Healthy Taieri

# Water quality in the upper Taieri/Taiari catchment

Water quality and various environmental monitoring information has been assessed to form a better understanding of the health of the Taieri/Taiari River, and to identify key priorities to maintain and enhance the health of waterways in the catchment. This summary focuses on the upper catchment (upstream of Tiroiti). Information was drawn from monitoring and investigations carried out by various organisations and groups, including the Otago Regional Council (ORC), Maniototo Irrigation Company, Central Otago District Council and Tiaki Maniototo.

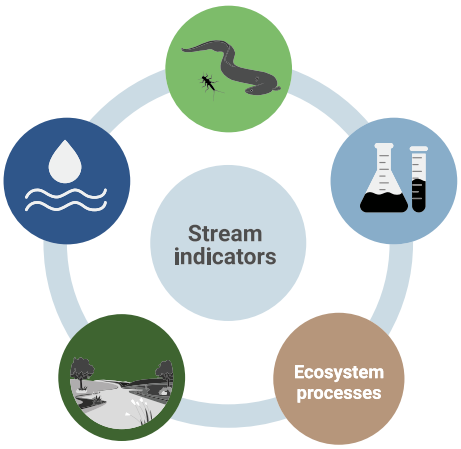
## One size does not fit all – unique features of the Taieri River

The Taieri River has a distinctive natural brown tea-colour, a result of tannins leached from the scroll plain wetland and tussock covered soils in the upper catchment. The dark waters contribute to reduced visibility through the water and lessen the amount of light that can reach the riverbed, even in the absence of sediment, algae or other particles suspended in the water. For this reason, care is needed when comparing visual clarity measurements for the Taieri River against other rivers and national measures for rivers that lack tannin-staining.

The slow, natural meander of much of the river in its upper reaches also means that it naturally has lower levels of dissolved oxygen than many other rivers. This 'sluggish' flow and numerous deep reaches mean that the river does not support the same number and types of invertebrates (e.g. aquatic insects, crustaceans, snails, worms and other small critters) commonly seen in many upland rivers. This contributes to the river's lower scores for traditional summary measures of invertebrate health.

Another feature of the Taieri River is the balance between the forms of nitrogen and phosphorus that can fuel nuisance algae or plant growth (often referred to as plant-available forms). In contrast with most New Zealand rivers, the plant-available nitrogen levels are very low compared to plant-available phosphorus levels. This means any increase in nitrate-nitrogen levels is more likely to increase nuisance algal growth more than a further increase in phosphorus would.

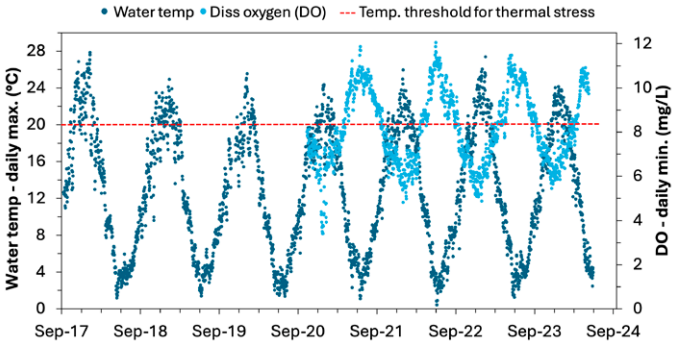
# How healthy is this part of the river and its tributaries?




**Right: Good water quality is only one element of a healthy river. The aquatic life it supports, along with key processes such as nutrient cycling, the quality of the riverbed and riparian habitat, and flow types and amount, are also important. Adapted from Milne et al. (2023) - available on the Wai Connection website under the Community-based Monitoring Resources section: waiconnection.nz/pages/resources/**

- The upper Taieri River has low levels of nitrogen and phosphorus compared with other New Zealand rivers draining rural catchments. At Linnburn Runs Road and Stonehenge, median concentrations of dissolved reactive phosphorus (DRP) and dissolved inorganic nitrogen (DIN) rank in the top (best) 25% of monitored rivers in New Zealand. But by the time the river reaches Waipiata, the water is more turbid (i.e. carries more sediment and is less clear) and the levels of nutrients and *E. coli* bacteria are higher. At this site DIN levels are still low, but median DRP and total phosphorus levels rank in the bottom (worst) 25% of all monitored upland river sites.

- Less is known about the river's ecological condition because this has not been monitored regularly. Recent ORC and Tiaki Maniototo invertebrate monitoring results suggest the river is not as healthy as it could be. Some of this reflects the river's characteristics (see 'One size does not fit all' box), but high water temperatures and low flows in summer also contribute while in-river and riparian habitat are degraded in places.




**Taieri River at Waipiata (ORC monitoring data). The river gets very warm in summer and can't hold as much oxygen. This can create stressful conditions for trout and other sensitive aquatic life. Recent research completed for DOC predicts water temperatures will only get warmer as climate change takes hold.**

**Excessive fine sediment and weed growth in the Taieri River at Cogan's Bridge**

- Fine sediment smothers the river bed in some locations. As well as reducing the quality of the river's naturally cobbled bed for invertebrates and fish, the fine sediment provides a base for rooted plants to establish as well as an additional source of nutrients to support their growth. Limiting the amount of fine sediment entering the river is critical to maintaining and improving water clarity and river health.

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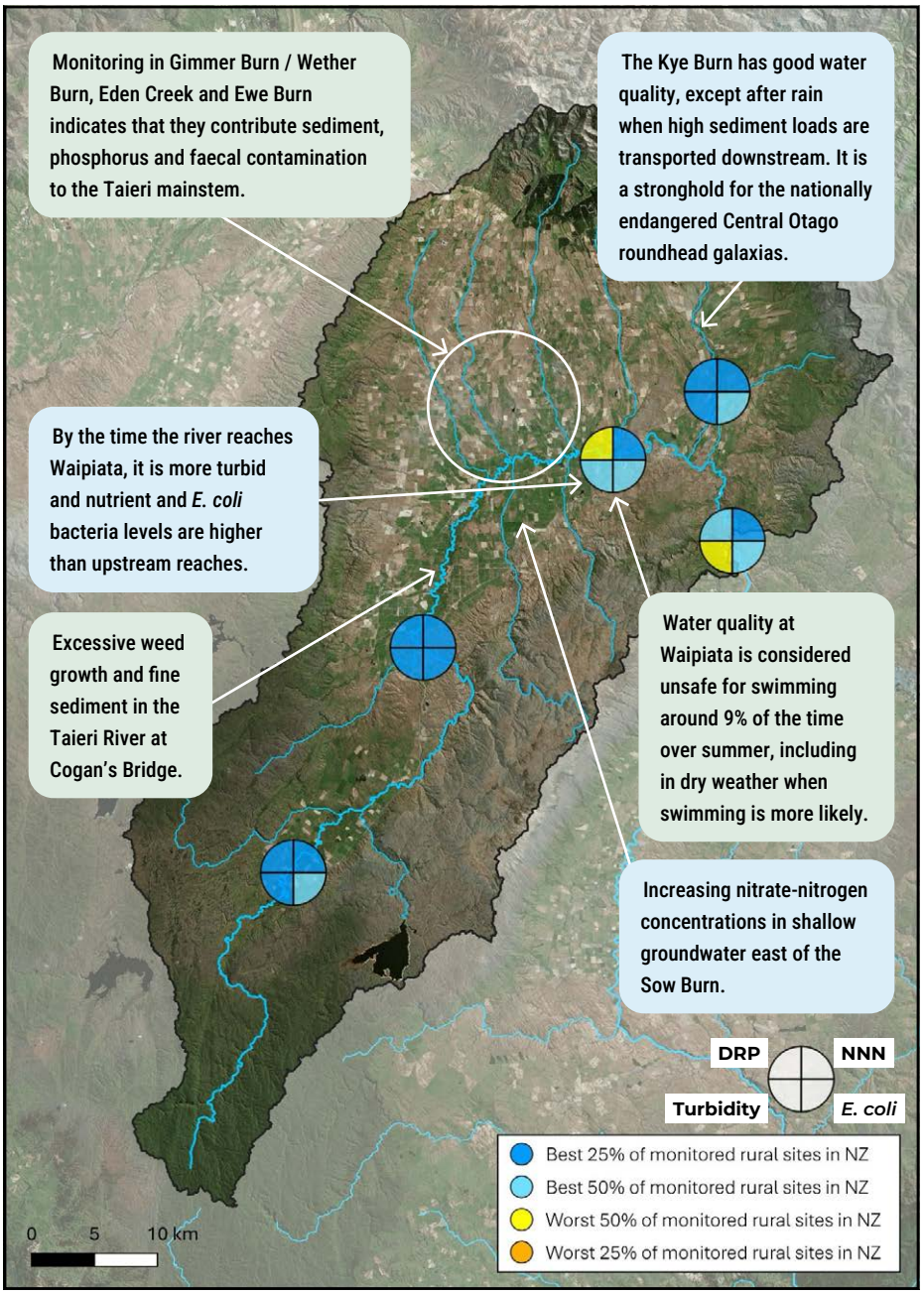
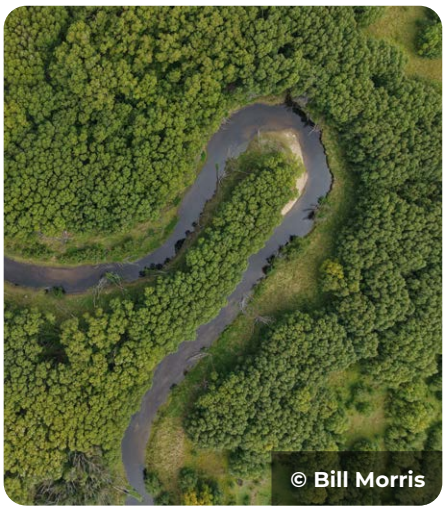
- The Kye Burn has very good water quality, except after rain when high sediment loads are transported downstream. It supports a reasonably healthy stream invertebrate community and, along with the Ewe Burn, is a stronghold for the nationally endangered Central Otago roundhead galaxias (pictured above).




- Investigations of water quality in low-lying reaches of tributaries joining the Taieri River upstream of Waipiata have shown that these tributaries contribute elevated levels of sediment, phosphorus and faecal contamination to the mainstem – particularly in locations where border dyke irrigation still occurs.

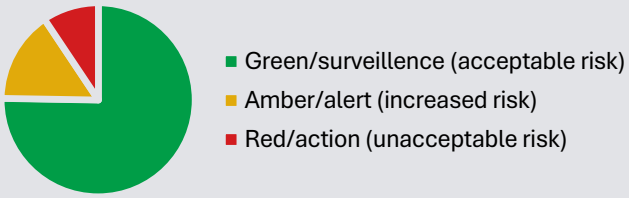
- Treated wastewater from Ranfurly is also discharged into a tributary of the Ewe Burn and may contribute to elevated levels of phosphorous in that area.

## Will we get sick from swimming at Waipiata?

Summer-time monitoring indicates that *E. coli* indicator bacteria counts sometimes exceed national guidelines for safe swimming at Waipiata.

Over the 10 summers ending March 2024, the risk to human health was unacceptable on 9% of sampling occasions. The high *E. coli* counts were not restricted to wet weather when overland runoff is known to impact water quality; they also occurred in dry weather when swimming is more likely.

Faecal source tracking by the ORC has identified both ruminant (e.g. cattle and sheep) and wildfowl (e.g. ducks and geese) inputs. Stock access in upstream tributaries and irrigation by-wash discharges are known contributors of faecal contamination.




**Summary of human health risk from swimming in the Taieri River at Waipiata, based on a comparison of *E. coli* counts against national guidelines for recreation. (Source: ORC data for the summer months between December 2014 and March 2024.)**

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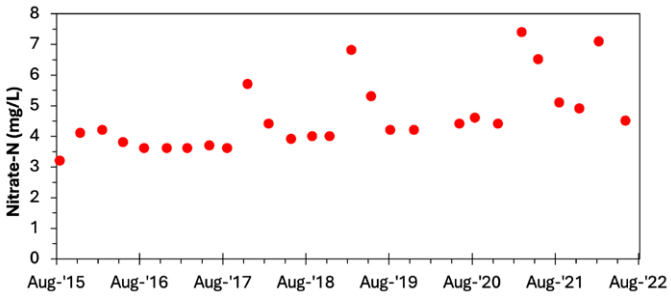
## Is river health getting better or worse?

State and trend reporting by the ORC indicates that turbidity and levels of phosphorus decreased (improved) in the main stem of the river over the 10 years ending in June 2022. There is no hard data to confirm why but improved stock exclusion from tributary waterways and an increasing shift away from border dyke irrigation to spray irrigation have likely contributed to the measured improvements.

**Watch for nitrogen:** There were some signs of increasing nitrate-nitrogen concentrations in shallow groundwater at one monitoring location. Spray irrigation can lead to increased leaching of nitrate into the underlying groundwater and from there into streams and the river. Anecdotally it appears that nuisance plant growth (possibly fuelled by increases in plant-available forms of nitrogen) is more widespread than it used to be, but we don't have any long-term monitoring data to know for sure.




**Increasing nitrate-nitrogen in shallow groundwater east of the Sow Burn (ORC data). More recent monitoring indicates concentrations are now closer to those measured when monitoring began in 2015.**

## How are the contaminants getting into the water?

- Bank erosion and stock access in the river's tributaries are major sources of fine sediment in the upper Taieri – stock access is also contributing to faecal contamination.
- Overland flow during rain events and surface runoff from border dyke irrigation are also a source of fine sediment to the river and pick up nutrients (especially phosphorus) and faecal matter at the same time.
- Grazing and stock access on lower terraces close to the river during winter also increases the risk of overland flow taking sediment and other contaminants (inc. faecal matter) into the river.
- Works within the bed of waterways (e.g. channel works, gravel extraction) can result in large releases of sediment into the river.
- Leaching of nutrients below the root zone – especially nitrogen – occurs on farmland, particularly during winter and spring or under irrigation.

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# Water quality in the upper Taieri River is generally in good shape. What steps could we take to make it even better?

## Act locally

Protect the waterways and drains on your farm, as individual efforts combine to make a large difference. The overview of water quality above highlights that tributaries in some localities on the Maniototo Plain need attention and can be improved significantly with changes from the paddock scale. Changes to practices at a paddock level will improve the quality of the smaller waterways that feed into the mainstem.

## Keep updating management practices

Check your farm annually and during the wet season, scanning for the next critical source area or risky location that needs to be improved that year. The smallest adaption introduced every year will add up to be significant for the smaller drains and waterways.

## What to look for and possible actions:

- Manage winter grazing well. Paddocks used for these purposes need to be checked regularly in the wet for swales or areas where water gathers before leaving the property. Light rain shouldn't be causing sediment flow.
- Consider not using areas on the lower terrace close to the river for planting fodder crop and winter grazing.
- Keep all stock out of waterways and drains – including by adding new troughs. Fence and leave rank grass along the edges of all drains and creeks – even if they are ephemeral.
- Identify any muddy areas caused by regular traffic and take action to reduce these and the risk of sediment and manure movement.
- Look for any sediment or contaminant movement during light rain and under irrigation. Capture or reduce this run-off by adding grassed buffers, filling in pivot wheel ruts, using VRI to turn off pivots over stock laneways, adding regular cut out on tracks going downhill.
- Are you using border dykes? Make sure the water from the last pass does not drain off the paddock. It may mean your final border is not well watered.
- It rains every winter so be realistic about the risk of bare soil on sloping land and be sure sediment control measures are in place.
- Check for and stop runoff from bridges and culverts entering drains or waterways e.g. by using boards along the edges of bridges.
- Consider spraying and/or physically removing willows so ongoing grazing near stream banks is not required for willow control.
- Is it time to consider sediment traps in areas where a buffer may not be enough?
- In Google Earth you can access several years of aerial photography. Go through the years and seasons to check for wet spots, run-off etc that can be addressed.

## Additional enhancement actions

In addition to the mitigations outlined above, plantings can reduce the amount of nutrients, sediment and faecal matter entering the water, stabilise stream banks, and improve instream habitat and on-farm biodiversity. Possible actions:

- Plant along riparian areas of tributaries to try and provide habitat for freshwater species and a cool refuge from flows in the mainstem.
- Add low growing shelter belts or riparian strips under the centre pivot, and along drains or tracks. The plants will grow well under irrigation.
- Propagate your own plants from local seeds, or purchase plants from the Tiaki Maniatoto nursery. The Maniatoto is a tough climate, the native plants still surviving here are a good indicator of suitable species.
- Survey any small pockets of natives to understand the flora and fauna on your property. That can give you guidance on how to protect or enhance those areas.

### Keep a record of your efforts

A record of the actions with before and after photos over the years is a great reminder of management efforts made to help improve river health and provides a method of reflecting on what has worked well or not so well:

- take photos
- record the length and location of new fencing
- the number and location of new troughs
- areas and numbers of new plantings.

Farming software packages (such as Resolution) could be used for electronic storage with actions linked to farm map locations. Reviewing the success or failures of changes provides information on what adjustments should be focused on next.

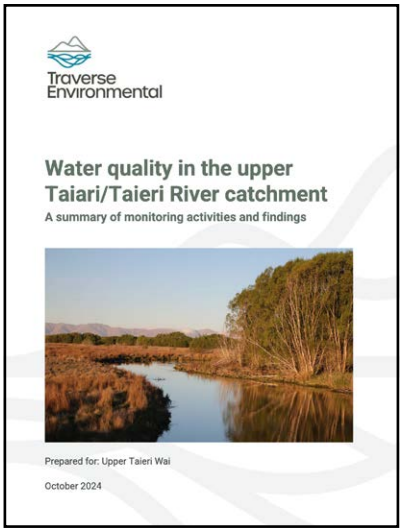
### Will good management practice be enough?

The upper Taieri catchment is fortunate in that if all farms adopt good management practice, we are likely to see significantly less sediment entering the waterways and curb any increasing trends in nitrogen concentrations. However, if good management practice is not adopted across the catchment land use change may be required in order for water quality in the catchment to meet regulatory bottom lines.

## More information

This summary has been prepared as part of the Healthy Taieri Project on behalf of Upper Taieri Wai. This project is funded by the Ministry of Primary Industries' Integrated Farm Planning Accelerator Fund as well as assistance from the Ministry for the Environment's Access to Experts Fund. Information on water quality and river health is based on the report "Water quality in the upper Taiari/Taieri River catchment: A summary of monitoring activities and findings" (Traverse Environmental, 2024).

The full report on water quality in the upper Taieri catchment, including the locations and details of current and past monitoring are available at **www.taiariwai.nz**. This site also has more information on the Healthy Taieri Project.




## Other resources

There is a huge amount of great information on farm planning and management to improve freshwater outcomes – see for example:

NZ Landcare Trust - good management practices: **https://bit.ly/4mJiZNL**

Our Land and Water - farm management resources: **https://bit.ly/42KBiJi**

Ground Rules - legislation for farmers and growers: **https://bit.ly/43ocQh8**