Te Kōrero o te whakahaere i ngā kāhui wai māori o Ngā roto moana o Te Arawa ki Rotorua

The Rotorua Te Arawa Lakes Freshwater Management Unit

The purpose of this booklet is to explain draft options to address requirements of the National Policy Statement for Freshwater Management 2020 (NPSFM) in the Draft Rotorua Te Arawa Lakes Freshwater Management Unit (FMU). These options are to do with how we manage freshwater in Rotorua Te Arawa Lakes to achieve outcomes the community wants there.

This booklet covers:

- A description of the draft FMU
- Freshwater management issues in this FMU
- Options for:
  - **A.** A long-term vision for freshwater;
  - **B.** Proposed outcomes for key freshwater values;
  - **C.** Water quality, ecosystem health and other issues and targets;
  - **D.** Water take limits and minimum flows; and
  - **E.** The kinds of rules and other methods being considered to achieve these things.

We are early in the policy development process and are seeking feedback from the community to help inform the important decisions.

Your feedback to the questions inside this booklet can be provided in writing on the corresponding question sheet, online via our website or in person at one of our community events.

TOI MOANA
BAY OF PLENTY
REGIONAL COUNCIL

Ko te wai te oranga o ngā mea katoa

Water is the life-giver and essence of all things

Ngā tohu

This design represents the multiple waterways and waterbodies such as streams, rivers, lakes, and sea. The overall flowing form represents a river/tributary carving its way through the whenua. The koru has been included to represent the life force that water embodies and gives. Haehae represent whakapapa, including the past, present and future. It is a visual celebration of water as a life-giver and the essence of all things.

Te Wairere represents a waterfall with huka (foam) the dynamic movement of the water and the connections between different tributaries as they flow from the land to the sea, mai i te whenua, ki te moana.

Te Mana o te Wai - Tirohanga whānui

Essential Freshwater - Overview

In 2020, the New Zealand Government released the National Policy Statement for Freshwater Management (NPSFM) which outlines the direction all regional councils must take in the management of freshwater. As a result, the Bay of Plenty Regional Council now needs to change its Regional Policy Statement (RPS) and Regional Natural Resources Plan (Regional Plan). This means changing some of the policies and rules we use to manage how freshwater and land is used.

Between April 2023 and September 2023 we will ask you about your aspirations for your local waterways and your feedback on our draft change options. Your elected regional councillors will then consider and decide on options.

By the end of 2024 we will notify formal proposed changes to policies and rules. Everybody will be able to make submissions and be heard by a freshwater hearings panel.

Draft change options *2022 - 2023*	**Community engagement** *April - Sept 2023*	**Amend options** *Late 2023*	**Councillors decide** *Late 2024*	**Notify propsed RPS and RNRP change** *Late 2024*	**Public submissions** *2025*	**Hearings** *Late 2025 - 2026*

We acknowledge there are already a lot of other changes happening due to a host of new national regulations and proposed new laws, and this is yet more. Nevertheless, we encourage your involvement because many of the proposals discussed are specific to this FMU and we need you, the community, to help work through and identify solutions that will work for us all.

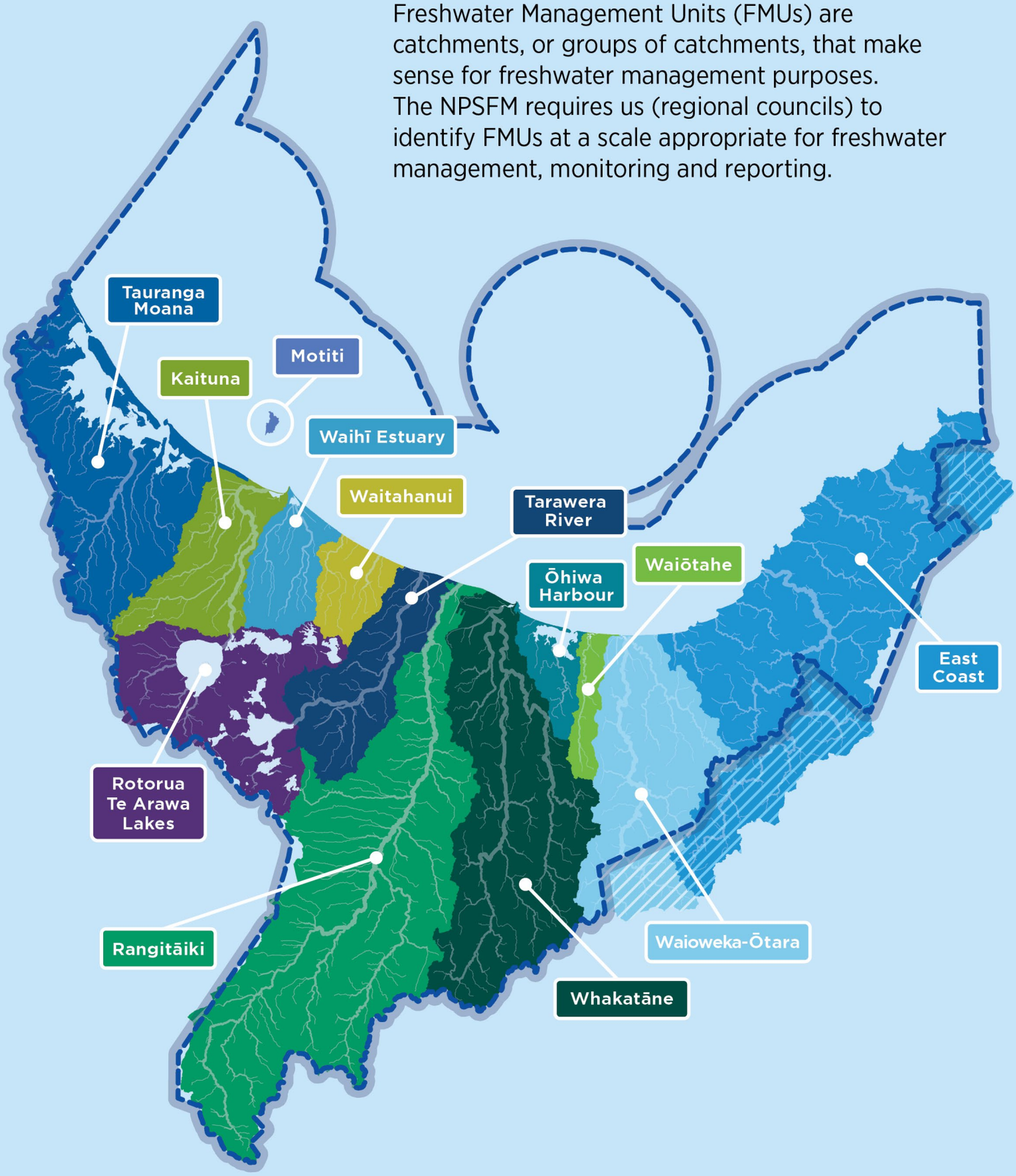
For more info

- Head to **boprc.govt.nz/freshwater**
- Read our Region Wide Overview booklet
- Sign up to receive our Freshwater Flash e-newsletter at **boprc.govt.nz/newsletters**
- Follow our social media
- Visit **participate.boprc.govt.nz**

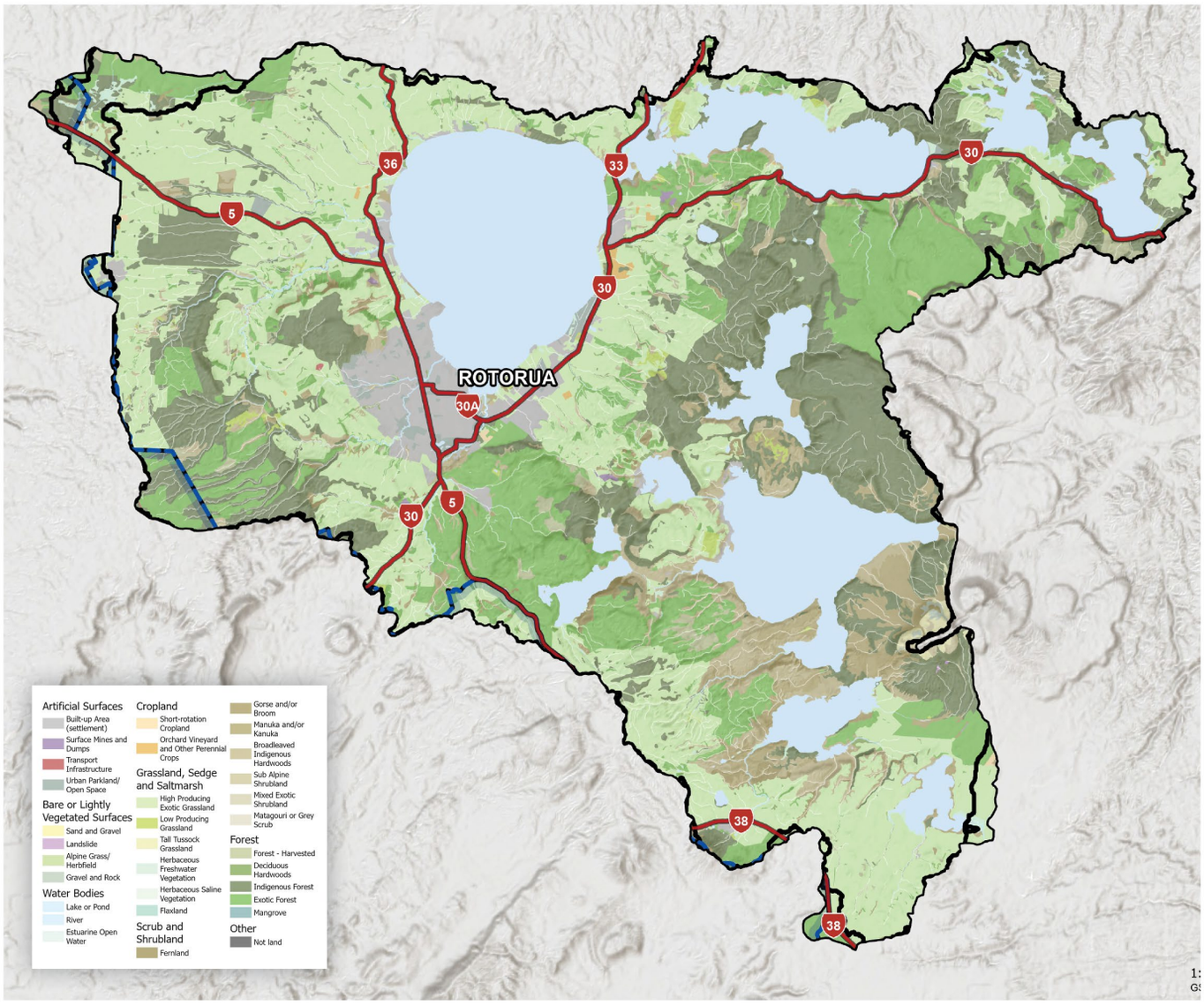
Ngā tauira o ngā rōpū whakahaere o te wai māori

Draft Freshwater Management Units

Freshwater Management Units (FMUs) are catchments, or groups of catchments, that make sense for freshwater management purposes. The NPSFM requires us (regional councils) to identify FMUs at a scale appropriate for freshwater management, monitoring and reporting.



We are proposing 13 Draft FMUs in our region, based on surface water catchments (or groups of these with similarities) and whether they feed into lakes, estuaries, or the ocean. Each Draft FMU has special characteristics (e.g., water body, cultural, community, geology, landform, land use and economic characteristics) that make it unique. Each will have its own chapter in the Regional Plan. The Regional Plan will have region wide rules but may also have rules specific to each FMU. The rules in FMUs may vary depending on the issues faced in that FMU.



Rotorua Te Arawa Lakes - FMU Map

Land area:

105,576 ha

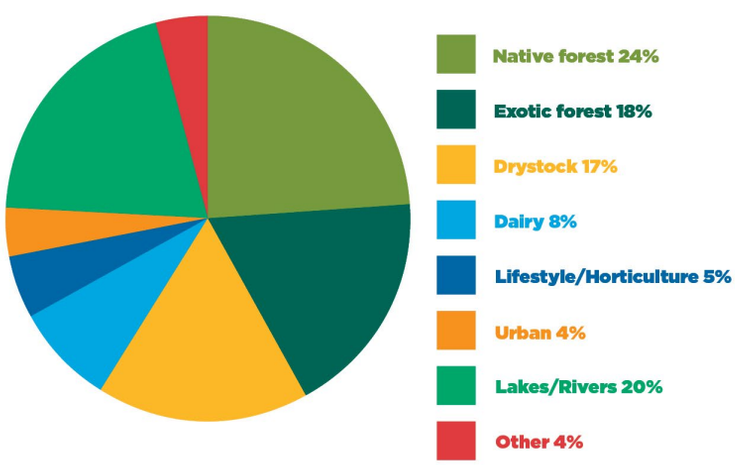
in Bay of Plenty

(+1,605 in Waikato)

Population:

71,080

people



Mō te Tauira o te whakahaere i ngā kāhui wai māori o Ngā roto moana o Te Arawa ki Rotorua

About the Draft Rotorua Te Arawa Lakes Freshwater Management Unit (FMU)

The Draft Rotorua Te Arawa Lakes FMU covers the catchments of Lakes Rotorua, Rotoiti, Rotoehu, Rotomā, Ōkataina, Ōkāreka, Tikitapu, Rotokākahi, Tarawera, Ōkaro, Rotomahana and Rerewhakaaitu, and smaller lakes such as Rotokawau and Rotokawa. Parts of the catchments extend over the Waikato region boundary. The area within the Bay of Plenty region is 105,576 ha, and in the Waikato – 1605 ha.

Lake Rotorua is the largest, with several sub-catchments including the Hamurana, Waiohewa, Rotokawa, Waingaehe, Waitawa, Puarenga, Utuhina, Waiowhiro, Ngongotahā, Waitetī, Waimahia, Awahou and Hauraki Streams. Lake Rotorua flows into Lake Rotoiti via the Ōhau Channel and most of the flow is diverted toward the Kaituna River by the Ōhau Diversion Wall. The combined flow from Lake Rotorua and Lake Rotoiti flows out to the Kaituna River via the Okere control gates, near Okere Falls. The Kaituna River is not included in the Draft Rotorua Te Arawa Lakes FMU but the health of the lakes does have a downstream effect on the river.

Lake Tarawera is the other larger lake in this FMU. It receives water from all the lakes within the Ōkataina caldera: Ōkāreka, Ōkataina, Rotokākahi, Rotomahana and Tikitapu. Lakes Ōkaro and Rerewhakaaitu are likely connected through groundwater.

Question 1 Do you think we have got this draft FMU boundary about right?

Tangata whenua

- The ownership of the beds of lakes Rotorua, Rotoiti, Rotoehu, Rotomā, Ōkataina, Tikitapu, Ōkāreka, Tarawera, Rotomahana, Rerewhakaaitu and Ōkaro were returned to Te Arawa under the Te Arawa Lakes Settlement Act 2006. The lakes, streams and puna/springs are of significance to tangata whenua.
- Tuhourangi, Ngāti Rangitihi, Ngāti Rangiwewehi, Ngāti Awa, Ngāti Manawa, Ngāti Raukawa, Ngāti Tuwharetoa (Bay of Plenty), Ngāti Tahu-Ngāti Whaoa, Ngāti Pikiao, Ngāti Kea, Ngāti Tuara, Ngāti Rongomai, Ngāti Makino, Ngāti Rangiteaorere, Ngāti Tarāwhai, Ngāti Uenukukōpako, Ngāti Whakaue and associated hapu have interests and heritage associated with the Rotorua Te Arawa Lakes FMU.
- Excluding lake beds, Māori-owned land in the Draft Rotorua Te Arawa Lakes FMU encompasses about 37,000 ha, or about a third of the FMU. Land use is dominated by exotic forestry (44%), native forest (26%), sheep and beef (14%), and dairy (8%). The catchments of Lakes Rotoehu and Rotoiti are dominated by Māori land, with significant amounts of Māori land in the catchments of Lake Rotorua, Rotokākahi, Rotomahana and Rotomā, and smaller percentages of Māori land in the catchments of Lakes Ōkataina, Tarawera, Ōkāreka, Tikitapu and Rerewhakaaitu.
- The Central North Island Iwi Collective has land within this FMU. Lake Rotokākahi is privately owned by local iwi and is considered tapu (sacred). All types of recreation is prohibited here and access to the lake is granted exclusively to iwi.

- Te Arawa, affiliate Te Arawa Iwi/Hapū [1], Ngāti Rangiteaorere, Ngāti Rangitihi and Ngāti Rangiwewehi have statutory acknowledgements relating to land and waterbodies in this FMU. Te Arawa statutory acknowledgements relate to Lakes Rotorua, Rotoiti, Rotoehu, Rotomā, Ōkāreka, Ōkataina, Tikitapu, Tarawera, Rotomahana, Rerewhakaaitu.

Communities

- As of June 2022, the population of the Draft Rotorua Te Arawa Lakes FMU was estimated to be 71,080 people, mostly concentrated within Rotorua township.
- All lakes (except Rotokākahi) are used by local communities for swimming, and online community engagement has confirmed the lakes are highly valued for recreational activities such as kayaking, paddleboarding, rafting, waka ama, rowing, yachting, boating, (water skiing, wakeboarding, kneeboarding and biscuiting), jet skiing, bombs off the rocks, snorkelling, swimming and fishing. People also value the beauty of the lakes and the scenery, wildlife, birdsong and pristine water. Walking and biking tracks around the lakes were often mentioned. Hot water spots were identified as another special feature of this FMU.
- Concerns were raised regarding urbanisation close to our water bodies, the use of diquat to control oxygen and hornwort weed and the impact it has on trout fishing, kōura, bully and dragonfly numbers, water quality, algal blooms, wastewater treatment plant overflows during heavy rain, illegal waste traps and stormwater connections, rubbish in and around the lakes, the use of jet skis and boats compromising the safety of swimmers and paddleboarders, swan droppings, lake weeds, and the risk of aquatic pests spreading between lakes.

Land and land use

- This FMU is unique in that 20% is covered by lakes and rivers. 42% of the FMU is forested (including 24% native), 17% is in drystock (including sheep and beef, dairy support and deer) 8% in dairy, 4% urban and 5% lifestyle and horticulture.
- At a catchment scale, native bush is the dominant land use in Lakes Ōkataina, Ōkāreka, Tarawera and Tikitapu. Sheep and beef is the dominant land use in Lake Ōkaro, dairy is the dominant land use in Lake Rerewhakaaitu, exotic forest is the dominant land use in Lakes Rotoiti and Rotokākahi. Lakes Rotoehu and Rotomā have similar proportions of exotic forest, native forest and sheep and beef. Lakes Rotomahana and Rotorua have a mix of forest, dairy, and sheep and beef land uses.
- Dairy farming and sheep and beef farming in the Rotorua District are estimated to contribute $121 million and $23 million respectively to the Bay of Plenty's regional GDP in 2020/21. Horticulture and other crops are estimated to contribute $7 million. The Rotorua Te Arawa Lakes FMU contributes towards the Rotorua District figures along with small parts of the Kaituna FMU, Waihī Estuary, Waitahanui, Rangitāiki and Tarawera River FMUs.

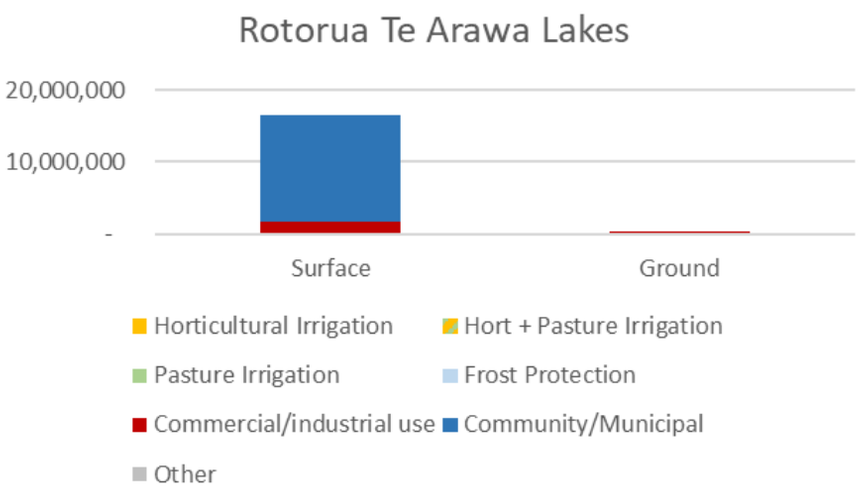
[1] Ngāti Ngararanui Hapu Trust, Ngāti Pikiao Iwi Trust, Ngāti Rongomai Iwi Trust, Ngāti Tahu, Ngāti Whaoa Runanga Trust, Ngāti Tarawhai Iwi Trust, Ngāti Te Roro o Te Rangi Hapu Trust, Te Runanga o Ngāti Kea, Ngāti Tuara, Tuhourangi Tribal Authority, Ngāti Tuteniu Hapu Trust, Ngāti Tura, Ngāti Te Ngakau Hapu Trust, Ngāti Uenukukopako Iwi Trust

Streams, wetlands, and lakes

- Lakes are sensitive receiving environments, highly susceptible to nitrogen and phosphorus loads. This has been a focus of the Rotorua Te Arawa Lakes Programme over the last two decades. A significant amount of work has been, and continues to be undertaken, including land use change, alum dosing, wastewater reticulation, wetland restoration, aquatic weed spraying and harvesting, improved farming and discharge practices, and regulation.
- In 1984 a Waitangi Tribunal claim was lodged relating to longstanding concerns about discharges to the Rotorua lakes and declining water quality. In 2005, rules became operative seeking to cap nutrient losses at baseline levels for the catchments of five lakes – Rotorua, Rotoiti, Rotoehu, Ōkaro and Ōkāreka. Nutrient management rules were introduced for Lake Rotorua in 2017.
- The FMU contains 25 threatened species and 49 priority biodiversity sites. The lakes are valued for their indigenous fish species such as kōura, kakahi and kōaro. A number of unique rare indigenous species and habitats are found only in this FMU.
- The trout fishery within this FMU is highly valued. Fish and Game have identified a number of streams where adult trout are present and/or spawn. Rotomā is known as the FMU's cleanest lake and Rotomahana contains the purest strain of rainbow trout in the world.
- A number of lakes and wetlands are identified as having outstanding natural character. There are 626 ha of wetland in the FMU (27% of the historical extent).

Water use, takes and discharges

- Water is used for a variety of purposes. It is used for a range of cultural purposes (such as karakia, iriiri, whakanoa), recreational purposes (such as fishing), mahinga kai and for food production (mostly horticultural irrigation/frost protection in coastal areas)
- As of January 2022, for this FMU, there were 12 water take consents (seven surface water and five ground water).
- The predominant water use is municipal supply. There are four surface water take consents held by Rotorua Lakes District Council that provide municipal water supply for the city of Rotorua.
- There are several commercial/industrial takes in this FMU. One from the Hemo Stream for industrial water supply, one from a spring for water bottling in Paradise Valley and takes for tourism activities such as a resort, camps around Lake Rotorua and Lake Ōkataina and a take from Ngongotahā Stream for use in a land jet boat facility.
- There are 74 discharge consents to land, 44 On-Site Effluent Treatment discharge consents and 72 discharge consents to water in this FMU. The larger discharges include stormwater from the urban areas and geothermal discharges, particularly in the Lake Rotorua Catchment.



Rotorua Te Arawa Lakes Resource Consents to take water – volume m^3/year

What is likely to happen with climate change over the medium to long term (mid-late century)?

- Climate change may make current nutrient/eutrophic targets for lakes very difficult to reach.
- More frequent intense rainfall is likely to increase erosion and sediment loads significantly.
- Average annual rainfall totals are not expected to change significantly in the period to 2040, although the seasonal pattern changes, with less in the spring/summer months. In Rotorua Te Arawa Lakes catchments, changes to low flow are likely to be subdued, although increases in evaporation (from land or water) and transpiration (from plants) may result in increased demand.

Question 2 Does this brief summary about the people, land and water in this FMU seem right to you?

He aha tōu kitenga mō te anamata o te wai māori?

What is your vision for the future of freshwater?

Draft long-term vision for freshwater

A key part of freshwater planning is being clear about what you seek to achieve. A long-term vision for freshwater is required by the NPSFM and must set out what tangata whenua and the community collectively want to see for freshwater in the FMU. Visions should be ambitious but reasonable.

We've drafted some options based on issues and what we've heard from tangata whenua and communities so far:

Option A The lakes and their catchments are restored and protected for the use and enjoyment of present and future generations, while recognising and providing for the traditional relationship of Te Arawa with their ancestral lakes.

E tiakina ana, e haumanutia ana hoki ngā roto o te rohe o Te Arawa hei painga mō tātau me ngā whakatipuranga e ara mai nei, ā, me te aro anō ki te hononga tuku iho o Te Arawa ki ō rātau roto.

1 In the catchments of Ōkaro, Rerewhakaaitu, Rotomahana, Rotoehu, Rotoiti and Rotorua, innovative and sustainable land and water management practices are supported and support food production, commercial and industrial uses and urban use so that waterways are safe for human contact, mahinga kai thrives and ecosystem health and mauri are enhanced.

2 In the catchments of Ōkataina, Tikitapu, Tarawera, Ōkāreka and Rotomā maintain the healthy ecosystems and natural form and character of the streams and lakes, including the margins and fauna.

3 In the catchment of Rotokākahi the privacy of the lake is respected.

This vision is to be achieved by 2045.

Option B The lakes and their catchments are restored and protected for the use and enjoyment of present and future generations, while recognising and providing for the traditional relationship of Te Arawa with their ancestral lakes. The Rotorua Te Arawa Lakes FMU will:

1 Support thriving mahinga kai which is accessible and abundant.

2 Be safe for contact recreation and mahinga kai gathering.

3 Maintain or improve the mauri of each catchment.

4 Maintain or improve where degraded the water quality of the lakes and their tributaries.

5 Protect places of significance (or wai tapu) for iwi.

6 In the catchments of Ōkataina, Tikitapu, Tarawera, Ōkāreka and Rotomā maintain the healthy ecosystems and natural form and character of the water bodies, including the margins and fauna.

7 In the catchments of Ōkaro, Rerewhakaaitu, Rotomahana, Rotoehu, Rotoiti and Rotorua innovative and sustainable land and water management practices support food production in the area, and reduce discharges of nutrients and contaminants to rivers, lakes and streams so that they are safe for human contact and protect ecosystem health.

8 In the catchment of Rotokākahi the privacy of the lake is respected.

The vision is to be achieved within the following timeframes: 2045

Question 3 As a draft vision do you prefer Option A or B?

Draft values and environmental outcomes

The NPSFM uses the term "values" to refer to important aspects of freshwater. We must manage freshwater to protect compulsory freshwater values and must also consider other values if present. We must set environmental outcomes for these values.

We have used iwi and community feedback as well as our own research to identify the values we think matter most in this draft FMU. Online engagement and iwi management plans suggest maintaining or improving water quality and restoring and enhancing the health and diversity of ecosystems and habitats for taonga flora and fauna species are important outcomes, as is the need for sources of mahinga kai to be restored. The lakes are valued for recreational activities. As is to be expected in an FMU with such rich and diverse freshwater resources, a great many freshwater related outcomes exist.

Other outcomes that are important in this FMU include the use of freshwater at marae and in households, as drinking water for animals, for irrigation and food production, and for commercial and industrial uses. Water is important for the livelihoods of local people, but we must make sure its use does not damage ecological health or diminish mauri.

The following table contains some draft outcome statements, based on what we have heard so far.

Freshwater Values *The ways fresh water is important* *Shaded values are compulsory national values in the NPSFM*	**DRAFT Environmental outcome** *How we would like the values to be*
Ecosystem health	Water quality in the lakes and their tributaries is improved where degraded. Maintain levels and flows of water in rivers and lakes to sustain fish and other customary resources for future generations and provide for cultural values. Riparian margins, lakes and wetlands are managed and restored, and pests are controlled to support thriving taonga flora and fauna species. Diversity and abundance of desired aquatic species is maintained or improved, and aquatic pest species are controlled. Protect and enhance each catchments ecology.
Human contact	Water quality is maintained or improved to be suitable for swimming with a low risk of getting sick and exotic lake weed is reduced where it affects the recreational value of the lakes.
Threatened species	Protect the critical habitats required to support

Freshwater Values *The ways fresh water is important* *Shaded values are compulsory national values in the NPSFM*	**DRAFT Environmental outcome** *How we would like the values to be*
	the presence, abundance, survival and recovery of threatened species.
Mahinga kai	Taonga species are protected and restored, and their cultural health and the continuation of mahinga kai practices and associated tikanga is provided for. Traditional mahinga kai resources and practices and are re-established, accessible and abundant. Restore, maintain and protect the mauri of freshwater resources.
Natural form and character	Maintain the natural beauty of the lakes, falls and puna (springs), and their margins.
Drinking water supply	People have sufficient, reliable and safe water for drinking and reasonable domestic use, to the extent possible and subject to providing for the outcomes shaded above.
Wai tapu	Wai tapu, wāhi tapu, sites of cultural significance and the tikanga associated with these sites and waters are protected
Transport and tauranga waka	The lakes are accessible and there are places to launch waka and watercraft (with the exception of Lake Rotokākahi).
Fishing	Maintain the trout fishing value of the streams and lakes and increase the presence of indigenous fish species.
Animal drinking water	Farmed animals have sufficient, reliable, safe, and palatable drinking water, to the extent possible and subject to providing for the outcomes shaded above.
Irrigation, cultivation, and production of food and beverages	Reasonable and efficient irrigation and food processing freshwater needs are provided for with an adequate level of reliability, to the extent possible and subject to providing for the outcomes shaded above.
Commercial and industrial use	Reasonable and efficient commercial and industrial freshwater needs are provided for with an adequate level of reliability, to the extent possible and subject to providing for the outcomes shaded above.

Question 4 What do you think of the draft values and outcomes identified for this FMU?

Te kounga o te wai me te oranga o te pūnahi hauropi

Water quality and ecosystem health

The vision, values and outcomes give a sense of where we want to be. How hard it is to get there depends very much on where we are right now. The things we do on the land can affect lake, river, stream, wetland and estuary health. We measure lots of different things to check the health of the environment - these are called attributes. The state given below is what it was like in September 2017 – called the baseline state as defined in the NPSFM. The NPSFM has a grading system for each attribute. The grades are A-D bands. A band = very good state, D = poor state. The trend tells us whether it is getting better or worse over time. Check out our Water Ecology Tool at www.boprc.govt.nz/wet for more information.

Lake water quality for ecosystem health

Bay of Plenty Regional Council monitors 15 lake water quality sites across 12 lakes in the Rotorua Te Arawa Lakes FMU. For the ammonia toxicity attribute, 12 sites had a baseline state in the A band and three were in the B band. There were worsening trends at nine sites around lakes Rotoiti, Rotoehu, Ōkataina, Ōkāreka, Tikitapu, Rotokākahi, and Rerewhakaaitu. There were improving trends at sites around lakes Rotomāhana, Tarawera and Rotorua. Total nitrogen states ranged across the A to C bands. Worsening total nitrogen trends were widespread, covering lakes Rotorua, Rotoiti, Rotoehu, Rotomā, Tikitapu, and Rotomāhana. Total phosphorus attribute states also spanned bands A to C. Worsening total phosphorus trends were found in all the lakes except Rotokākahi, Rotomāhana, and Rerewhakaaitu.

The Trophic Lake Index (TLI) measures the trophic state of a lake based on four metrics: chlorophyll-a, total phosphorus, total nitrogen, and clarity. This index has been included in BOPRC's NPSFM implementation approach as an optional attribute, predominantly due to its legacy with the Rotorua Te Arawa Lakes community and inclusion in statutory and non-statutory documents such as the Regional Natural Resources Plan as well as action plans for individual lakes. The TLI attribute has also been through a community consultation process resulting in a community agreed TLI target for each lake.

The TLI baseline state analysis shows a distribution of lakes across the A (four lakes), B (six lakes), and C bands (two lakes).

The lakes with the best water quality in this FMU are Rotomā, Ōkataina, Tikitapu and Tarawera which are in an oligotrophic state (generally A band). Lakes Ōkāreka, Rerewhakaaitu, Rotoiti, Rotokākahi and Rotomahana have moderate water quality (mesotrophic/B band) and Lakes Ōkaro, Rotoehu and Rotorua have poor water quality (eutrophic/C band). Lakes Rotoehu, Rotomā, Rotorua, and Tikitapu showed worsening trends over the past 10 years.

Lake aquatic life for ecosystem health

The Native Condition Index (NCI) describes the diversity and extent of submerged indigenous plant communities, and the Invasive Impact Index (III) describes the nature and amount of submerged invasive weed species. Data on aquatic macrophytes has been collected from 12 of the Rotorua Te Arawa Lakes.

Baseline state for the NCI was in the B band for three lakes (Ōkāreka, Rotomā and Rotomāhana), and the C band for all others. In contrast, the baseline state for the III was in the D band for Lakes Rotoiti and Rotoehu. This poor band reflects the substantial growths of invasive exotic plants such as hornwort (*Ceratophyllum demersum*) in these lakes. All other lakes had a baseline state in the C band for the III.

Grades for the phytoplankton attribute were split across all four bands. Overall, four sites were graded A, five sites were graded B, five sites C, and one site D. Trends were worsening at Lake Rotorua, western sites in Lake Rotoiti, Lake Rotoehu, Lake Tikitapu, and Lake Rerewhaakaitu. Lake Rotorua at Site 2 was the only site to breach the national bottom line for phytoplankton. Four of the 15 sites showed very likely worsening trends. These are Lake Tikitapu at Site 1, Lake Rotorua at Site 5, Lake Rotoiti at Okawa Bay and Lake Rotoehu at Site 3. Two sites, Lake Rotokākahi at Te Wairoa Outlet and Lake Rotomā at Site 1 are showing very likely improving trends.

Stream water quality for ecosystem health

The main water quality attributes we measure in rivers and streams are the contaminants of concern for most areas, the nutrients nitrogen and phosphorus, and sediment. Find out more about how we monitor river health, here.

The Bay of Plenty Regional Council has four monitoring sites to measure state and trends in stream water quality in the Rotorua Te Arawa Lakes FMU, plus two sites at lake outlets (Kaituna and Tarawera Rivers), which are outside the FMU boundary. In areas where we don't have enough monitoring data, stream health has been estimated by an Expert Panel using the best information available. This gives us a sense of states and helps us identify where changes may be needed to meet environmental outcomes. The NPSFM requires us to take action and make improvements if water quality is below a national bottom line or is degrading (shows a worsening trend over time), unless this is due to natural causes.

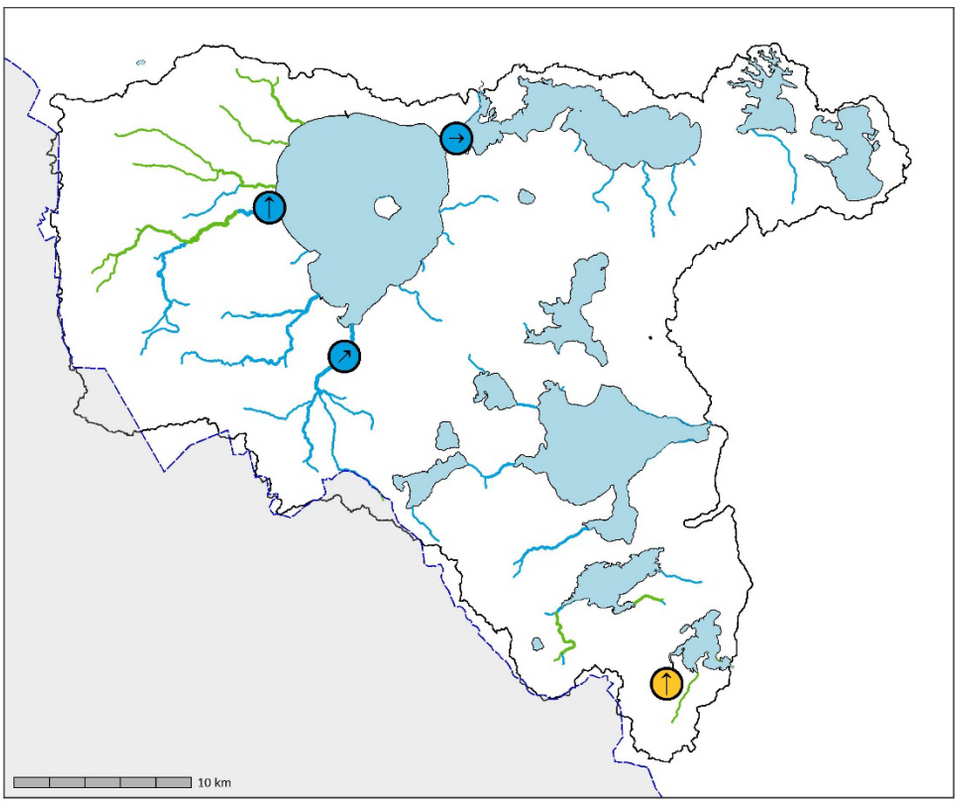
Measured nitrogen concentrations are well below levels that can have toxic effects. Five of the six stream sites are graded A band for baseline nitrate toxicity. The exception is Mangakino at Rerewhakaaitu Road, which is in the C band, and below the national bottom line, but the site does show an improving trend.

Measured dissolved reactive phosphorus concentrations upstream of the lakes are high, in the D band, but are showing some improving trends. The high phosphorus is likely from the volcanic influence in the area, although human activity will be adding to this. Phosphorous is low (A band) at the lake outlets because the lakes act as a sink for nutrients.

Baseline suspended fine sediment (by way of water clarity) is in the A band for Mangakino at Rerewhakaaitu and Tarawera outlet, B band for Ngongotahā, C band for Kaituna at Rotoiti Outlet. Puarenga and Ōhau Channel are in the D band and below the national bottom line. The Ōhau Channel site shows an improving trend, but the Puarenga is very likely worsening.

Large wet weather events can contribute harmful pulses of sediment that may not be reflected in this data.

Nitrate (toxicity)



Regional boundary

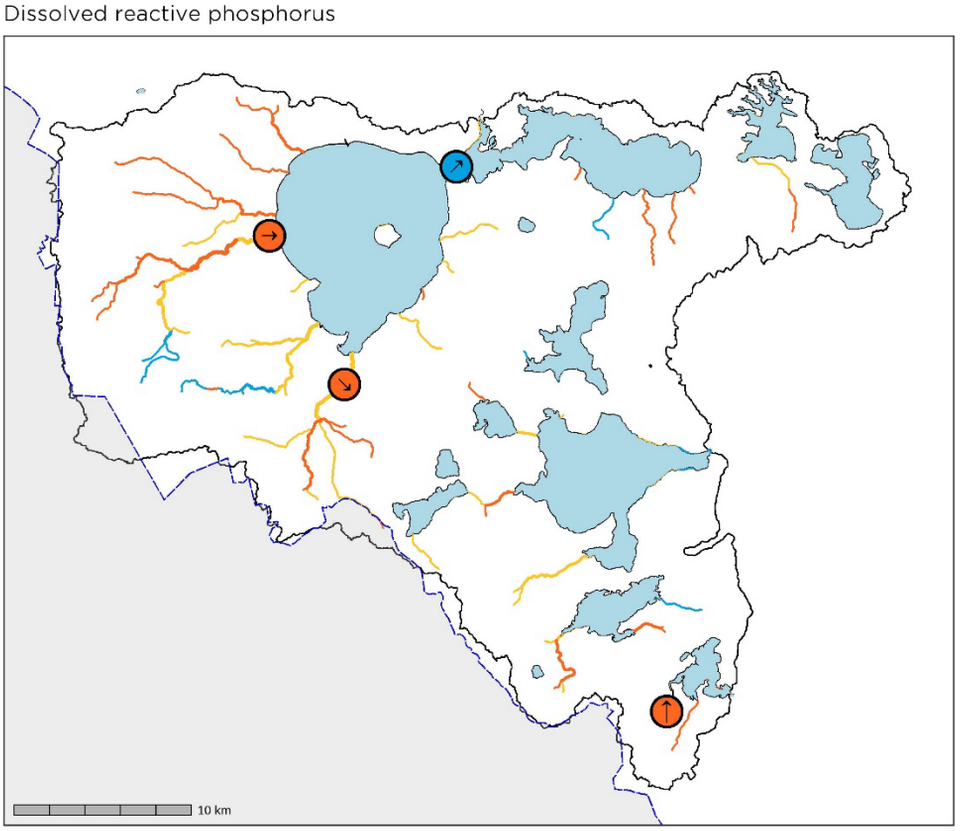
FMU boundary

Estimated state
- A
- B
- C
- D

Monitored state
- A
- B
- C
- D

Monitored trend
- ↑ Very Likely Improving
- ↗ Likely Improving
- → Indeterminate/Uncertain
- ↘ Likely Worsening
- ↓ Very Likely Worsening

Dissolved reactive phosphorus



Regional boundary

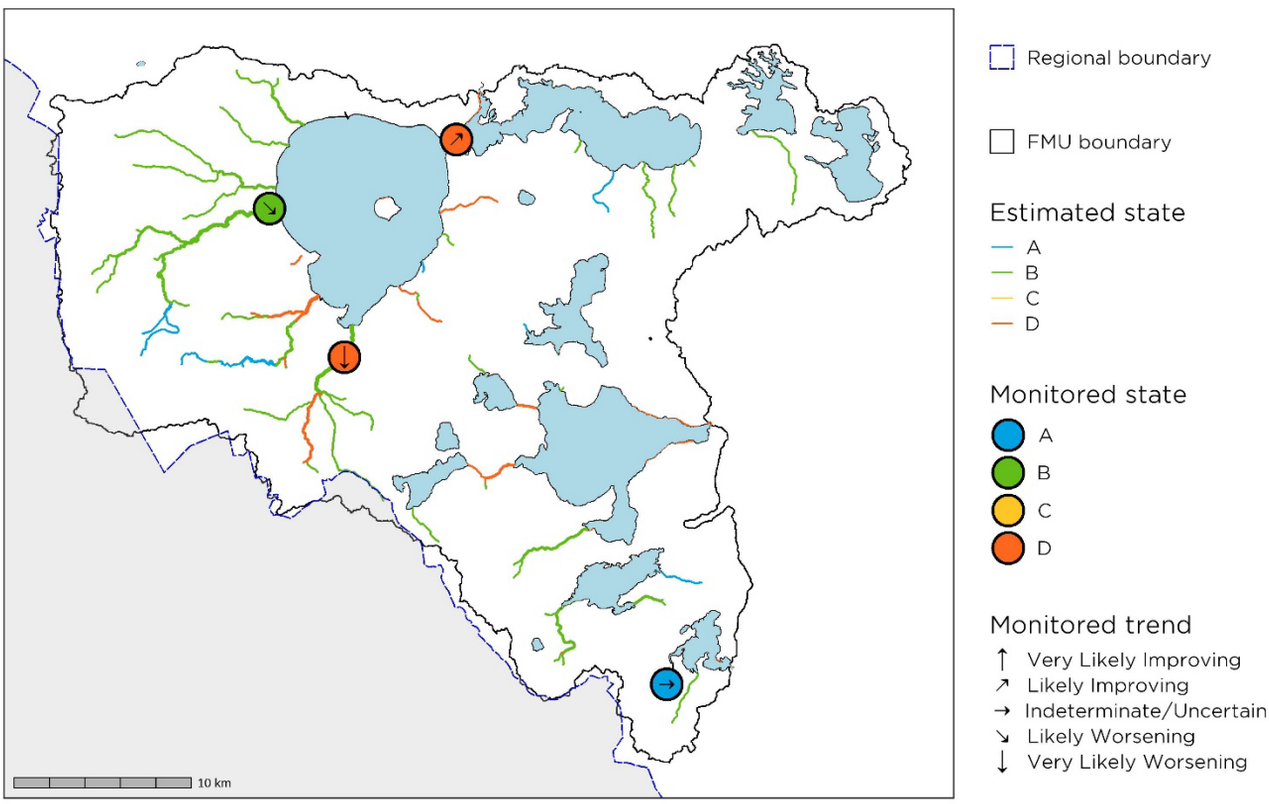
FMU boundary

Estimated state
- A
- B
- C
- D

Monitored state
- A
- B
- C
- D

Monitored trend
- ↑ Very Likely Improving
- ↗ Likely Improving
- → Indeterminate/Uncertain
- ↘ Likely Worsening
- ↓ Very Likely Worsening

Suspended fine sediment



Stream aquatic life for ecosystem health

The main aquatic life attributes we measure are fish, macroinvertebrates which include worms, snails and insects, both in their immature larval phase, and as adults (e.g., mayflies, caddisflies, beetles), and periphyton - algae and fungi that grow on the beds of our rivers, lakes and streams and can make it slippery and slimy. For ease of interpretation, invertebrate data is simplified as special indices such as the Macroinvertebrate Community Index (MCI). The MCI is based on the tolerance or sensitivity of species to organic pollution and measures the presence (or absence) of invertebrates. Higher MCI scores indicate better stream conditions at the monitoring site. Two other indices are also used to describe macroinvertebrate health – the quantitative MCI and Average Score Per Metric.

Fish surveys show 12 fish species recorded in this FMU, and six of these are native. Rainbow trout, common bully, and smelt were the most common. Despite being common in the rest of the region, both longfin and shortfin eels were rare in this FMU. It is likely that natural barriers such as the Ōkere and Tarawera Falls prevent even good climbers such as eels from accessing the lakes. Iwi are known to have stocked some of the lakes with eels in historic times, which explains why there are still some present.

Invasive brown bullhead catfish have been found in Lake Rotoiti in 2016 and in Lake Rotorua in December 2018, thought to be an accidental introduction via a boat trailer. These pest fish are managed as a progressive containment species and the council is working with Te Arawa Lakes Trust on a community-based volunteer netting program to remove catfish from the lakes.

The Council has 13 macroinvertebrate monitoring sites in the Rotorua Te Arawa Lakes FMU to measure state and trends in river health. A wide range of MCI state bands have been observed in this FMU, from A to D bands. Urban streams typically displayed low ecological health.

There are no river periphyton monitoring sites in the Rotorua Te Arawa Lakes FMU as the streams have mobile pumice beds, where it is generally not an issue.

Human contact (Streams)

The main human health attributes we measure are bacteria and cyanobacteria (blue/green algae). Elevated levels of faecal bacteria from animal dung, human wastewater and birds can make water unsafe for people to swim in or gather kai from. This is often used as a measure of 'swimmability'. E. coli is the bacteria we measure in rivers, streams and lakes as an indicator of other microorganisms that could be present. Faecal coliforms and enterococci are the bacteria we measure in estuaries and the sea. Find out more about how we monitor river health, here.

The Council monitors eight stream bathing sites in this FMU. Of these, four had a baseline state below the national bottom line (D band), and all of these drain into Lake Rotorua. One Lake Rotorua site was rated C band (Puarenga at Whakarewarewa) and the remaining three were either B band (Hamurana at Hamurana) or A band (Ōhau Channel at SH33, Waitangi Soda Springs at Bathing Pool).

Faecal Source Tracing (FST) results from Ngongotahā at SH36 provides strong evidence that contamination comes from a ruminant source (most often cows). Additional results from the Waitetī Catchment show a mix of ruminant and bird sources. Ruminant sources appear to be dominant higher up in the catchment while bird sources are present throughout the catchment. Recent low-detection FST results (2022-23 season) show ruminant sources at lower catchment sites (SH36), with low levels of human markers, which may indicate leaking septic systems.

Human contact (Lakes)

Bacteria: There are 13 monitored lake bathing sites in the Rotorua Te Arawa Lakes FMU. Nine of these sites had a baseline state in the A band, three sites were in the B band, and only one site (Lake Rotorua at Ngongotahā) breached the national bottom line with a D band. Several sites show worsening trends, especially around Lake Rotorua. Faecal Source Tracking results show that the Ngongotahā site has low levels of ruminant markers and the Hamurana site had avian (or bird) markers only.

Cyanobacteria: Twelve monitored cyanobacteria sites are located within the Rotorua Te Arawa Lakes FMU, spread across four different lakes: Lake Rotorua (four sites), Lake Rotoiti (five sites), Lake Rotoehu (two sites), and Lake Ōkaro (one site). Seven sites had baseline states in the A band, three were in the B band, and three were below the national bottom line (D band) - located on lakes Rotoehu and Ōkaro. Lake Rotoehu was the only lake with monitoring sites consistently in the D band. These sites must be improved according to the NPSFM and are being actively addressed through the lakes action plan process. Overall, there are improving trends in cyanobacteria grades. There were blue-green health warnings on Lakes Ōkaro, Rotoehu, Rotoiti and Rotorua.

Lakes Rotorua (and the Ōhau channel), Rotoehu, Ōkaro, and to a lesser extent Rotoiti, have experienced regular cyanobacterial blooms. Less frequent blooms have also occurred in in Lakes Tarawera, Rotokākahi and Ōkāreka.

Attribute	Lake	Baseline			
		A	B	C	D
Cyanobacteria (Table 1)	Ōkaro				1
	Rotoehu				2
	Rotoiti	3	2		
	Rotorua	3	1		

Mahinga kai

The mahinga kai compulsory value includes the freshwater-related plants and animals that tangata whenua traditionally subsisted on, the places these are harvested from, the traditional materials sources from the environment and the tikanga (practices) of collecting or harvesting them. This value is demonstrative of tangata whenua connections, responsibilities and kaitiakitanga obligations. It is important because the loss of these species and associated tikanga can have a profound effect on tangata whenua who rely on them.

We do know that taonga fish species in this Draft FMU include kōura, kōaro, kākahi (freshwater mussel), tuna (eel), inanga. Some lakes were more renowned than others for their abundance of kōura, inanga, kakahi, morihana (carp), toitoi (bully), or tuna. Traditional species of fish and shellfish are still gathered at certain times of the year from most lakes. Traditional plant materials of relevance include harakeke, paopao/kuta, toetoe and raupō.

Kōura and kakahi are monitored in some lakes in the FMU.

We recognise the importance and value that tangata whenua and kaitiaki in the FMU place on mahinga kai, traditional materials sources and gathering sites throughout the FMU. Identifying these and understanding how tangata whenua and kaitiaki understand, assess and care for wai māori is critical to understanding and providing for the health of the mahinga kai compulsory value. We welcome any information tangata whenua wish to provide.

Where do contaminants come from?

Dairy farming is estimated to contribute relatively high proportions of the nitrogen and phosphorus load in comparison to its relative land area

Old age groundwater in the Lake Rotorua Catchment and naturally occurring geothermal inputs in the Lake Tarawera Catchment contribute significant natural phosphorus loads. Nutrient recycling in the lakes themselves and geothermal sources also contribute significantly to nitrogen load.

Dairy farming is estimated to contribute a disproportionately high load of E. coli for the land area it covers, although all other land uses and the water bodies themselves also contribute (generally in proportion to their land area). There are point source stormwater discharges from urban areas in this FMU, and significant discharges to land from the Rotorua wastewater treatment plant and industrial areas.

Freshwater health issues for this FMU

Water quality is not always safe for contact recreation/swimming in some lakes and streams. Water quality in lakes Ōkaro, Rotorua, Rotoiti (and Ōhau Channel) and Rotoehu are not always safe for swimming due to E-coli levels and cyanobacterial blooms. Cyanobacteria biovolumes are below national bottom lines (NBL) in Lakes Rotoehu and Ōkaro and E. coli concentrations are below the NBL for primary contact in Lake Rotorua. Lake Rotoiti at Okawa Bay meets the NBL however there have been health warnings annually regarding potentially toxic levels of cyanobacteria or blue green algae in the area. Ngongotahā, Puarenga, Utuhina and Waitetī Streams within the Lake Rotorua catchment all have E. coli results below the NBL for primary contact sites.

Ecosystem health national bottom lines not being met at some monitored lake and stream sites, and at this stage it is uncertain whether this is due to natural processes or is caused by human activities. This includes nitrate (toxicity), suspended fine sediment, deposited fine sediment, macroinvertebrate indices, phytoplankton and dissolved oxygen levels.

Worsening trends for some attributes, very likely worsening trends in phosphorus and/or nitrogen in lakes Rotorua, Rotoiti, Rotoehu, Rotomā, Tikitapu, Ōkaro and Ōkataina impact on overall ecosystem health.

- Lakes Rotoiti and Rotorua have worsening kōura trends due to catfish predation, Lake Tikitapu has a declining trend due to white tail disease and Lake Rotoehu has a declining trend due to declining water quality.

Some lakes are not meeting community water quality aspirations due to nutrient loads or are still dependent on alum dosing to achieve them.

TLI baseline state for Lakes Ōkāreka, Rotoiti, Rotoehu, Tarawera and Rotokākahi did not meet TLI objective (set in the current regional plan) by more than 0.2 units. Where the 3-year average TLI doesn't meet the objective by more than 0.2 units existing actions need to be reviewed.

Alum dosing is undertaken in Lakes Ōkaro, Rotorua and Rotoehu to reduce the effects of high phosphorus concentrations in the lakes and assist in reaching TLI targets. This has been accepted as a medium-term solution by iwi to a long-term problem. It is also an aspiration of Council to stop alum dosing when land use within catchments is aligned with a sustainable lake load.

The existing TLI target for Ōkaro can still be met while not meeting the national bottom line for cyanobacteria. Furthermore, the TLI for Lake Ōkaro may not be aspirational enough to support key values. For example, it is valued as a water-skiing destination, having hosted multiple national and regional championship competitions for the sport.

Pest Species are impacting ecosystem health in Lakes Rotoehu, Rotoiti, and Rotorua

Lakes Rotoehu and Rotoiti do not meet the national bottom line for invasive submerged plant species reflecting often luxurious growth of invasive exotic plants such as hornwort (*Ceratophyllum demersum*).

In Lakes Rotoiti and Rotorua catfish contribute to a decline in native species. The population of catfish are currently being controlled through netting.

Cultural indicators of health. We know there will be important cultural indicators that can provide a deeper understanding of wai ora. Identifying these and understanding how fresh water supports the cultural health and wellbeing of tangata whenua and how they understand, assess and care for wai māori is in relation to their cultural health is critical to understanding and providing for the health of the mahinga kai compulsory value.

Question 5	Does this brief summary about water quality in this FMU seem about right to you?
Question 6	How satisfied are you with the water quality in this FMU?

What are we aiming for?

The NPSFM requires us to set targets for water quality that are at least as good as the baseline state of streams, rivers and lakes, and better than the national bottom lines. These targets are the specific, measurable levels of water quality or ecosystem health, which will help us to achieve the environmental outcomes (on previous page).

For the lakes:

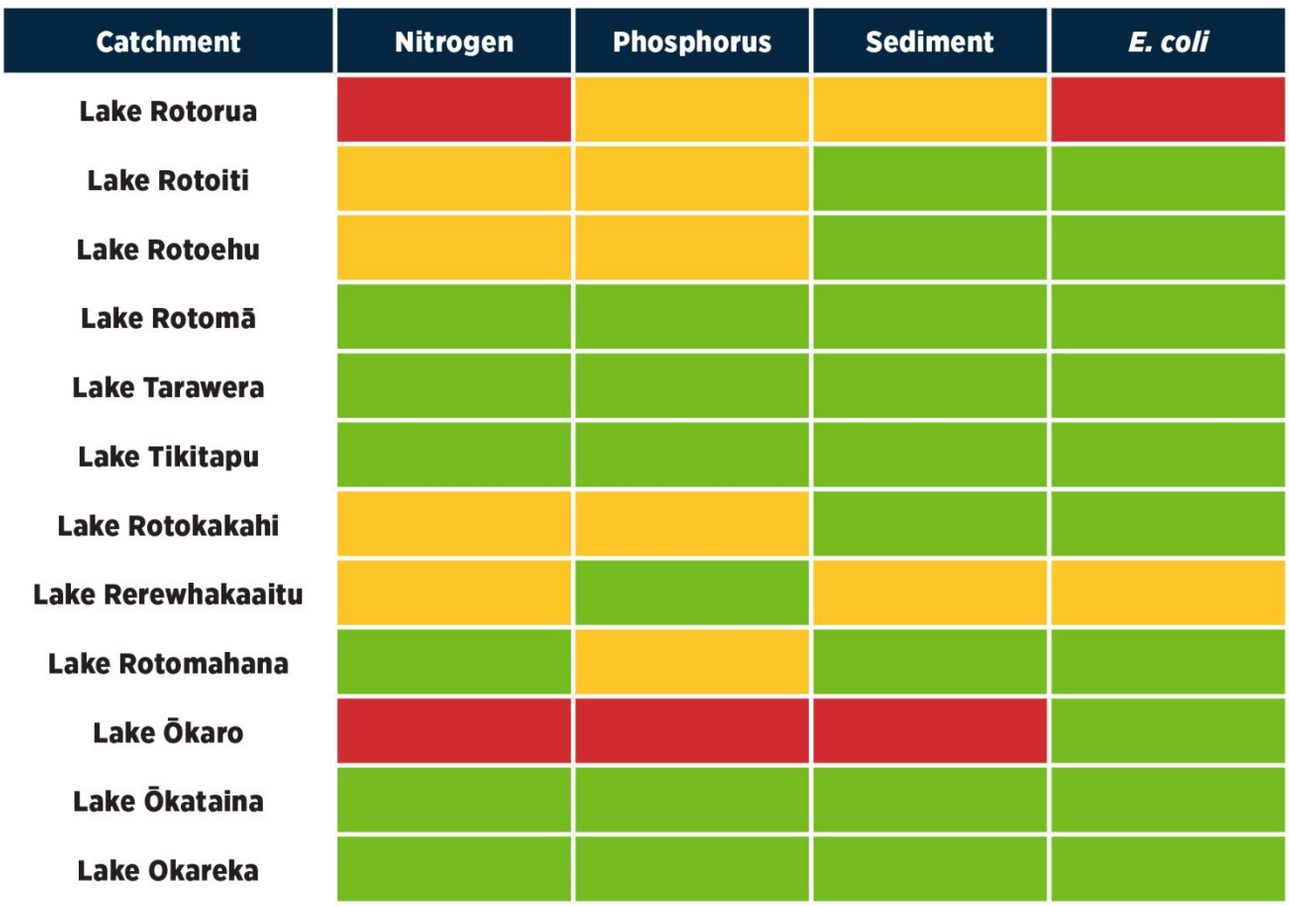
- Nitrogen and phosphorus loads from streams feeding the lakes need to be reduced to meet lake targets. The greatest reductions are required in Lakes Rotorua, Rotoiti, Rotoehu, Rotomahana and Ōkaro.

Several attributes are in the A state band and we will need to maintain this. This will require action to halt any degrading trends.

- Baseline state for some attributes at the following monitored sites are worse than national bottom lines (NBL), and targets will need to be set to improve them unless their state is due to naturally occurring circumstances (work is underway to assess this): Nitrate (toxicity) in Mangakino at Rerewhakaaitu Road. The soils in this catchment are highly permeable pumice soil and land use is primarily dairy.
- Suspended fine sediment in the Puarenga Stream and Ōhau Channel at SH33. Deposited fine sediment in 11 out of 13 sites, although this may be due to dominance of pumice in these streams. Some pasture, exotic forest and urban streams' QMCI and ASPM scores. However, this might be due to pumice on streambeds.
- Three stream sites (Puarenga at FRI, Ngongotahā at SH36 and Mangakino at Rerewhakaaitu) are in the D band for baseline DRP (there is no national bottom line for DRP). DRP is likely to be naturally high.
- Phytoplankton for Lake Rotorua and dissolved oxygen levels at the lake-bottom and/or mid-hypolimnetic layer in Lakes Rotomā, Tikitapu, Rotomahana, Rotoiti, Rotoehu, Ōkaro, Ōkataina and Ōkāreka. The low dissolved oxygen levels occur in some of the oligotrophic lakes (best water quality in the region) and in the case of Lake Ōkataina with minimal anthropogenic pressures. From feedback we have received to date, we anticipate tangata whenua and communities will want:
    - To achieve A or B band state for all attributes if this is achievable.
    - To accept C band state or worse only if that is naturally occurring, or if climate change predictions suggest no better can be achieved.
    - To apply a reasonable timeframe to achieve this, so that any land and water users who need to make changes have time to transition. For this FMU a timeframe of at least 20 years is suggested where significant reductions are required. It is likely there will be a lag time for the lakes to response to reductions in load, which has not yet been estimated.

Work is underway to estimate how much we need to reduce loads by to meet targets. Rough estimates are provided below. Lake Rotorua already has a target load reduction of 435 tonnes of nitrogen.

Indicative scale of nitrogen, phosphorus, sediment and *E. coli* load reduction needed to improve water quality and meet draft environmental outcomes.



This includes rivers flowing into the lake

KEY: Indicative scale of change needed to improve water quality, or likely water quantity constraint.

Small **Moderate** **High**

How can we meet the outcomes and targets we set?

The outcomes we set for freshwater will be met via a mix of voluntary measures (things people choose to do themselves), investment and works/actions by Council, regulations the government has set that everyone must follow, and extra rules Bay of Plenty Regional Council sets in the Regional Plan. The rules we set in the Regional Plan will be where these are the most appropriate way to address remaining issues that are not likely to be addressed by national regulations.

Regional Councils must implement national regulations relating to freshwater (via consents, monitoring, and compliance). We cannot change these but can make additional rules if we think they are needed to address local issues. It is important to have a sense of what national regulations currently say:

National regulations for freshwater

Current national regulations require:

- Stock exclusion (with a 3 m buffer) from large rivers (>1 m wide), lakes and wetlands for dairy cattle on all terrain, and for drystock on low slope land (<5 degrees).
- Controls on activities within and close to rivers, streams, lakes and wetlands.
- Feedlots and stockholding area requirements: sealed; effluent collection, storage and disposal; 50 m setback from rivers, lakes, wetlands, bores, drains and the coastal marine area.
- Cap of 190 kg/ha/yr on the amount of synthetic N-Fertiliser applied to dairy farms, along with reporting requirements.
- Controls on intensive winter grazing on forage crops – subject to conditions or consent required.
- Consent required for substantial land use change from forestry to pasture, anything to dairy or dairy support, or extending the irrigated area within dairy farms (provisional rule expires 2025).
- Plantation Forestry: a number of practice requirements, including setbacks from rivers, lakes and wetlands, and requirements relating to earthworks, harvesting, slash and other activities.

Pending national regulations in 2023 are:

- Certified Freshwater Farm Plans will be required for all farms over 20 ha and horticultural enterprises over 5 ha. Farm operators will need to identify activities that pose a risk of contaminant loss and identify actions to reduce risks.
- New regulations requiring Regional Councils to control activities in drinking water source protection areas.

Draft water quality options

In addition to national regulations a large amount of work has been undertaken or is underway in this FMU already to maintain or improve the state of the Rotorua Te Arawa Lakes. This includes:

- Regional Natural Resources Plan (RNRP) Plan Change 10 – Lake Rotorua Nutrient Management which requires rural properties in the Lake Rotorua groundwater catchment to have a nutrient management plan which identifies relevant nitrogen, phosphorus and sediment management practices and mitigation measures that will be undertaken. We intend to continue with this approach.
- Operative regional plan rules RL R1-R7 restricts nitrogen and phosphorus losses from diffuse and point sources in the catchments of Lakes Ōkāreka, Rotoehu, Ōkaro and Rotoiti and point source discharges in Lake Rotorua Catchment.
- Non-regulatory measures set out in the lake action plans.
- Construction of Ōhau wall in Lake Rotoiti to divert water from Lake Rotorua down the Kaituna River.
- Alum dosing in Lakes Ōkaro, Rotorua and Rotoehu to reduce the effects of high nutrient loads into the lakes.
- Catfish culling in Lakes Rotorua and Rotoiti.

The key additional things to focus on are:

- In the catchments of Lakes Ōkataina, Rotomā, Tarawera, Tikitapu, Rotomahana, Rerewhakaaitu, Rotokākahi, Ōkāreka and Rotoiti maintain ecosystem health and human contact values and halt worsening nutrient trends.
- In the catchments of Lakes Ōkaro and Rotoehu improve ecosystem health and human contact values and reverse worsening nutrient trends.
- In the catchment of Lake Rotorua improve ecosystem health and human contact values.

Additional options being considered are:

- Using Freshwater Farm Plans to reduce risk, set minimum standards and continual improvement requirements to address rural land practices that pose a high risk of sediment, nitrogen, *E. coli* and phosphorus loss.
- Gathering farm data on stock, feed, fertiliser and other farm and horticulture nutrient inputs, and consider controlling these to bring down nutrient losses in lakes catchments where we don't have this already.
- Consider setting a cap on nutrient inputs.
- Controlling intensive grazing that removes vegetation cover (such as strip grazing), cultivation and potentially horticulture, requiring active management of Critical Source Areas (overland flow paths), in similar way to national Intensive Winter Grazing Regulations.
- Enabling physical technological solutions such as sediment control bunds in appropriate locations.
- Requiring no future net increases in *E. coli*, nitrogen, phosphorus, or sediment as a result of future land use and practice change (this may require offsetting).
- Encouraging restoration of in-river habitat, as well as estuary and river margin habitat, including fish passage.

- Supporting and encouraging land use change to land uses with lower contaminant losses, potentially by providing incentives and removing barriers for land use change where we can.
- Controlling grazing of steep (>25 degrees) erosion prone land – either no stock, or stock size constraints.
- Continuing to reduce Phosphorus, *E. coli* and nitrogen from point source discharges via conditions for resource consents, including requiring lined animal effluent storage and setting effluent irrigation rate, timing and volume requirements.
- Requiring stock exclusion from all large (>1 m wide) rivers, streams, canals (which are modified rivers) and drains, and encouraging exclusion from smaller ones. Maintenance of a thick grass sward on margins and/or planting of one side of drains and canals to provide shade and bring down water temperature.
- Restricting new irrigation and managing all irrigation (particularly on pastoral land) as these tend to increase contaminant losses.
- Requiring temporary stock exclusion from ephemeral flow paths when wet.
- Requiring plantation forestry harvest management plans at the time of afforestation to address sediment loss during and after forest harvesting.
- Continue aquatic weed surveillance, spraying and harvesting and other pest control as managed through the Regional Pest Management Plan, and potentially increase investment in control.
- Requiring improved processes for municipal wastewater emergency discharges.
- Requiring a minimum level of treatment for new stormwater discharges.
- Requiring improvements to existing urban stormwater discharges over time.

Question 7	Does our approach to setting the water quality targets seem about right to you?
Question 8	On balance, what is a reasonable timeframe to achieve these water quality targets for this FMU?
Question 9	Do you support the suite of draft water quality management options being considered for this FMU?
Question 10	What minimum good land management practice requirements do you think we should consider in this FMU?

Te nui o te waipapa me te tukunga

Surface water quantity and allocation

Surface water is the water that flows in rivers, streams and lakes. Across the region, water is taken for different uses, and is usually taken with a pump connected by pipe to rivers and streams.

What are we aiming for?

How much water we take from rivers and streams for people to use will affect how much water is left for native fish and macroinvertebrates that depend on it for their survival, and for in-river cultural, recreation and other uses.

One of our main aims with water quantity is for people to know how much water is available to be used. We do that by managing water takes to ensure plenty of water remains to sustain habitats for the fish that live in rivers and streams, and generally thereby protect other values too.

The NPSFM hierarchy of obligations prioritises the health and well-being of rivers, streams, lakes, wetlands and groundwater first, then human health needs, and then ability of people to provide for social, cultural and economic wellbeing.

One of the ways we can do this is to protect native fish populations by setting limits on the total amount of water that can be allocated from each river and stream for people to use, and setting minimum flows, where users have to stop taking water if rivers and streams get too low. These limits can have a big influence of the health of rivers and streams, the things living in it, on the community, economic development and possible land use in the catchment.

How can we meet the outcomes we seek?

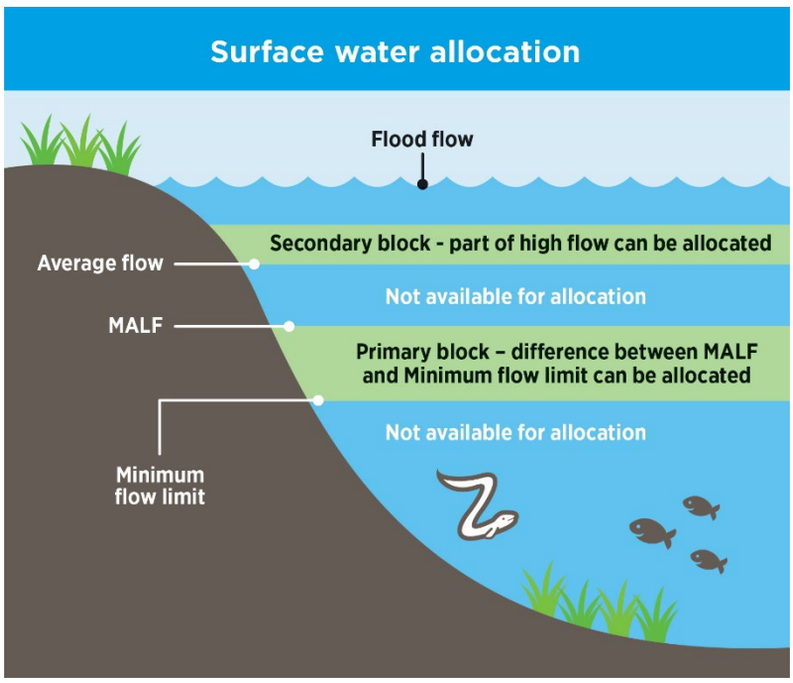
Our main tool for managing water quantity is the setting of minimum flows (limits to achieve the desired level of environmental protection).

Some rivers and streams are relatively resilient, and more water can be taken without affecting/damaging/stressing ecosystems, whereas others are more sensitive. Likewise, some fish prefer deep, fast flowing water and others prefer slower flowing, shallower rivers and streams.

Currently a ‘one size fits all’ approach is used to set limits for surface water takes from most rivers and streams in the region. This approach has a default minimum flow of 90% of the 1 in 5-year low flow (the average of the lowest flow recorded in a rolling 5-year period) and an allocation limit set at 10%.

In eight streams within this FMU, we now have stream specific scientific studies to help us understand the likely effects of different water levels on the different fish populations in each stream. We are using this information to draft new minimum flow limits for individual streams, based on achieving a consistent level of habitat protection for native fish (and sometimes trout). More detailed assessments of flow and the ecology of streams used for municipal supply are currently in progress. We will include any improved information in the limit setting process, as it becomes available.

For streams where such studies are not available, we've based the limits on our knowledge of stream characteristics and the results of other studies.



The above figure shows how the minimum flow limit, primary allocation block and secondary allocation block relate to the flow in a river or stream. Mean Annual Low Flow (MALF) is a commonly used measure that describes the average amount of water expected in a river or stream during times of low flow. It is calculated by averaging the lowest weekly flow in each year of the flow record.

If people are allocated or authorised to take more water than the total allocation limit, rivers and streams are over allocated. The NPSFM requires us to not allow over allocation. While nobody wants to be told to stop taking water, especially during a drought, there is a trade-off between managing effects on the health of rivers and streams (constraining takes at the minimum flow), the amount of water available for people to use (allocation limits), and how often restrictions are needed (reliability).

Habitat retention levels

With a lot riding on the limits we set, we need to get them right. A key part of the consideration is what level of habitat protection we want i.e. At times of low flow, how much stress should organisms living in rivers and streams experience (they will be used to some stress from natural causes).

A proposed habitat retention level we are aiming to achieve by setting these minimum flows is shown in the table below. The suggested levels for target native fish species are based on our understanding of how flows affect these fish species, and how scarce and vulnerable or resilient the species are. For example, shortjaw kōkopu and giant kōkopu are threatened species that are scarce and vulnerable, so the highest retention level is proposed.

We know other considerations may be needed too, including ensuring flows support mahinga kai, cultural or recreational values. For example, where trout are in a river or stream, we suggest setting habitat retention levels for those to provide for fishing values, so these are in the table below as well.

Target Species	Habitat retention level
Shortjaw kōkopu	100%
Giant kōkopu	100%
Other kōkopu species	95%
Kōaro (adult)	90%
Inanga	90%
Bullies (excluding bluegill)	90%
Eels (tuna) juvenile	80%
Eels (tuna) adult	75%
Torrentfish	70%
Bluegill bullies	70%
Trout	95%

Question 11 We are moving to limits on water takes based on habitat protection for fish. Does this seem the best approach?

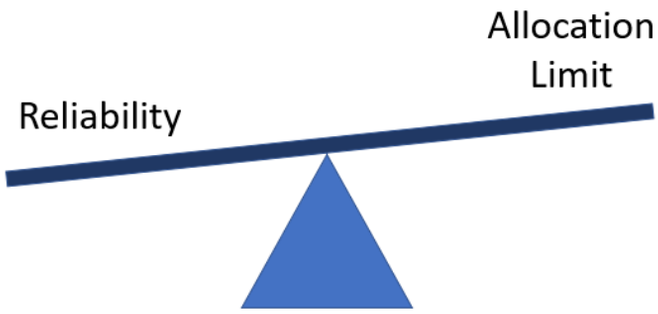
Water use

Once we've identified the minimum flow to protect the habitat for selected fish, we need to decide how much water is available to allocate to users.

The current default allocation limit is currently set at 10% of the 1 in 5-year low flow. Based on the current default allocation limits, several streams are currently considered over allocated in this FMU.

Reliability is a measure of how often authorised water users have to stop or reduce their water take (because rivers and streams are or would fall below the minimum flow). The higher the minimum flow, the more likely rivers and streams will fall to that flow due to natural conditions and the more frequently taking water will be restricted or stopped. The more water we allocate, the less reliable it is (the more often we need to restrict or stop water takes).

A study of flow patterns in the region's spring fed rivers and streams (such as found in the Rotorua Te Arawa Lakes FMU) found that if the minimum flow was 90% MALF there would be an average of 14 days per year that flow falls below this level, and no water would be available to take. In very dry years, the number of days below 90% MALF might be over 100. At a minimum flow of 80% MALF reliability improves substantially, with the average days of no take reducing to two per year and the expected range to around 40.



A balancing act: With a set minimum flow limit, there is a trade-off between the amount of water allocated for use and the reliability of water availability.

Question 12 Do you support or oppose the idea of encouraging more users to store water after heavy rainfall to help us all get through periods of drought?

Question 13 If you had to choose between a reliable water supply but very little water available and more water available but unreliably, which would you prefer and why?

Question 14 Sometimes our surface water challenges are because people take water at the same time. How willing would you be to work with others in your area to ensure water is taken from your stream(s) at different times?

Question 15 When the minimum flow is set at a high level, there isn't much water available to allocate and reliability is likely to be poor. Would you support reviewing the habitat retention levels of fish in over allocated catchments to increase the amount of water available for allocation?

Surface water quantity issues

Surface water demand in this FMU is generally low as there is an absence of irrigation demand and limited industrial use. However, in specific catchments with municipal water takes, allocation is very high. In addition, many Rotorua streams support highly valued trout populations with high flow requirements.

Cultural values associated with water are very high. Ngāti Rangiwewehi have developed a cultural flow regime as part of the consenting process for the Awahou Stream, but less cultural values information is available regarding other streams.

Reliability is very important for municipal supplies. Allocation from streams with high minimum flows (90% MALF or more) will likely experience periods when flow naturally falls below this level and this will constrain or halt the taking of water. Rostering of takes does not help when flow is naturally below the minimum or if there is only one large take.

Minimum water levels and take limits for lakes have not been identified. Currently the only consented water takes from a lake relates to lake level control rather than consumptive use. In future it is suggested that lake water takes be guided by *Draft Guidelines for the selection of methods to determine ecological flows and water levels* which evaluated the risks to changes in lake levels. A low risk was defined as less than 0.5 m change to median lake levels in lakes greater than 10 m deep and less than 10% change in others, with the patterns of lake level seasonality remaining unchanged from the natural state.

Dams and secondary allocation are unlikely to be particularly relevant in this FMU.

Question 16 Does this brief summary about water quantity in this FMU seem about right to you?

Surface water quantity options

In the past, we used a single allocation block (10% of the one in low flow) because we didn't have enough information to do better. Now that we have more information about our rivers, we can approach allocation differently. In some areas habitats will now need to be better protected, and in other areas more water will be available to use. We are now considering key options for setting allocation limits.

Option set 1: Choosing habitat retention levels (minimum flows)

The first set of choices we need to make concerns the level of protection we give to the main fish present in streams. Essentially, we are keen to know what you think of the Habitat Retention Levels in the table above, which we have used to identify an ecological minimum flow. We could make them more protective, which would mean water takes would have to be restricted or stop more often, or less restrictive, posing a risk that low flows may reduce usable habitat for some fish.

The minimum ecological flow is informed by scientific studies and provides a habitat protection level of 95% for trout. An alternative minimum flow would reduce trout habitat by around 15% (providing around 85% of habitat retention) while maintaining native fish habitat.

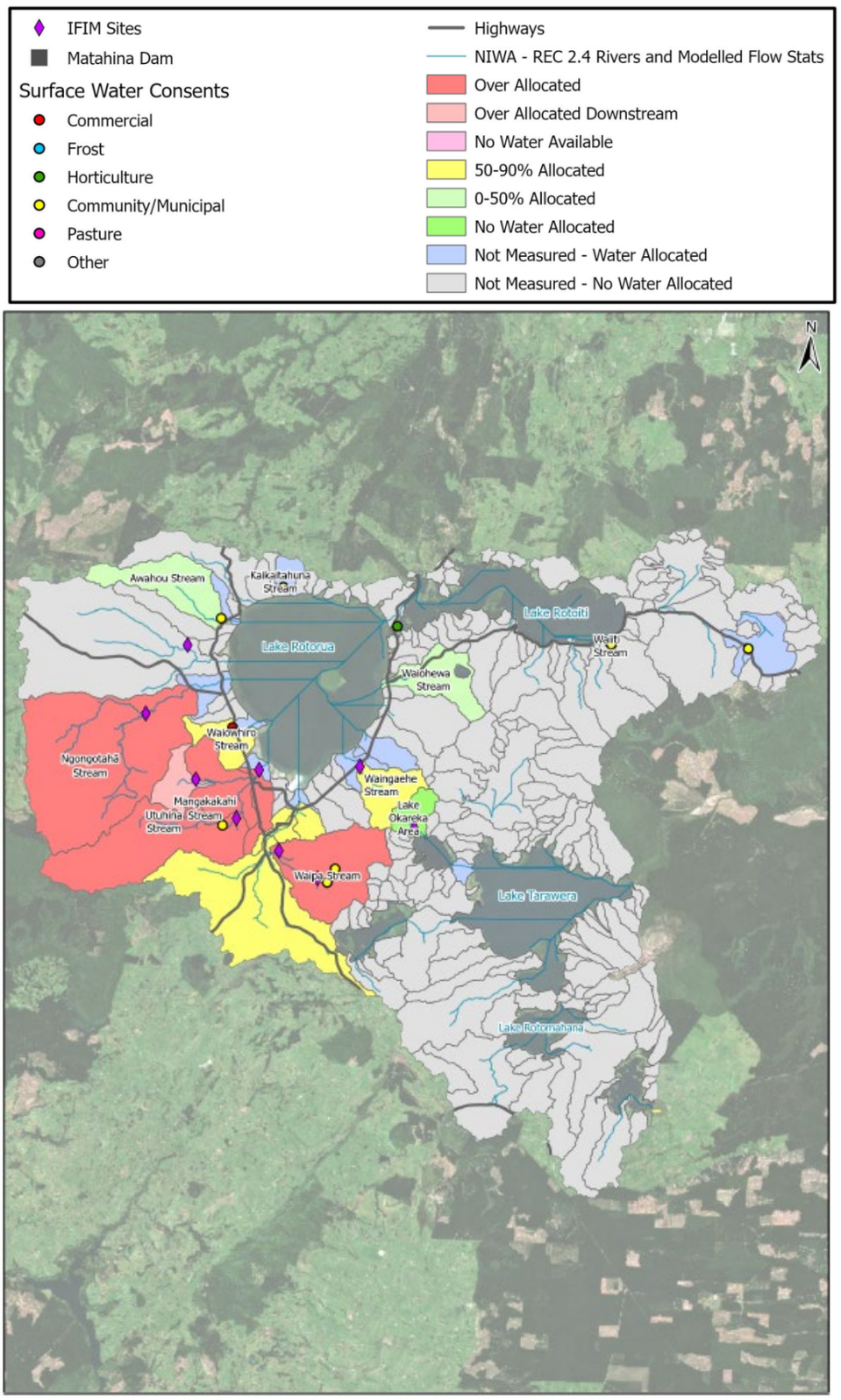
Option set 2: Deciding how much water can be allocated (primary allocation)

Our next choice concerns how much water to allocate and the effect of this on reliability for users. We propose that the allocation limit should be the difference between the mean annual low flow (MALF) and the ecological minimum flow (that provides the habitat protection levels noted above. The map on the following page shows the current allocation status using this option.

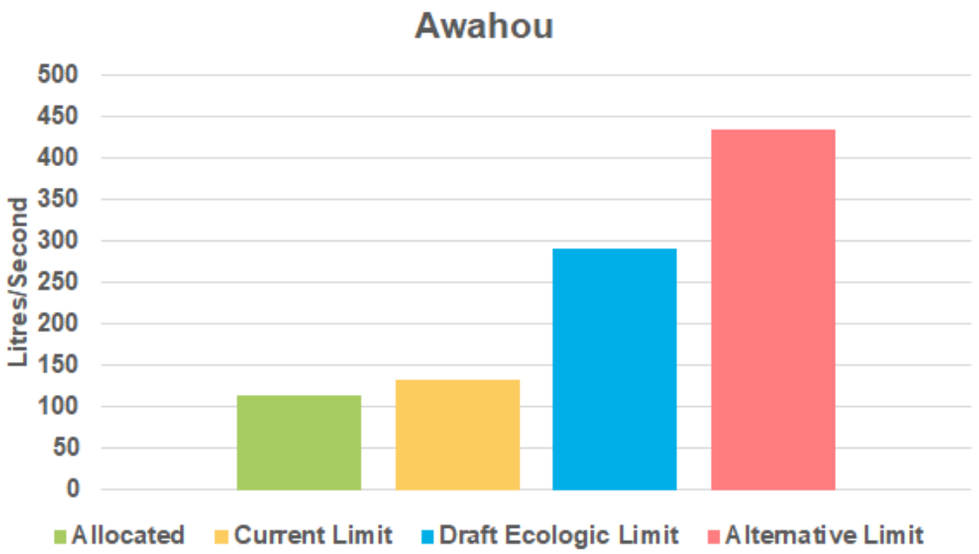
An alternative allocation limit (shown in the graphs below) could be set using the difference between MALF and the alternative minimum flow described in Option set 1.

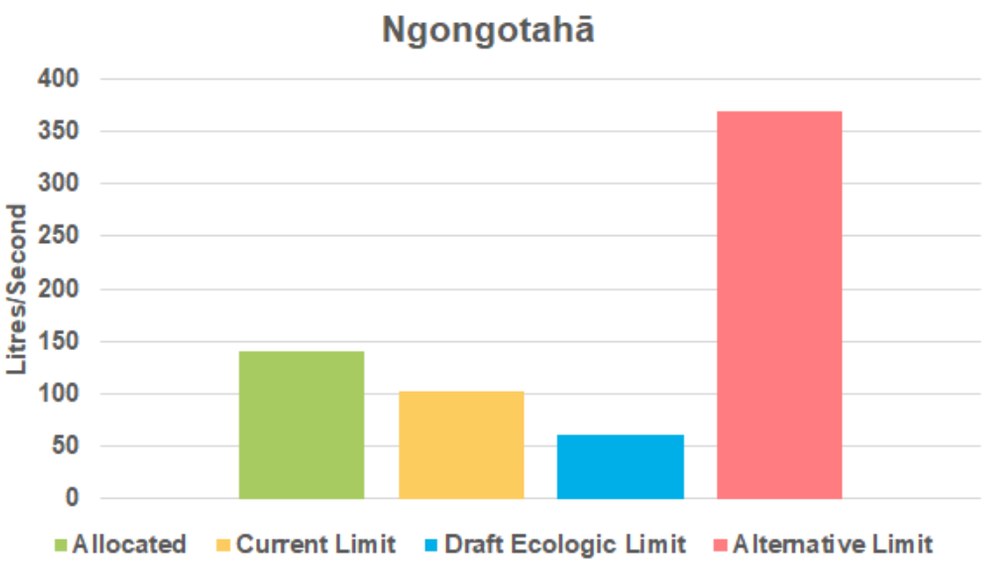
Option set 3: Primary and secondary block

We could allocate a lot more water (maybe twice as much) if we allocate a secondary block that can only be taken during periods of high flow. In this situation, users of the secondary block would probably need storage dams to provide reliable access to water during dry periods, because there will be more days when the allocated water cannot be taken.



Allocation status based on draft ecological minimum flows, and an allocation limit that is the difference between the Mean Annual Low Flow and ecological minimum flow. *(Note that a large number of catchments don't have flow estimates in this FMU (the grey and blue areas), but these are mostly places where there are no, or just one, resource consent to take water)*


Awahou
500
450
400
350
300
250
200
150
100
50
0
Litres/Second
Allocated
Current Limit
Draft Ecologic Limit
Alternative Limit


Ngongotahā
400
350
300
250
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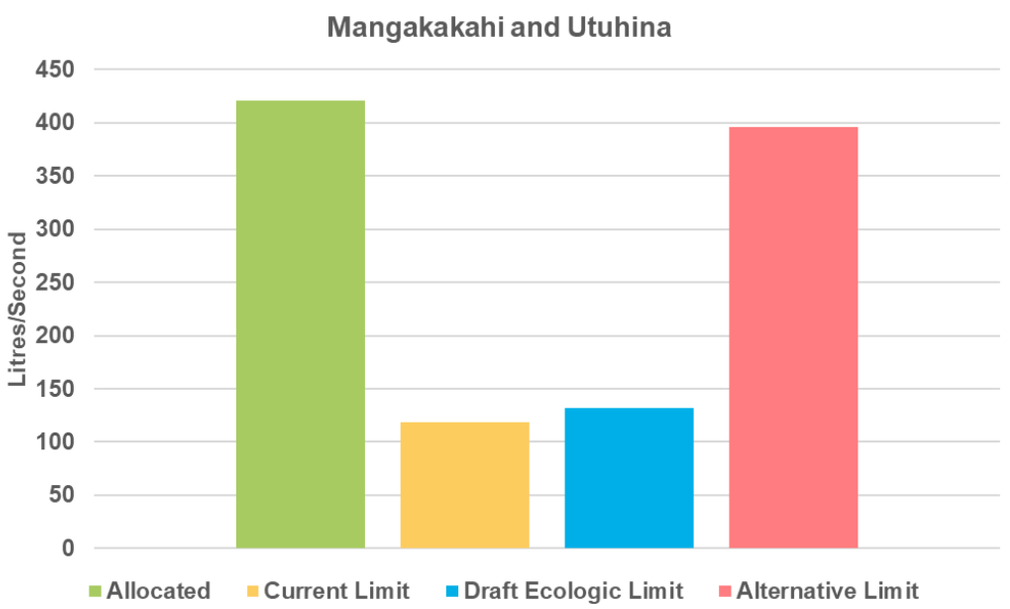
50
0
Litres/Second
Allocated
Current Limit
Draft Ecologic Limit
Alternative Limit


Mangakakahi and Utuhina
450
400
350
300
250
200
150
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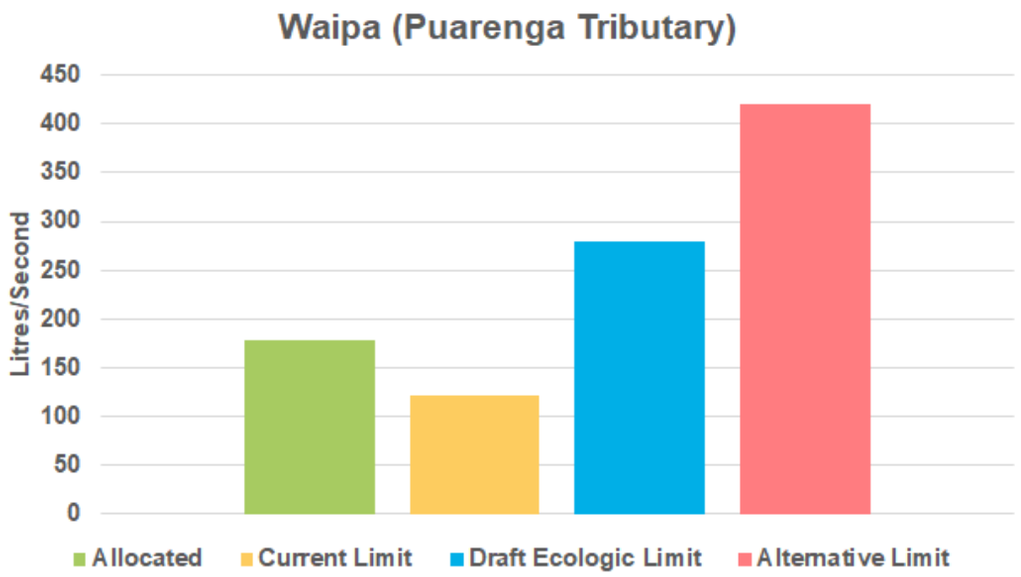
50
0
Litres/Second
Allocated
Current Limit
Draft Ecologic Limit
Alternative Limit



Total water currently allocated to water users, current allocation limit (default allocable flow in the current Regional Plan), draft ecological allocation limit (total allocable flow using the difference between the Mean Annual Low Flow and the ecological minimum flow), and an alternative allocation limit which provide less habitat retention for trout.

Question 17 We have options to set water allocation limits for a catchment that are complex and species and area specific or more generic, simple and region wide. Which approach to water allocation limits do you prefer and why?

Question 18 A small number of catchments in the Tauranga Moana, Kaituna, Rangitāiki, and East Coast FMU's are currently over allocated. We may need to claw back or reduce the overall water allocation in some catchments. How do you think we should approach this i.e. prioritise particular uses, timeframes for transition?

Te nui o te wainuku me te tukunga

Groundwater quantity and allocation

Groundwater is the water that flows underground – through gravel, sand, mud and between the crevices in rocks. Groundwater can be taken for irrigation or storage and can usually only be accessed via a bore drilled into the ground. In general, groundwater is more costly to access than surface water, especially if it is difficult to find or extract.

We manage groundwater differently to surface water. For groundwater, our focus is much more on the annual volume of water taken, while the surface water we are concerned about the rate of take at any one time. However, our concern for groundwater takes also relates to how they will affect surface water features such as wetlands, rivers and streams.

The FMU is characterised by a complex mix of predominantly volcanic geology, dominated by lavas and ignimbrite deposits. Alluvial and lake sediments are also widespread. Groundwater utilisation is relatively low in this Draft FMU, which is mainly due to a lack of irrigation. Numerous bores in the urban area are associated with the geothermal resource, which are used for heating and pools. Large springs are common and these are utilised for the Rotorua municipal water supply.

Current consented groundwater abstraction in the FMU (1.0 M m^3 /year) is a very small proportion of total groundwater recharge. Recharge rates are generally high due to the volcanic soils in the FMU, accounting for roughly half of total precipitation. Groundwater supports flows in a number of large springs which drain to the lakes. Several of these are utilised for public water supply to Rotorua and surrounding communities. Although water takes from springs are considered surface water takes, they are very reliant on groundwater. Springs have significant cultural values associated with them.

Historically, no groundwater availability assessments have been completed for the FMU except for a small part of the Rerewhakaaitu area that shares a groundwater management zone with the Mid-Upper Rangitāiki Catchment. So, unlike other parts of the region, no interim limits were established for this FMU. That situation has now changed as the area has been modelled under the Bay of Plenty region-wide groundwater model.

There is an amount of cross-boundary exchange of groundwater from this Draft FMU into adjacent FMUs to the north (e.g. Waihi Estuary, Waitahanui FMUs).

Issues

Groundwater issues associated with this FMU include:

- The substantial and sensitive geothermal resource being so connected with the freshwater system.
- Aquifers in this FMU are susceptible to the effects of land use and surface activities. This is due to the dominant source of recharge being from land directly above the aquifers.
- The receiving environment of the groundwater system is the lakes, which are sensitive to nutrient contamination.
- Investigations into surface and groundwater ages indicate that there may be a lag in nutrient concentrations affecting water quality as a result of land use activities in the catchment (groundwater was at least 30 years old in the catchment).

Policy options

Utilisation. The relatively low level of groundwater utilisation, and relative abundance of groundwater means there may be potential for increased groundwater use. Groundwater allocation policy in this FMU may not need to be particularly restrictive on takes.

Efficient Use. Notwithstanding groundwater availability in this FMU, across all FMUs consideration is being given to how to achieve more efficient use of freshwater; i.e. ensuring water allocation (what we consent) more closely matches need (what is used). This is because allocation status (whether an area is overallocated or not) is calculated based on what is allocated and theoretically able to be used (not what is actually used).

Groundwater Management Zones. Next steps for this FMU include developing new Groundwater Management Zones within which allocation limits will be set. In this FMU the geology is quite complex making the development of management units more conceptually challenging than in some other areas. Given the relative abundance of groundwater in this FMU, management units are unlikely to result in new use restrictions.

Water quality: See the water quality section of this document.

Question 19	Does this brief summary about groundwater quantity in this FMU seem about right to you?
Question 20	Groundwater is managed primarily to protect and maintain surface waters, and to meet current and future beneficial uses. What other things should it be managed for?
Question 21	Our understanding of groundwater availability is incomplete. We can set groundwater allocation limits that are lower i.e. more conservative or higher i.e. greater risk of overallocation. Where on the spectrum of risk are you?

For more information go to www.boprc.govt.nz/freshwater-info

Ngā mea e whai ake nei
Next steps

Feedback can be provided via our online platform, in person at community meetings, or in writing via post.

You can sign up to receive our Freshwater Flash e-newsletter at **boprc.govt.nz/newsletters** follow our social media or visit our website for regular updates.

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