENV AUTO (368 288) extn 9851 and follow directions to the algal line. This has an automated message with the state of warnings dated at the last sampling date.

You could also ask the operator to transfer you to a staff member who can give you more information.
- 4 Visit www.envbop.govt.nz

- 5 If the lake has a green surface scum, do not swim.

- 6 If you cannot see your feet in the water at knee depth do not swim and exit the water straight away.

If there are no health warnings in place and the water looks clear, can I assume that it is safe to swim in or drink the water?

Health authorities advise against drinking lake water at any time. If you cannot see your feet in the water at knee depth do not swim and exit the water straight away.

How often does Environment Bay of Plenty sample the lakes and upgrade health warnings?

Environment Bay of Plenty staff monitor the Rotorua lakes each week during the period of greatest risk. For the rest of the year there is a lower frequency of monitoring.

The Medical Officer of Health issues health warnings based on the results of monitoring.

These are upgraded as changes occur in the lake circumstances.

Two clear samples are required before a clearance is issued so the warning can be in place after the bloom has apparently collapsed. However, a risk is still possible as toxins may remain in the water over this period.

Maintenance and Performance Inspection and Certification Programme

The septic tank maintenance programme has raised public awareness of the importance of maintaining on-site effluent treatment systems.

Sustainable management servicing programmes, like the septic tank maintenance programme, are essential for protecting public health and the environment.

The Maintenance and Performance Inspection and Certification Programme (clean-out and inspection programme) is done by Environment Bay of Plenty–certified operators. If a system fails the inspection, it may need to be upgraded or modified.

NOTE: The permitted rule for advanced systems requires a record of servicing and maintenance of your system to be kept and a certificate of performance from the manufacturer lodged with Environment Bay of Plenty.



More information is available in “Dealing with your wastewater - A guide to the On-Site Effluent Treatment Regional Plan 2006” available by contacting us or visit our website www.envbop.govt.nz



For further information and advice, contact a Nutrient Assessment Officer at Environment Bay of Plenty’s Rotorua office, phone 0800 ENV BOP (368 267), 1125 Arawa Street.



See our website www.envbop.govt.nz for a list of Environment Bay of Plenty certified operators for the maintenance and performance inspection and certification programme.



Plantings above a septic tank.

Environment Bay of Plenty

- 5 Quay Street, Whakatane
- 1125 Arawa Street, Rotorua
- 6 Rata Street, Mount Maunganui

Post: P O Box 364, Whakatane

Phone: 0800 ENV BOP (368 267)

Fax: 0800 ENV FAX (368 329)

Pollution Hotline: 0800 73 83 93

Email: info@envbop.govt.nz

Website: www.envbop.govt.nz

This fact sheet was last updated June 2006.

OSET: Rotorua Lakes Catchments



Environment Bay of Plenty has reviewed its On-Site Effluent Treatment Regional Plan to help protect the Rotorua lakes.

The Bay of Plenty has thousands of households with on-site effluent treatment systems. Many are very old and very basic. In some areas they are causing serious pollution problems. These areas include the Rotorua Lakes catchments, where too many nutrients are getting into the lakes and causing water quality to drop.

This is because some nutrients, like those from septic tank systems, can be dissolved in the lakes. This boosts the production of algae making the lakes unhealthy. Reducing the amount of nutrients that enter the lakes will help us improve the lakes’ quality.

One step Environment Bay of Plenty has taken to do this is reviewing its On-site Effluent Treatment Regional Plan. It has new rules that will help limit the number of nutrients entering our lakes, streams and rivers from septic tanks.

This fact sheet:

- Helps you identify if you will be affected by the plan.
- Applies to you if you live in a Rotorua Lakes catchment and have either:
 - a conventional septic tank system, or
 - an advanced on-site effluent treatment system.
- Deals with systems that discharge up to 2m³/day to land.

For more detailed information about the plan, see either our booklet *A guide to regional plans - dealing with your wastewater, the On-site Effluent Treatment Regional Plan 2006*, or contact us.

The Rotorua Lakes Problem

- Many of Rotorua’s lakes have too many nutrients, caused by activities such as farming and residential settlement.
- These nutrients (nitrogen and phosphorus) feed algal growth, which degrades water quality.
- The Rotorua Lakes Protection and Restoration Action Programme is initially tackling water quality problems in five lakes in the Rotorua district.
- Some long-term solutions focus on land management and include new wetlands, restricting nutrient “outflows” from properties, and changes in land use.
- More urgent solutions include sewerage reticulation, structures to divert water flows, and the use of mineral products to lock up nutrients.



A joint Environment Bay of Plenty, Rotorua District Council and Te Arawa Maori Trust Board project

Nutrient stripping will improve the quality of our lakes

Nutrients that can be dissolved in a lake, such as those from septic tank systems, boost the production of algae. In coastal areas the nutrients can disperse quickly and do not have the same impact as in a lake. Reducing the amount of nutrients that enter the lakes will help improve the quality of the lakes and play an important part in keeping them healthy.

Environment Bay of Plenty has a list of some advanced systems available in New Zealand, whose manufacturers' specifications meet the discharge limits for biochemical oxygen demand and suspended solids set by the plan.



A septic tank system.

These specifications and those for nitrogen reduction are being examined in a trial that is testing advanced systems under Rotorua conditions.

The results of these trials will be available end 2006, and will be posted on our website www.envbop.govt.nz.

Will I be affected by the plan?

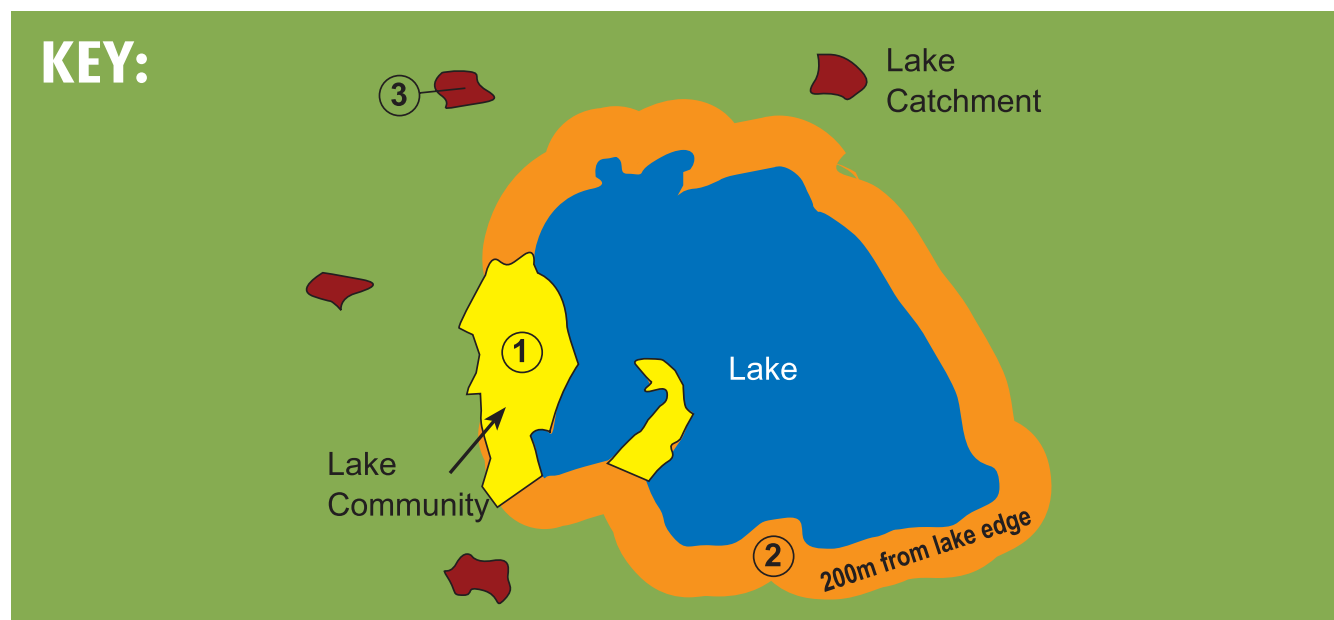
If you live in a Rotorua Lakes catchment, and have an on-site effluent treatment system that discharges up to 2 m³/day to land, you will be affected by the plan. How you are affected will depend on both the type of system you have and where you live.

The plan looks at three areas in the catchments:

1 specified lake communities

2 within 200 m from a lake edge (outside of the specified communities)

3 sections 2 ha or smaller on one property title, where there is at least one treatment system



1 Specified lake communities

This applies to on-site effluent treatment systems in the lake communities of Brunswick, Rotokawa, Hamurana, Okawa Bay, Mourea, Okere Falls, Otaramarae, Gisborne Point, Hinehopu, Rotoma, Okareka and Tarawera.

These communities will be reticulated by the following dates.

Lake	Community	Date
Rotorua	Brunswick, Rotokawa	1 December 2010
Rotorua	Hamurana	1 December 2014
Rotoiti	Okawa Bay/Mourea, Okere Falls, Otaramarae, Gisborne Point, Hinehopu	1 December 2010
Rotoma	Rotoma	1 December 2014
Okareka	Okareka	1 December 2010
Tarawera	Tarawera	1 December 2014

- If reticulation is available, or becomes available, you must connect to it. Under the Local Government Act you must connect to a reticulated system if reticulation is within 30 m of the property boundary or within 60 m of any dwelling.
- By 1 December 2010 or 1 December 2014 (whichever is relevant) all systems must be able to comply with the permitted rule for on-site effluent treatment systems. The discharge must reduce the total nitrogen to 15 g/m³ or less, reduce the biochemical oxygen demand to 30 g/m³ or less, and reduce suspended solids to 45 g/m³ or less.
- If you cannot comply with the permitted rule you will need to apply for resource consent from us.

Conventional on-site effluent treatment systems

- These are also subject to a maintenance and performance inspection and certification programme* until 1 December 2010 or 1 December 2014 (see table above). The communities will be reticulated by this date.
- The community of Rotoma is subject to the first round of inspections and septic tank pump-outs which must be completed by 1 December 2006.
- Please contact Environment Bay of Plenty for confirmation of details.

2 Within 200 m from a lake edge (but outside of the communities specified in 1)

This applies to on-site effluent treatment systems within 200 m from the edge of lakes Rotorua, Rotoiti, Rotoehu, Rotoma, Rotokawau, Okataina, Okareka, Tikitapu, Rotokakahi, Okaro and Rerewhakaaitu

- At 1 December 2010 you must be able to comply with the permitted rule for on-site effluent treatment systems. The discharge must reduce the total nitrogen to 15 g/m³ or less, reduce the biochemical oxygen demand to 30 g/m³ or less, and reduce suspended solids to 45 g/m³ or less.
- If you cannot comply with the permitted rule you will need to apply for resource consent from us.

Conventional on-site-effluent treatment systems:

- Are also subject to a maintenance and performance inspection and certification programme*. The first round of inspections and septic tank pump-outs must be completed by 1 December 2006.

3 Sections 2 ha or smaller on one property title, where there is at least one treatment system

This rule applies to the lake catchments of Rotorua*, Rotoiti, Rotoehu, Okareko and Okaro.

* This does not apply to the Haumurana area that will be reticulated.

- At 1 December 2010 you must be able to comply with the permitted rule for on-site effluent treatment systems. The discharge must reduce the total nitrogen to 15 g/m³ or less, reduce the biochemical oxygen demand to 30 g/m³ or less, and reduce suspended solids to 45 g/m³ or less.
- If you cannot comply with the permitted rule you will need to apply for resource consent from us.

Lake Tikitapu (Blue Lake)

Lake Tikitapu is a small and enclosed lake. It's heavily used for recreation and sporting events. Because it is close to Rotorua city it's a very popular lake during summer. This heavy lake use without proper sewerage reticulation or treatment is the likely cause of the decline in the lake water quality. The bottom waters now lose all their oxygen during the summer/autumn months.

Action Plan status: Process initiated
Quality now: 3.2 TLI
Quality goal: 2.7 TLI

Possible actions

- Sewage treatment
- Flocculants to remove excess nutrients from the water column.

Lake Okataina

Lake Okataina is surrounded by native bush, and is valued for its recreation opportunities. It has had excellent water quality, but is starting to show signs of water quality decline. This could be a natural water quality cycle, a result of higher lake levels, effects from farmland to the south and west edges, or the result of another cause.

Action Plan status: Process initiated
Quality now: 3.0 TLI
Quality goal: 2.6 TLI

Possible actions

- Groundwater research
- Identification of nutrient sources

Lake Rotokakahi (Green Lake)

Lake Rotokakahi is a privately-owned lake. As a Rotorua lake that is part of the Lake Tarawera catchment, it has a water quality TLI goal of 3.2.

Environment Bay of Plenty is working with the only farm in the catchment to reduce nitrogen and phosphorus to the lake. Environment Bay of Plenty is also discussing options for lake quality management with the lake trustees.

For further information and advice, contact Environment Bay of Plenty:

Telephone: 0800 ENV BOP (368 267)
Facsimile: 0800 ENV FAX (368 329)
Pollution Hotline: 0800 73 83 93
Email: info@envbop.govt.nz
Website: www.envbop.govt.nz
Address: 5 Quay Street, P O Box 364, Whakatane, New Zealand

This fact sheet was last updated August 2006.

Saving The Lakes



Lake Rotoma.

The problem

Water quality is declining in several Rotorua lakes. The cause is nutrient overload. The amount of nutrient (nitrogen and phosphorus) in the lakes has increased markedly over the past few decades, and continues to rise.

The main causes:

- Land use activities, particularly intensive farming.
- Sewage from Rotorua city and rural communities.
- High natural phosphorus load because of the old age groundwater flowing through the geology.
- Large amounts of nutrients stored in the sediments of some lakes.

Other issues:

- Some groundwater reservoirs are loaded with historic nutrients that will feed into the lakes over the coming decades. Because of this, water quality is likely to get worse before it can get better.
- The science is new.
- We're in a hurry, but don't want to make mistakes.
- Finding a balance between urgent and longer term actions to improve water quality.
- As water quality improves weed growth may increase.

Research

Environment Bay of Plenty has funded a Chair in Lakes Management and Restoration at Waikato University. Professor

David Hamilton's work is focused on the Rotorua lakes. Several other research organisations are also involved in the programme including the Institute of Geological and Nuclear Sciences, National Institute of Water and Atmospheric Research, URS, AgResearch, SCION.

Research includes:

- Groundwater flows.
- Lake dynamics.
- Economic evaluations of land use changes.
- Nutrient management options.
- Surface water flows.

Regulation:

- Proposed Regional Water and Land Plan
 - » this sets out ways to limit future nutrient loss and keep stock out of waterways.
- Reviewed On-Site Effluent Treatment Plan
 - » this sets out new rules for septic tanks in lake catchments.

The Rotorua Lakes Protection and Restoration Action Programme

This programme has been set up to achieve a standard of water quality in individual lakes which is acceptable to the community. It is overseen by a strategic partnership made up of



Environment Bay of Plenty, Rotorua District Council and Te Arawa Maori Trust Board. These strategic partners work closely with the community and interest groups, and with independent technical advisory groups (land and lake) which evaluate options from a scientific perspective.

Action Plans

Action Plans are in place for Okareka and Okaro, and are currently being developed for Rotorua, Rotoiti, Rotoehu, Tarawera and Rotoma. Eventually all the lakes will have an Action Plan. Each plan is developed by a working party, which includes community representatives as well as scientists, iwi and local government agencies. They focus on ways to reduce nutrients in the lakes.

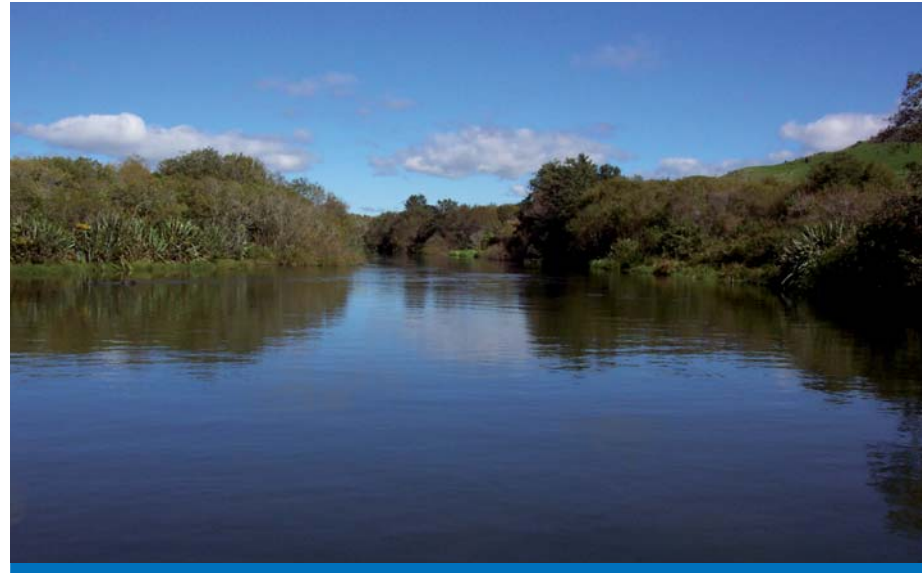
Water quality

Every lake in the Rotorua area has a quality goal. The quality measurement is called a Trophic Level Index or TLI. A high TLI number indicates poorer water quality than a low TLI.

The lakes

Lake Rotorua

Lake Rotorua has a city of more than 55,000 people on its shores, and smaller communities are scattered around its edge. It also hosts an extra 15,000 visitors a day, on average, throughout the year. The catchment contains beef, sheep and dairy farms and indigenous and exotic forest, but only a few industries. Water quality in the lake has dropped over the decades, in spite of massive environmental work.



Ohau Channel.

It improved after a leading-edge sewerage scheme was installed for Rotorua city in the late 1980s, but has since deteriorated again. In an effort to resolve the problem once and for all, an Action Plan is currently being developed.

Action Plan status: In progress
Quality now: 5.0 TLI
Quality goal: 4.2 TLI

Sewage

With so many people living in the catchment, nutrients from sewage are an ongoing issue. This is being tackled in a number of ways.

What's being done?

- Construction of an \$18.5 million reticulation scheme for eastern lakeside communities has begun.
- Rotorua city's sewage plant has been given a major upgrade.
- New rules are in place for advanced on-site effluent treatment in rural areas.

Land use

Land use activities – particularly intensive farming – often produce more nutrients than the soil can easily absorb.

This excess either flows overland into waterways or leaches into underground reservoirs, which eventually feed into springs, streams and lakes. In the



Dairy farming is one of the land uses.



Lake Okaro wetland walkway.

Lake Okaro

Popular with water-skiers, this small lake has had algal blooms every summer for many years. The small catchment hosts beef, sheep and deer farms. Land owners have worked closely with the programme partners to develop the Action Plan.

Action Plan status: In operation
Quality now: 5.6 TLI
Quality goal: 5.0 TLI

What's being done?

- Environment Bay of Plenty and land owners are working together to develop on-farm nutrient management practices.
- A major wetland has been constructed to reduce nitrogen from farmland.
- Fencing and plantings are being improved around the lake margin and streams.
- Mineral dosing of the lake sediments is under investigation.

Lake Rotoehu

This lake's quality is generally poor. The lake has recently been infested with hornwort. Over a number of years, Maori land owners have worked with local councils to plant lake margins.

Action Plan status:
In development. Investigations into groundwater flows – possible actions to cut down nutrient concentrations.

Quality now: 4.6 TLI
Quality goal: 3.9 TLI

Possible actions

- Advanced on-site effluent treatment in Lake Rotoehu community.
- Subsidies for environmental work on farms.
- Treatment to remove nitrate and phosphorus from streams.
- Further groundwater investigations.
- Evaluation of constructed wetlands.
- Weed harvesting.

Lake Tarawera

Lake Tarawera is a large scenic lake with good water quality. It takes water from seven surrounding lakes. Scientists are working out what nitrogen and phosphorus sources the working party should focus on, to protect the lake's good quality for the long term.

Action Plan status:
In development
Quality now: 2.9 TLI
Quality goal: 2.6 TLI

Possible actions

- Sewage reticulation
- Land use change to low nutrient-leaching uses
- Environmental programmes with landowners
- New rules to cap existing nitrogen and phosphorus loss from land use into the lake

Lake Rotoma

Lake Rotoma has the best water quality out of all the Rotorua lakes. It has a small catchment made up of the village, forestry, native bush and a few sheep/beef farms.

Action Plan status:
In development
Quality now: 2.5 TLI
Quality goal: 2.3 TLI

Possible actions

- Phosphorus management on farms.
- Sewage reticulation.
- New rules to cap existing nitrogen and phosphorus loss from land use into the lake.