WATER AND LAND 2020 & BEYOND

WATER QUALITY IN SOUTHLAND

Southland's water quality is a mixed bag. Some areas are good, but some are not. It's not all bad news, but there are key areas where improvements in water quality need to be made.

Through our scientific work, we have identified water quality issues that have the potential to make the catchment limit setting process more challenging if something is not done now.

The Government's National Policy Statement for Freshwater Management (NPS–FM) has set minimum thresholds for a number of freshwater attributes that are to be met in waterways across New Zealand (national bottom lines). Our scientific monitoring and investigations show that for some attributes and in some areas, we do not meet these national bottom lines.

Environment Southland is therefore considering some proposals to assist with halting the decline of water quality where required and maintaining existing water quality. The focus is on identifying the activities where we know changes in practice can have a positive impact on water quality. These proposals will eventually form a Water and Land Plan.

These scientific results provide a regional summary of water quality monitoring results using both state (where it is currently at) and trends (how it has changed over time). Included is a comparison with several national bottom lines. In particular, *E.coli*, nitrate and slime algae (periphyton). Macroinverebrates (fish food) are also presented to provide an indication of overall ecosystem health in Southland.

National Objectives Framework

Outlined in the NPS-FM, the National Objectives Framework (NOF) provides an approach to establish objectives for national, regional and local values for freshwater. Some national values are compulsory (every waterway must meet these) and there is scope to include a number of regional or local values through the catchment limit setting process that our communities may decide they want to achieve for water quality.

Currently, the compulsory values set by the NOF are *E. coli* for secondary contact, nitrate toxicity, slime algae, ammonia toxicity and planktonic algae.

The intention is that water quality must be maintained where it meets the national bottom line, or be improved where it is worse.

There is currently no national bottom line for sediment or phosphorus in rivers, however the Government is developing a bottom line for sediment. One aspect of our science programme is focusing on better understanding high intensity rain and high flow events because they are so important for the transport of sediment and phosphorus. The effects of sediment on ecosystems is a focus of the ecosystem response programme and includes consideration of estuaries, lakes, rivers and recreational waters.

The NOF does not currently provide a framework for wetlands, groundwater or estuaries. However we know some estuaries are experiencing declining health.

The science to better understand our estuaries is currently being completed. Once this is finished it will be available on our website.

COMPULSORY NOF ATTRIBUTES

- Secondary contact for recreational purposes
- Nitrate toxicity to fish
- Slime Algae (Periphyton)
- Ammonia toxicity
- Planktonic algae

environment SOUTHLAND Te Taiao Tonga

HOW DO WE COMPARE? ▲

The map shows surface water monitoring locations where enough data is available to make robust comparisons with the NOF, the Regional Water Plan standards and national guidelines.

Each monitoring location is represented by a circle, each quarter represents what we are measuring and the colour of the quarter represents the current quality.

It's important to note that simply aiming to achieve the national bottom lines may not be enough to sustain a healthy ecosystem or meet the community's values for water.

▲ HUMAN HEALTH

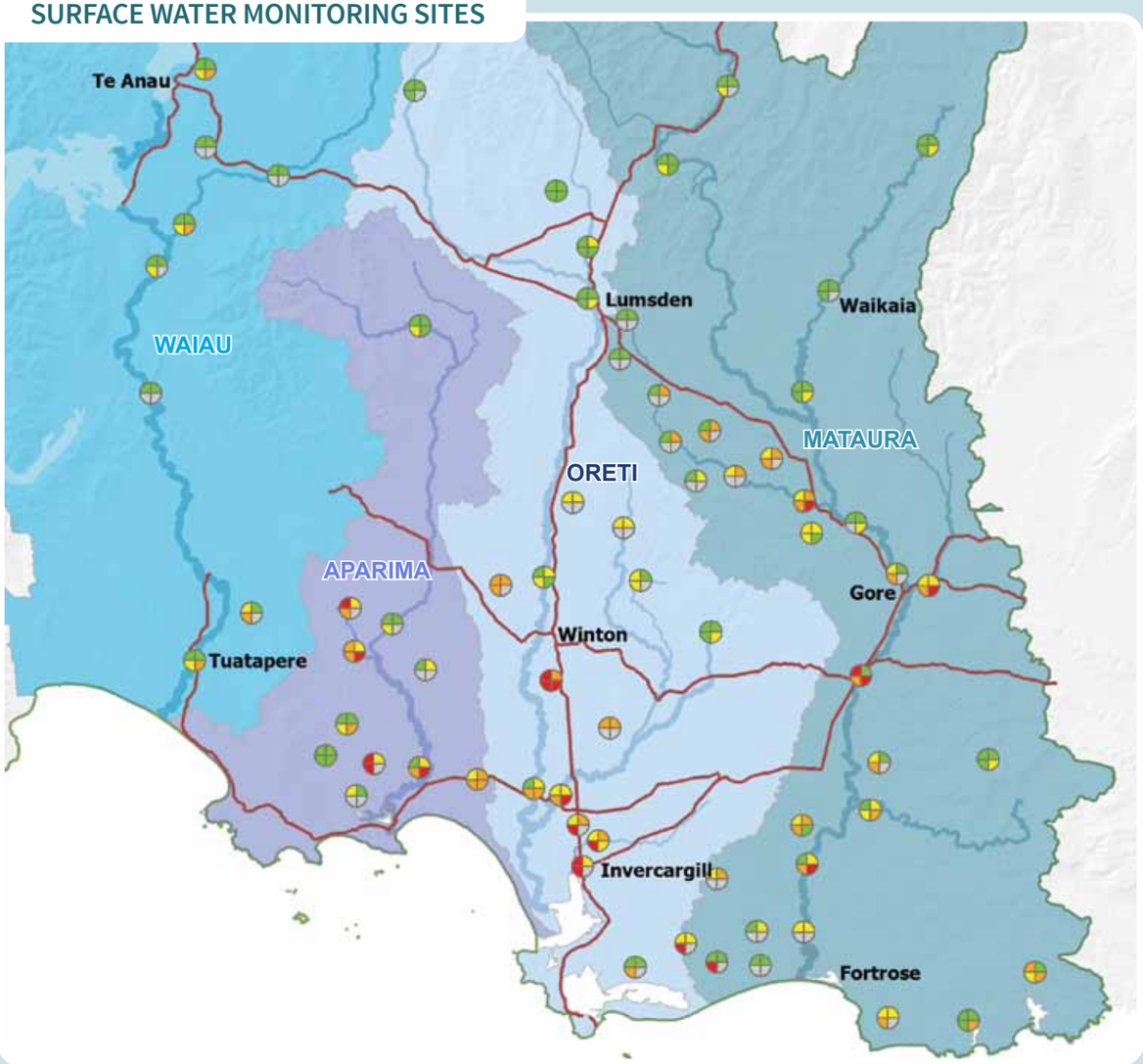
Primary contact recreation

Activities where you are likely to be fully immersed or swallow water, e.g. swimming, waterskiing.

Secondary contact recreation

Activities where your head is unlikely to go underwater, e.g. fishing, wading, boating.

SURFACE WATER MONITORING SITES



▲ *E.coli* (Secondary contact)

In water *E.coli* is used as an indicator of the risk of getting sick from contact with it, defined as either primary or secondary contact. High levels of *E.coli* in water can make people and animals sick.

Here, *E.coli* from five years of monitoring is compared to the compulsory national bottom line for secondary contact, which is 1000 *E.coli* per 100ml.

Monitoring locations with red in the top left quarter do not meet the national bottom line for *E.coli* (five of 60 sites) and will need to improve in the future.

Through the catchment limit setting process, communities may wish to apply a 'primary contact recreation' value to some areas. The known swimming spots in Southland are of concern when this more stringent criteria for *E.coli* is used. Many of these spots put swimmers at an unacceptably high level of risk.

Go to our BEACON online mapping service to see more information on these sites – www.es.govt.nz

▲ Nitrate toxicity to fish

Nitrate is essential for all life, although in high amounts it can cause undesirable growths of algae and become toxic to fish.

Here, nitrate monitoring from July 2009 – June 2014 is compared to the national bottom line criteria for toxicity to fish. No monitoring locations are below the national bottom line for fish toxicity, however at many locations nitrate levels are getting higher. The NPS–FM requires these levels be maintained, so any decline needs to be halted. Where slime algae levels are high, nitrate levels may need to be improved.

▲ Slime algae (periphyton)

Slime algae is sometimes called periphyton. It grows naturally in all water; however its growth is enhanced by high nutrient levels. Very thick mats of slime algae can be toxic to humans, can reduce the amount and type of food available for fish and remove oxygen from water.

Here, summer algae monitoring has been compared to the compulsory national bottom line for periphyton using a model of how much algae is likely to be present for one or two months per year. Eight sites indicate regular or longer duration of slime algae blooms.

A model is used because the suggested three years of monthly observations of algae is not available. To better understand slime algae in Southland, in November 2014 Environment Southland introduced a monthly algae monitoring programme.

▲ Macroinvertebrates

Macroinvertebrates include the may flies, caddis flies, worms and snails that live in rivers. They are an important food source for fish and birds and sensitive to the combination of nutrients, sediment and habitat. Because of this sensitivity, they are considered to be a good representation of overall water quality and ecosystem health. The different macroinvertebrates present can be identified and then converted to a score called the Macroinvertebrate Community Index (MCI).

The median MCI scores over five years (2010–14) are compared to national quality classes for sites with more than three observations. Monitoring locations with red in the bottom left quarter are classified as having poor ecosystem health (seven sites).

Water quality sampling locations in Southland

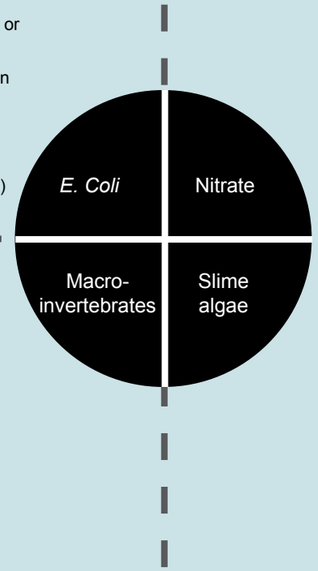
Each monitoring location shown on the map opposite is represented by a circle. Each quarter represents what we are measuring and the colour of the quarter represents the current water quality as detailed below.

E. COLI (SECONDARY CONTACT)

- Minimal health risk for wading or boating.
- Increased health risk (less than 1%) for wading or boating.
- Moderate risk of infection (1-5%) for wading or boating.
- High risk of infection (over 5%) for wading or boating.

NITRATE TOXICITY

- No observed effect on any species tested.
- Can have an impact on the 5% most sensitive species.
- Can have an impact on the 20% most sensitive species.
- Impacts on the growth of many species and can have an acute impact on more sensitive species.



MACROINVERTEBRATES (FISH FOOD)

- Excellent
- Good
- Fair
- Poor
- Data unavailable

SLIME ALGAE (PERIPHYTON)

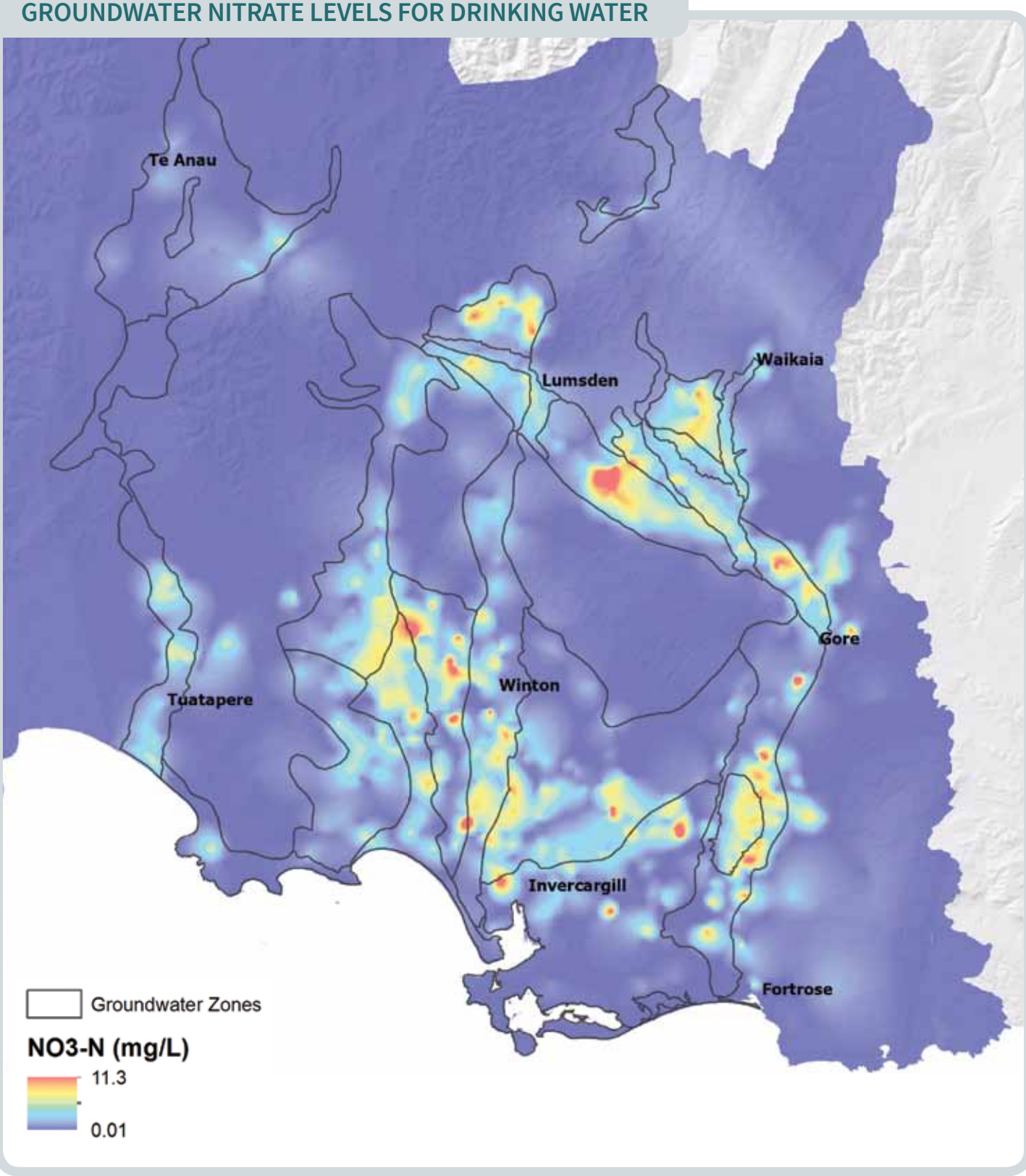
- Algal blooms are rare, indicating minimal nutrient levels and/or natural flow or habitat disruption.
- Occasional blooms, indicating low nutrient level and/or natural flow or habitat disruption.
- Periodic short-duration blooms, mostly of nuisance value, indicating moderate nutrient levels and/or natural flow or habitat disruption.
- Regular or longer duration blooms, indicating high nutrient levels and/or significant natural flow or habitat disruption.
- No monitoring at this site

▲ Groundwater quality – nitrate toxicity to humans

Some areas of the Southland Plains clearly show elevated nitrate levels when assessed against the drinking water standard of 11.3 mg/L.

This is the acceptable level for human drinking water, however if we were to manage our water to this standard we would struggle to meet the NOF bottom line of 6.9 mg/l (nitrate toxicity to fish) and would see noticeable changes in ecosystem health. The link between groundwater and surface water means the impact of nitrate-rich groundwater can pose a significant risk to ecosystem health in our rivers and streams.

GROUNDWATER NITRATE LEVELS FOR DRINKING WATER

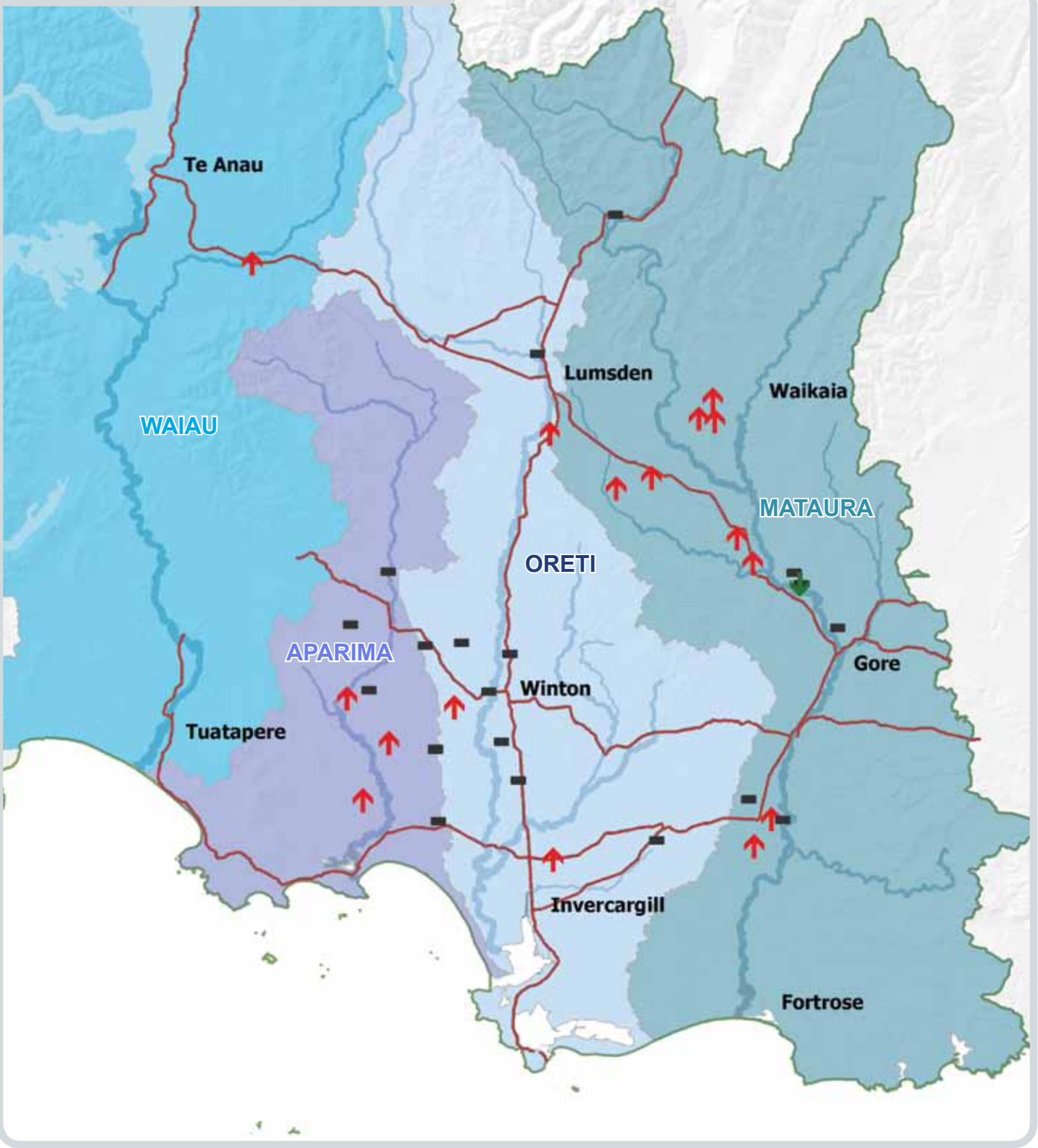


▲ Nitrate changes over time – groundwater

This map shows nitrate trends in groundwater across Southland for monitoring sites with 10 years of data (2003 – 2013). The most recent 10-year trend analysis is available at www.lawa.org.nz.

Deteriorating trends for nitrate in groundwater are shown with red arrows below. In groundwater only one site shows improvement (green arrow). The sites with black dashes show no significant change.

GROUNDWATER NITRATE TRENDS

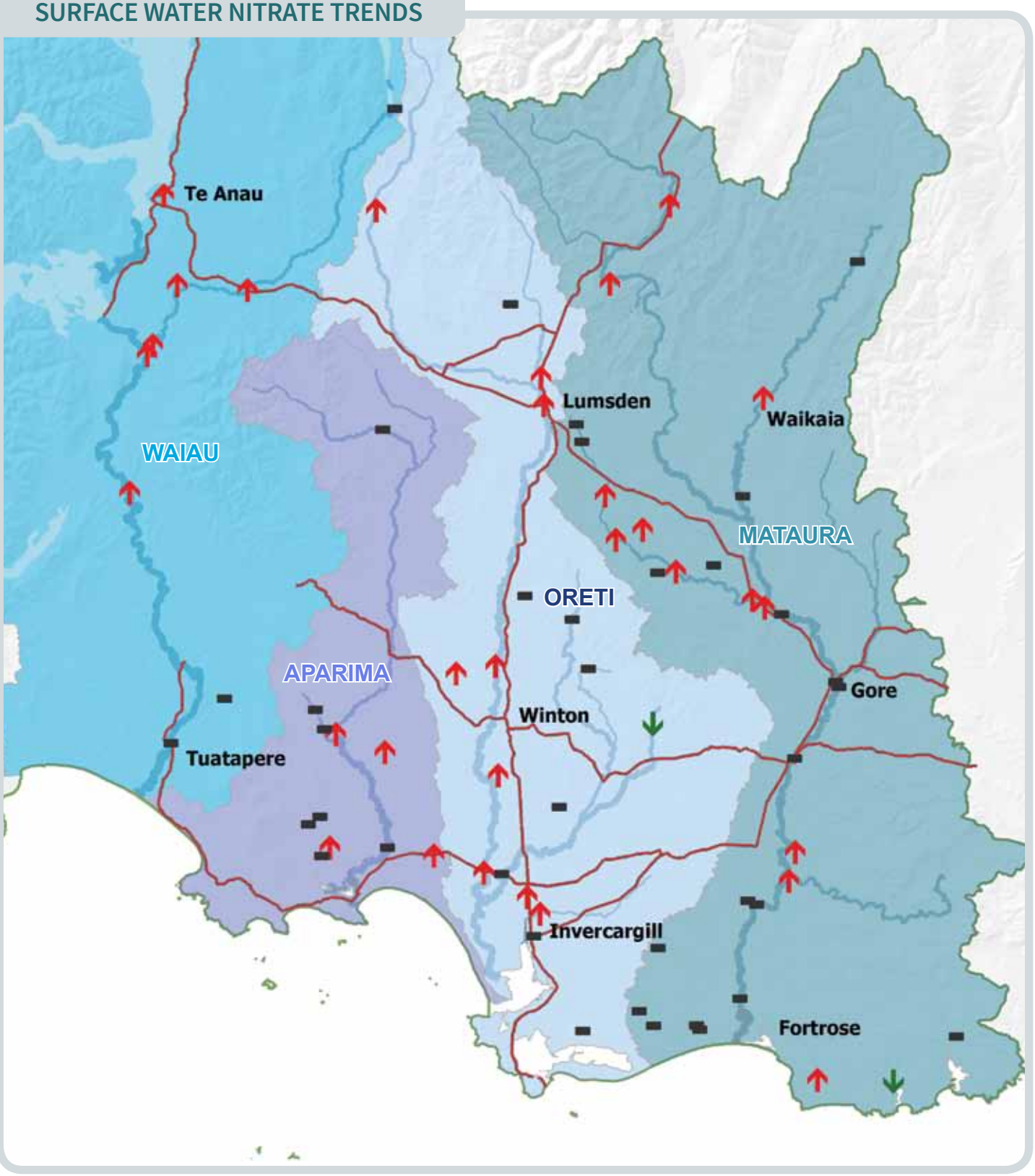


▲ Nitrate changes over time – surface water

This map shows nitrate trends in surface water across Southland for monitoring sites with 10 years of data (2003 – 2013). The most recent 10-year trend analysis is available at www.lawa.org.nz.

Deteriorating trends for nitrate in surface water are of concern across Southland. In surface water two sites are showing improvements (green arrow), however many sites have increasing levels of nitrate (red arrow). The sites with black dashes show no significant change.

SURFACE WATER NITRATE TRENDS

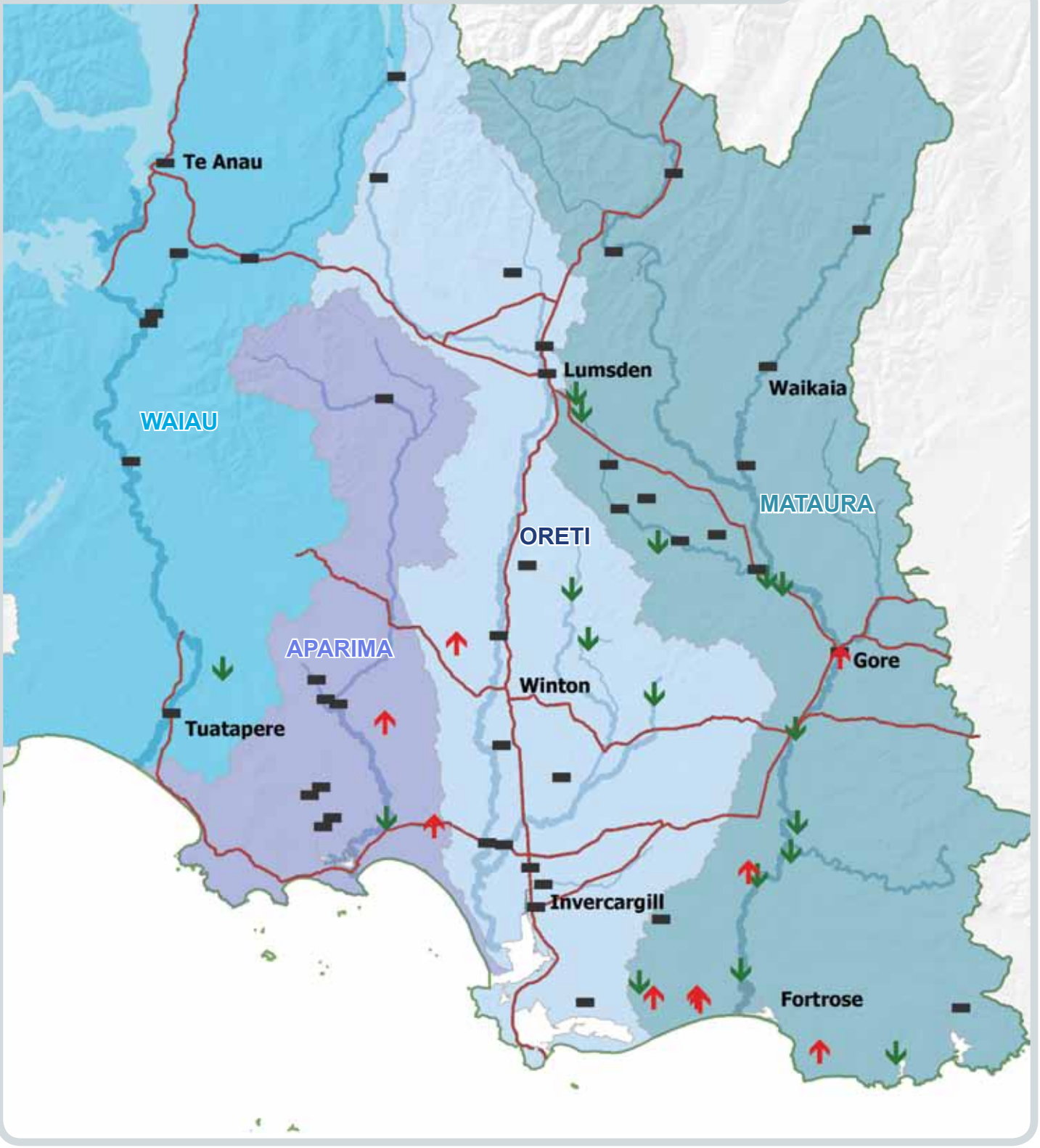


▲ Dissolved reactive phosphorus – surface water

These maps show dissolved reactive phosphorus trends in surface water across Southland for monitoring sites with 10 years of data (2003 – 2013). The most recent 10-year trend analysis is available at www.lawa.org.nz.

Across Southland we are seeing a number of improving trends for dissolved reactive phosphorus (green arrow). Many other regions are also seeing this improvement in dissolved reactive phosphorus, but despite many theories, the cause for the improvement is still unknown.

SURFACE WATER DISSOLVED REACTIVE PHOSPHORUS TRENDS



How is water quality assessed?

In Southland surface water quality samples are collected each month from a number of locations. Ecosystem health is monitored by observing macroinvertebrates annually during summer and algae is monitored monthly.

When the results from the water quality monitoring and ecosystem health monitoring are combined, they indicate the overall health of a stream.

Groundwater samples are taken every three months and analysed for a wide range of parameters including nitrogen and phosphorus.

What is Water and Land 2020 & Beyond?

The Water and Land 2020 & Beyond project is a partnership project with Ngāi Tahu ki Murihiku, developed to respond to Southland's water quality and quantity issues.

The project brings together information to help us understand our region, through science, economic, social and cultural work streams. We want to understand the likely impacts of potential policies, as well as our communities' aspirations for water before we set any catchment limits required by the government through the National Policy Statement for Freshwater Management (NPS-FM). The catchment limit setting process is due to commence in late 2016. Go to **www.es.govt.nz/waterandland/** for more on this process.

For more information

- Use Environment Southland's BEACON online mapping service to see more details on water quality at each monitoring site. There are also more detailed scientific reports and summaries available on our website – **www.es.govt.nz**.
- For the latest trend information on the sites we monitor go to **www.lawa.org.nz**. The LAWA website also holds groundwater quality and quantity information for Southland.
- More more on the NPS–FM and the national bottom lines go to **www.mfe.govt.nz.**

References

Rissmann, C. 2012. *The Extent of Nitrate in Southland Groundwaters Regional 5 year median (2007 – 2012 (June)*. Environment Southland Publication No 2012-09. www.es.govt.nz/media/21535/five_year_median_nitrate_technical_report-2012.pdf

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Stark, J. and Maxted, J. 2007. *A User Guide for the Macroinvertebrate Community Index*. Prepared for the Ministry for the Environment. Cawthron Report No. 1166. 58 p.

Moreau, M. and Hodson, R. 2015. *Trends in Southland's water quality: a comparison between regional and national sites for groundwater and rivers*. GNS Science Consultancy Report 2014/61.

Southland Science Programme

The Southland Science Programme aims to fill the gaps in our knowledge about how our waterways function and how their ecosystems respond to the pressures from different land uses. As well as improving our understanding of our river catchments, one of the key outcomes of the science programme will be the development of a 'scenario' computer model. Our scientists will use this model to create 'what if' scenarios that simulate the impacts of land uses on waterways.