

Understanding Nutrients and Periphyton

Freshwater Consultation Document

June 2024



The purpose of this document is to begin discussions about some of the high-level changes to the regional rules for nutrients disturbances to help you provide feedback Taranaki Regional Council (the Council) will use to prepare targets, limits and actions to manage and protect freshwater.

This factsheet is one of a suite of documents (listed below) that explore the specific water quality challenges facing the Taranaki region. They include analysis of the current state of play for each issue in the context of national standards as well as examining trends. They also discuss potential actions and responses to address the identified issues.

- Understanding Water Quantity and Water Allocation
- Understanding *E. coli*
- Understanding Sediment
- Understanding Nutrients
- Understanding Earthworks and Land Disturbance
- Understanding Stormwater and Wastewater Discharges
- Understanding how Farm Practices can help Water Quality
- Understanding Animal Effluent
- Understanding the Taranaki Economy.

Throughout these documents we pose specific questions that we would like your feedback on. Look for the question mark to guide your responses.

What we have heard so far

The information and options in this document reflect previous conversations with the community where we heard not only what people value about freshwater, but also what outcomes they want to see. The results of those conversations can be found on our website: <https://haveyoursay.trc.govt.nz/>

Working with iwi

Through the development of the proposed Land and Freshwater Plan, work has been ongoing with Ngā iwi o Taranaki Pou Taiao to understand and develop our knowledge of tangata whenua freshwater values. In developing these fact sheets, we have had regard to the information shared and discussed with us, and this is reflected in the management options presented. We will continue work with tangata whenua to refine approaches as development of the proposed Plan continues.

We want to hear from you

Have your say via our online survey at <https://trc.govt.nz/helpshapetherules> or by getting along to one of 16 community drop-in sessions around the region. Meeting dates and locations are available online.

You can also respond in writing to the Council at 47 Cloten Road, Stratford or email policy@trc.govt.nz.



This phase of community consultation begins on Monday, 10 June and ends on Friday, 2 August.

There will be additional opportunities to engage on the proposed Plan as we move toward Plan notification in mid-2025. See the timeline in the next steps section for further details.

Want to know more?

The information contained in this fact sheet is informed by the Council's scientific investigations into environmental issues affecting the region's freshwater including sediment, *E. coli*, nutrients, and water allocation. The technical memorandums and supporting materials are available on the Council's website at <https://trc.govt.nz/helpshapetherules>

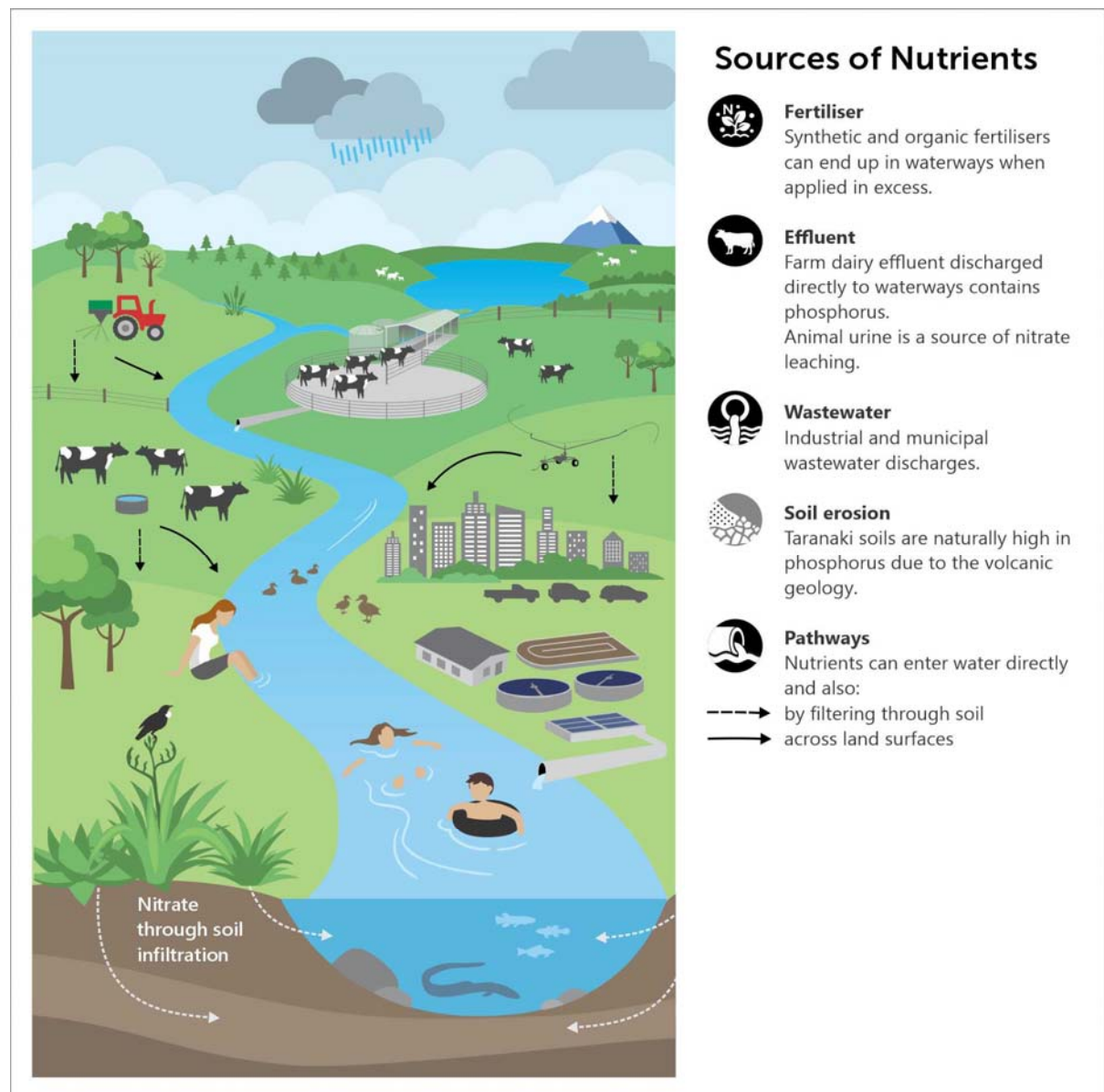


What are nutrients?

Dissolved reactive phosphorus (DRP) is a form of phosphorus that is dissolved in water and available for plants and algae to use as a nutrient to grow.

Ammonia and nitrate are two forms of inorganic nitrogen that are also important for aquatic plant and algae growth. Together, ammonia, nitrate (and nitrite) are referred to as dissolved inorganic nitrogen (DIN).

Only small amounts of these nutrients are required for healthy ecosystem function; too much can cause excessive plant and algae growth, reducing oxygen levels, which in extreme cases can kill fish. At high levels, nitrate and ammonia can become toxic to aquatic life. Both effects of nutrients are important to monitor and manage.



What is periphyton?

Periphyton is the slime and algae found on the beds of lakes and rivers. It includes algae, cyanobacteria, bacteria and fungi

Why is it important?

Periphyton is a food source for many insects and animals that live in freshwater, and it is one part of a healthy ecosystem. However, when it grows in excess, periphyton can have negative effects on the ecosystem, such as reducing habitat available for sensitive species and reducing dissolved oxygen concentrations. Nuisance periphyton growth also affects the values of water that the community considers important, from how the water looks to how we use water for swimming and other uses like domestic water supply.

What affects periphyton growth?

Nutrients are essential food for plant and algae growth and are a part of a healthy ecosystem. However, excess nutrients in freshwater contribute to the nuisance growth of periphyton. Shading and stream flow are also important factors which influence periphyton growth.

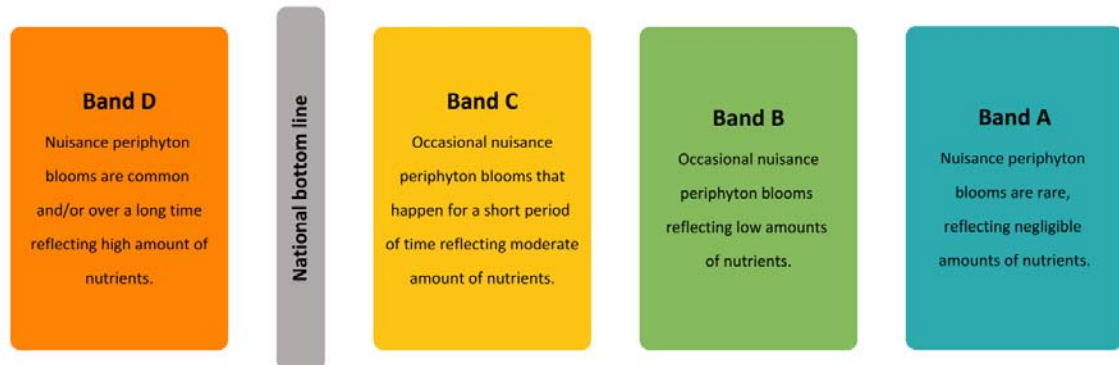


Monitoring for periphyton and nutrients

We monitor and assess periphyton in our rivers at 12 sites and nutrients at 22 sites across the region, assigning a grade based on the data collected.

Periphyton

The grades range from band A to band D and assess how often algal blooms occur. More frequent algal blooms indicate that a stream is affected by excess nutrients.



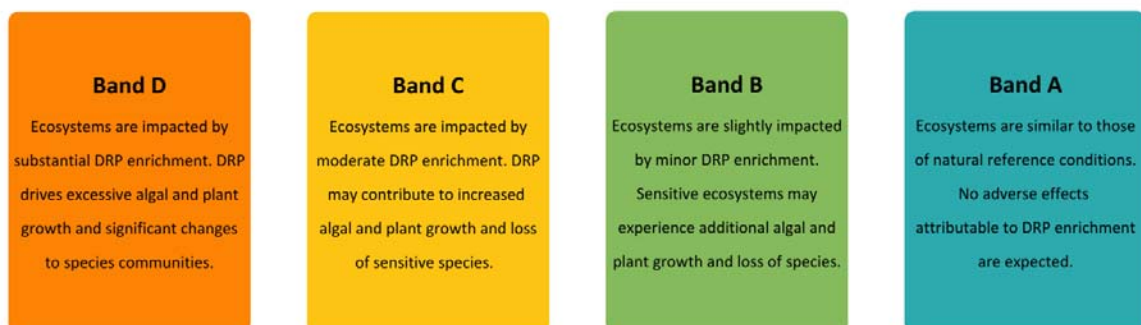
Nutrients

The grades for the three nutrients range from band A to band D. For ammonia (toxicity) and nitrate (toxicity), grades are reflective of the toxic effects that high amounts can have on animals and plants living in freshwater.

Ammonia and Nitrate



Dissolved Reactive Phosphorus (DRP)



The Government has identified a minimum standard, known as the national bottom line, for periphyton, ammonia (toxicity) and nitrate (toxicity).

Regional councils are directed by the Government to work with communities to improve water quality in rivers, streams and lakes and set targets for freshwater quality in the region. Currently, there are no sites which fall below the national bottom line for ammonia (toxicity) or periphyton, and two sites which fall below this standard for nitrate (toxicity).

Due to the complexity of phosphorus in the environment, including natural sources, there has been no minimum standard identified by the Government for DRP. This approach allows us to set draft targets for DRP that work for our region.

In addition to setting targets for the three nutrient attributes mentioned here, given the

relationship between nutrients and periphyton growth additional nutrient criteria must also be established to support the achievement of periphyton targets. The criteria we're using translate to concentrations of DIN, and DRP. Generally, the DIN criteria for periphyton are far more stringent than targets for nitrate (toxicity) and ammonia (toxicity), given that periphyton responds to much lower concentrations than the toxicity thresholds.

You have told us you want better quality water in our rivers and streams and we are now considering the opportunities and challenges to improving degraded water quality. We are also considering water quality improvement targets, which requires a long-term approach with smaller targets along the way to map progress.



Draft targets

Below are the draft targets for each of the three nutrient attributes, as well as an overview of the initial steps for establishing periphyton targets. In setting targets, we are looking to strike the right balance between these being ambitious and achievable.

Draft targets state for nutrients

The baseline state represents the starting point from which we are setting targets at each of our water quality monitoring sites, and the other columns represent draft targets for the number of sites in each band by the given year.

For nitrate (toxicity), two sites fall below the national bottom line in band C. Of the remaining sites, four fall in band B, and 16 fall in band A. Where sites are achieving minimum standards, our draft targets are to improve where possible, or otherwise maintain. Where sites fall in band C, our draft target is to see this improve by 2055.

For DRP, improvements are possible at a number of sites despite naturally elevated concentrations

in some catchments. Targets have been set for the number of sites in the D Band to reduce from 10 to 2 by 2055. Most of these improvements are only likely to achieve the C Band, though targets have been set for two additional sites to reach B band, and for one site to reach A Band.

The road to improving water quality in Taranaki first requires preventing further degradation. We therefore need to think carefully about our first steps and what that might look like as well as considering the time it might take before we see the improvements.

For ammonia (toxicity), all sites are achieving the national bottom line with six sites falling in band B, and the remaining 16 sites falling in band A. Our draft targets are to maintain those in band A, and by 2055 lift all sites to the same level.



Details of the targets for individual monitoring sites are available in the Nutrients Technical Memorandum available on our website.

Attribute	Band	Baseline state	Draft target 2035	Draft target 2045	Draft target 2055
Nitrate (toxicity)	A	16	16	16	18
	B	4	4	4	4
	C	2	2	2	0
	D	0	0	0	0
Ammonia (toxicity)	A	16	19	22	22
	B	6	3	0	0
	C	0	0	0	0
	D	0	0	0	0
Dissolved Reactive Phosphorus	A	5	6	6	6
	B	3	2	2	4
	C	4	5	10	10
	D	10	9	4	2



To what extent do you agree with the draft targets to achieve improvements in each of these nutrients by 2055?

Draft periphyton outcomes

One of the most significant impacts that can arise from high nutrient concentrations is excess growth of periphyton. Excess periphyton can clog fish spawning sites and habitat for aquatic insects, and lead to extremes of dissolved oxygen and pH (or alkalinity) which stresses fish populations and can lead to fish-kill events.

Due to the relationship between periphyton and nutrients, we will be setting criteria for in-stream nutrient concentrations to reduce the risk of excessive periphyton growth. These criteria will be



It is likely that reductions in current instream nutrient concentrations will be required for a large number of catchments.

applied to the entire region, in addition to the site-based nutrient targets introduced earlier to ensure that periphyton growth is not exacerbated by nutrient concentrations.

Based on community feedback that ecosystem health is important, the minimum target for periphyton corresponds to band B (occasional nuisance periphyton blooms reflecting low levels of

nutrients). We have used this target to establish the draft nutrient criteria framework, though further refinement is still needed.

The framework for setting nutrient criteria involves identifying appropriate nutrient concentrations based on the susceptibility of each catchment to excess periphyton growth. This may vary depending on temperature, rainfall and shading.

It is worth noting that the attribute standards for nitrate and ammonia are based on toxicity impacts and the criteria for nitrogen will generally be more stringent than the draft targets for nitrate and ammonia.

We are still in the process of defining the draft periphyton targets to achieve outcomes for wider ecosystem health, and what the criteria for nutrients might look like to achieve these targets. We are also considering whether different criteria may be necessary to protect sensitive receiving environments such as lakes and estuaries.

Based on a preliminary assessment of nutrient criteria to achieve a regional target of Band B for periphyton, nutrient reductions in some catchments would be significant. See the most challenging spots section of this factsheet for information about where the greatest reductions are required.



How far will current practice take us?

Through the process of setting the draft nutrient targets, we looked at what can be achieved with the current programmes. Alongside the community, we have made considerable progress with land management programmes and removal of effluent discharge to water. These management programmes have placed us in a more positive position to deal with ongoing water quality challenges.

What is being done now?

Rural landowners across the region have long worked with the Council to improve environmental outcomes and reduce the impacts of land use on freshwater.



Riparian fencing and planting

The majority of dairy farming occurs on the ring plain surrounding Taranaki Maunga and coastal areas in the northern and southern parts of the region. In this intensive farming area, Riparian Management Plans are developed to protect waterways with fencing and planting.

Riparian fencing and planting helps to improve water quality by reducing the runoff of nutrients (mostly phosphorous) and preventing direct discharges of dung and urine through excluding stock access into streams. Planting vegetation along stream margins has multiple benefits beyond mitigating contaminant losses.



Shading of waterways through riparian planting helps to limit periphyton growth and stream

temperatures during warm periods, both of which help reduce ecosystem stress. This will likely become even more important under a warming climate. Riparian margins also provide important habitat for wildlife both within the stream and on the river banks.



Farm dairy effluent discharge

Under the operative Regional Freshwater Plan for Taranaki, direct discharges of dairy effluent to water are allowed with a consent. The Council has been working with consent holders to move dairy effluent discharges to land. In addition to reducing nutrient and *E. coli* concentrations in freshwater, this enables farmers to use effluent as fertiliser.

Eliminating remaining direct discharges of farm dairy effluent to waterways is a crucial step towards improving water quality and reducing nutrient pollution, particularly phosphorus. This is especially relevant in the ring plain catchments where most of the remaining direct discharges exist.



Council will be changing its approach so that dairy effluent discharges are required to go to land.

Switching to land-based application of dairy farm effluent is expected to reduce in-stream nitrogen concentrations by 3% to 10% at current monitoring sites in catchments where these discharges still occur. However, we expect to see greater reductions for phosphorus, particularly in the southern ring plain. Estimated reductions range from between 25% to 70%.

We also modelled the nutrient reductions that can be achieved with both the completion of riparian planting and fencing and the removal of farm dairy effluent. Reductions in instream nitrogen concentrations are estimated to range from 5% to 16% at current monitoring sites. Slight improvements in phosphorus concentrations were also estimated.

Smaller reductions are expected for nitrogen with the completion of these management options due to the primary pathway for nitrate entering surface water is via groundwater. Because of this, the removal of discharges to water, and completion of riparian fencing and planting has limited scope to reduce instream nitrate concentrations.

Comprehensive Farm Plans

Comprehensive Farm Plans provide a whole farm approach to sustainable land use in the hill country. The Plans address erosion risks on steep terrain to minimise soil loss and address other environmental impacts arising from farm activities. The Plans include soil conservation works consisting of a combination of scrub reversion on the steepest slope class and space-planted trees on other slope classes.



N-cap nitrogen reporting

The regulations to better control the effects of synthetic nitrogen fertiliser use were introduced in 2021. These regulations apply to pastoral land of 20ha or more and put a cap on synthetic nitrogen fertiliser use of 190kgN/ha/year. Anything above this level requires a resource consent.



Lake Umutekai is one of many key native ecosystems that Council is seeking to preserve through the proposed Land and Freshwater Plan.

Where are the most challenging spots?

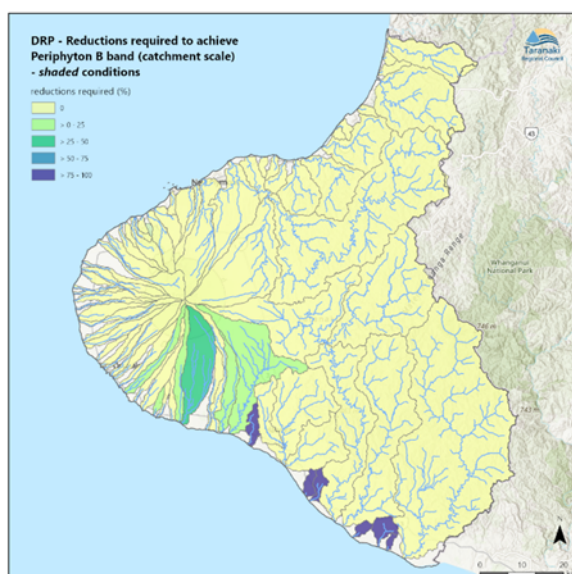
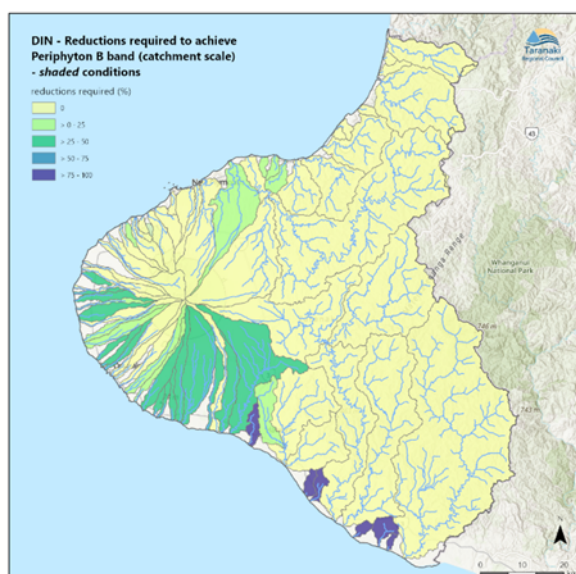
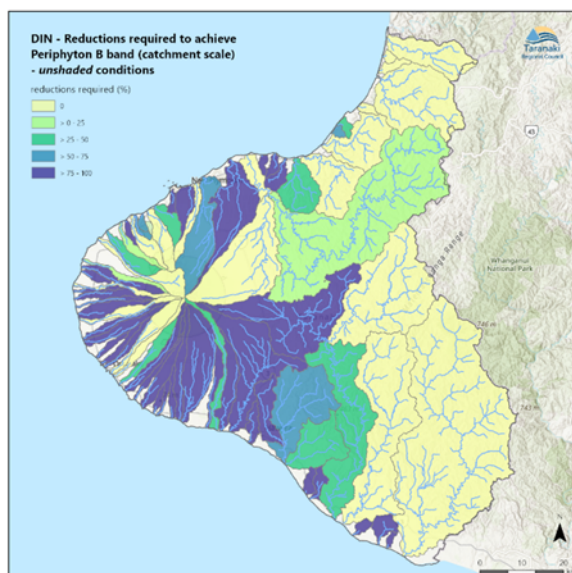
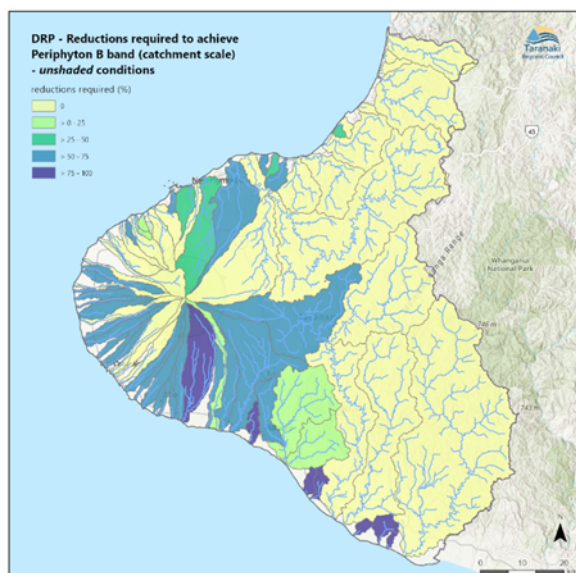
The maps below indicate the scale of reductions that would be required to achieve the draft nutrient criteria. Despite these nutrient criteria not yet being finalised, the maps below provide a useful indication of areas in the region where some level of reduction will likely be required.

In terms of nitrogen, the largest reductions are needed around the volcanic ring plain and coastal terraces, particularly in the southern catchments. Comparatively lower reductions in phosphorus are required across fewer catchments.

The maps also highlight the importance of effective stream shading. Reductions in nitrogen and phosphorus are required in fewer catchments if it

is assumed that there is sufficient shading to effectively limit periphyton growth. Where reductions are still required, they are generally of a lesser magnitude. We are currently investigating ways to account for stream shading at the catchment scale in order to refine these nutrient criteria.

As mentioned earlier, we know there are two sites within the Waikura Catchment in the southern ring plain where instream nitrate concentrations exceed the national bottom line for toxicity impacts. Reductions will be required to at least achieve band B in this catchment.



What else do we consider when setting the draft targets?

Naturally occurring processes

Volcanic soils found in Taranaki, particularly around Taranaki Maunga, naturally contribute phosphorous into freshwater. The degree to which these natural sources of phosphorous impact river water quality varies across the region. It is necessary to take this into account when setting the draft targets, while still aiming for improvements where possible.



Did you know?

Around 80% of the length of all of the streams and rivers in Taranaki flow through volcanic soils.



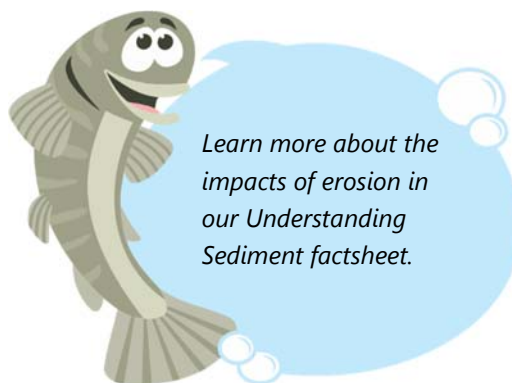
Climate change

Predicting the effects that climate change will have on water quality in the future is challenging. Climate change will bring rising temperatures and increased variability in weather patterns in the region, which will have a range of effects on water quantity and quality.

On the land

We could see larger amounts of nitrogen and phosphorus entering waterways directly following intense rain or stormy weather. We are also expecting to see longer dry spells. The longer the dry periods, the drier the soils are likely to become. Water is not so easily absorbed by dry soils. As a result, rain travels over the land instead picking up nutrients and reaching rivers and streams much more quickly than if the soils were wet and more absorbent.

These dry conditions could also have an effect on pasture growth. Slower pasture growth and more exposed soils leaves the land more vulnerable to erosion.



In the water

In the water, the biggest challenges will be rising water temperatures and changes in river flows.

Dissolved oxygen in water is essential for aquatic life. Warm waters hold much less dissolved oxygen than cooler waters and lower oxygen levels will cause significant stress on the animals that live there.

Warmer waters provide more favourable conditions for microbial activity and periphyton growth. The combination of increased water temperatures and spikes in nutrients entering waterways, suggests problematic algal growth may become more common.

During longer dry spells, we expect to see lower flows in our rivers and fewer high-flow flushing events during these periods. These flushing events are critical for washing away periphyton growth and are a natural mechanism that helps to keep periphyton growth in check.

The science on nutrients

Baseline state - where we were

Baseline states represent the starting point in the target setting process. From these values, we can see the scale of change required to achieve targets. This provides an indication of how reasonable or realistic the targets might be and how long it might take to achieve them.

The baseline state for periphyton achieved band A at five out of 12 sites, band B at four sites and band C at three.

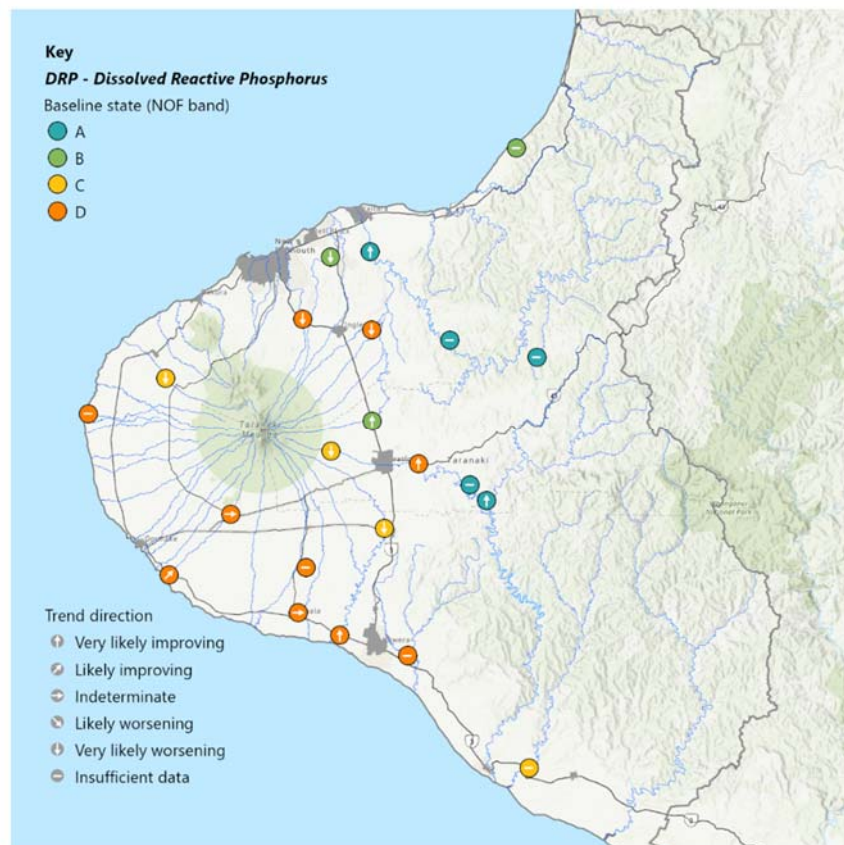
Ammonia achieved band A at 16 of the 22 sites, six sites achieved band B. No sites were below the national bottom line.

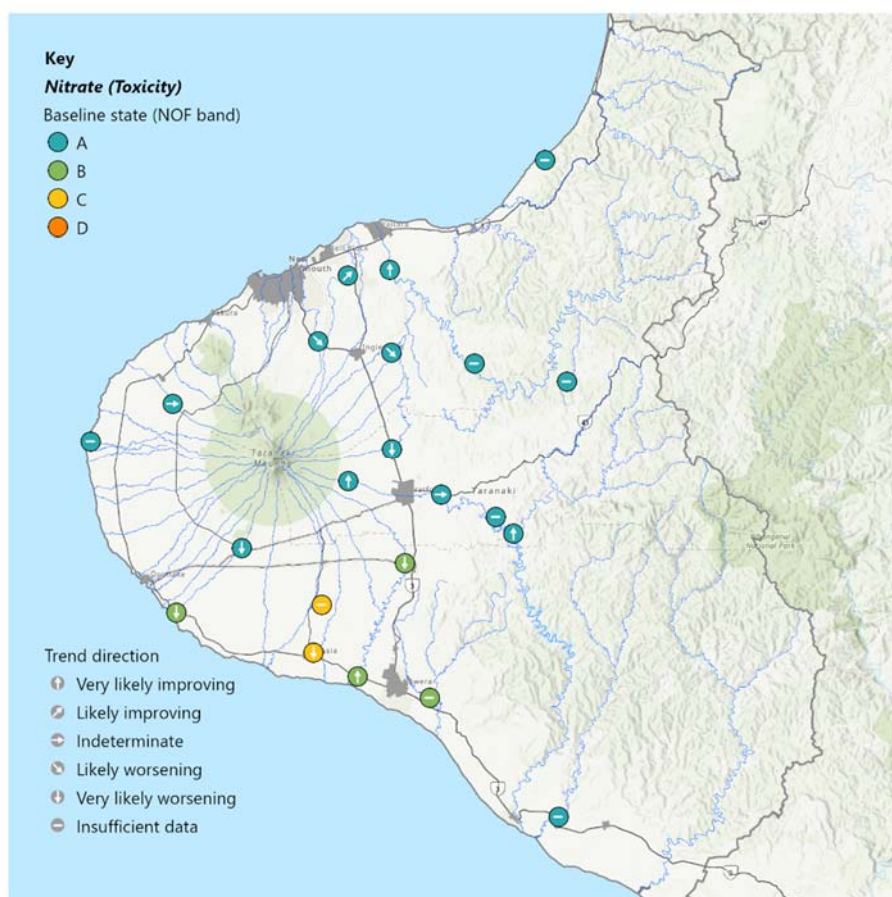
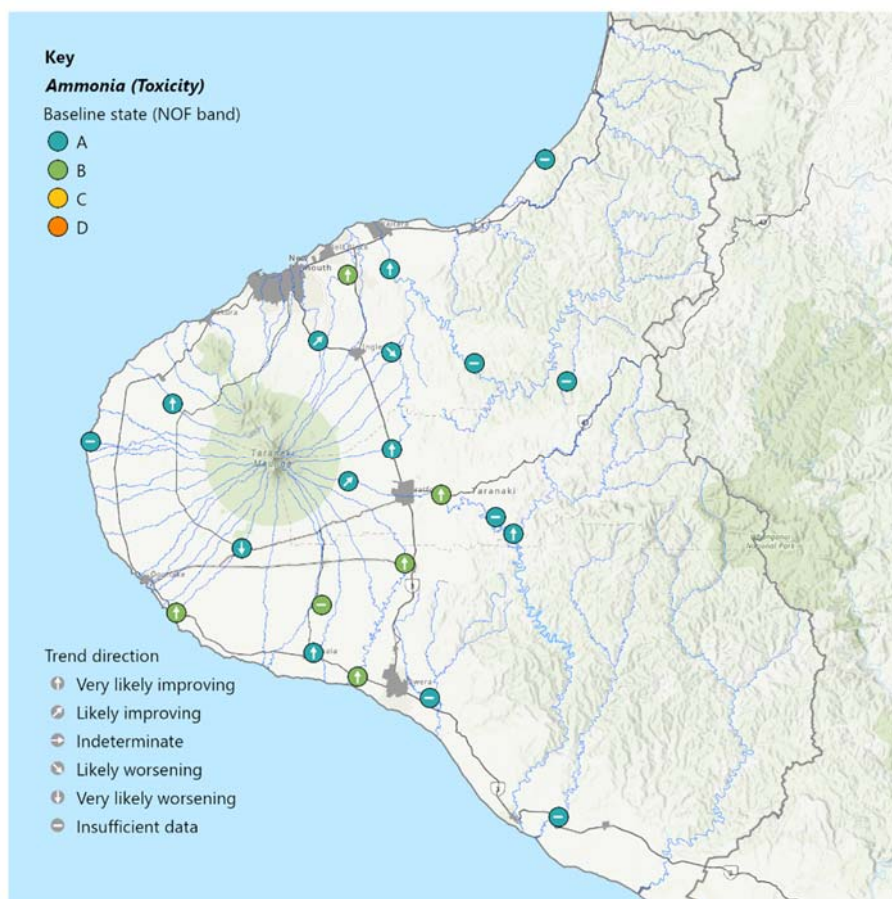
Nitrate achieved band A at 16 of 22 sites, while four sites achieved band B. Nitrate concentrations are below the national bottom line at two sites.

DRP achieved band A at five out of 22 sites, while three sites achieved band B. Four sites achieved band C and 10 sites fell within band D, of these sites 12 out of 14 are located on the volcanic ring plain, reflecting naturally elevated phosphorus levels in the region's volcanic soils.

Trends - Where we are going

There are 14 sites across the region where the Council has carried out monitoring for long enough to calculate whether the amount of nutrients in the water is getting better or worse.





Next steps

Feedback you provide through this process ultimately helps shape the rules that the Council will put in place to protect and manage freshwater. The rules will appear in the Proposed Land and Freshwater Plan (Proposed Plan) that will replace the region's Current Freshwater Plan (Current Plan) which is more than 20 years old.

Next steps for the Council are:

- Continue to develop the science on sediment, nutrients, E. coli, effluent and a range of other measures of water health as well as the potential options to manage these challenges
- Use your feedback on proposed targets to help shape rules that apply to nutrients in the Proposed Plan.
- Work toward further community engagement on refined policy options and additional science.

We want to hear from you



There are many ways that you can share your views with us:

Join us at one of 16 **community meetings** around the region. Meeting dates and locations are available online.

You can also **write to us**:

Policy Manager, Freshwater Consultation, Taranaki Regional Council, 47 Cloten Road, Stratford.

Email us at policy@trc.govt.nz

Take our **online survey** at <https://trc.govt.nz/helpshapetherules>

Timeline



Jan 2021–Sept 2022

Understanding the story so far
Collating the story of what's happening with Taranaki freshwater to inform conversation with the community, special interest groups and iwi.



Apr 2021–Dec 2022

Vision, values and FMUs
A chance for people across Taranaki to give their feedback on the region's draft FMUs, the visions that will establish the long-term goals for those units and the values which apply to them.



2023

Te Mana o te Wai
Exploring how Te Mana o te Wai can be applied in Taranaki and how our planning framework can improve the way that tangata whenua and communities are involved in freshwater management decisions.



Sept–Oct 2023

Freshwater outcomes and change drivers
Closing the loop on what we learned with our engagement so far and what it will mean for how we go forward with improving the quality of our water, the timelines and where the pinch points might be.



June–July 2024

Setting targets
Exploring potential targets for key areas linked to improving water quality.



Nov–Dec 2024

Limits
Exploring the potential rules that may be introduced through the proposed Land and Freshwater Plan to drive the change to achieve the targets we set for freshwater.



Feb–April 2025

Feedback on Draft Plan
Iwi, special interest groups and stakeholder engagement and feedback on the draft Land and Freshwater Plan.



Mid 2025

Plans notification
The Land and Freshwater Plan will be publicly notified prior to a formal submissions and hearing process.



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