Healthy Taieri

Water quality in the lower Taieri/Taiari catchment

Water quality and various other environmental monitoring information has been assessed to form an understanding of the health of the Taieri/Taiari River, and to identify key priorities to maintain and improve the health of waterways in the catchment. This summary focuses on the lower catchment reaches downstream of Outram Glen. Water quality information was drawn from monitoring and investigations carried out by various organisations and groups, including Otago Regional Council (ORC), Dunedin City Council and Clutha District Council.

One size does not fit all – unique features of the Taieri River catchment in its lower reaches

The Taieri Plain is low lying and flood prone, with an elevation of about 40m in the east, to below mean sea level in the west. At its lowest point (excluding drains and ditches), it lies about 1.5m below mean sea level. Lake Waihola/Waihora, Lake Waipori/Waipōuri and Te Nohoaka o Tukiauau (Sinclair Wetlands) are the remnants of a much larger lake-wetland complex that once covered the Taieri Plain.

Farming and other landuse activities, as well as roading and infrastructure on the Taieri Plain are only possible with extensive artificial drainage to lower the naturally high underlying groundwater table and to drain water away during floods. Most of the natural streams, including the lower Silver Stream and the Ōwhiro Stream also form part of the managed drainage network. This restricts riparian planting and other initiatives that can be carried out to improve instream habitat for aquatic life on these waterways. The combination of managed flows, flat terrain, low elevation and tidal influence in the River's lower reaches means this area has a unique set of challenges.

The Taieri River has a distinctive brown tea-colour from tannins leached from the scroll plain wetland and tussock covered soils in the upper reaches of the river and its tributaries. This colouring reduces visibility through the water and the amount of light reaching the riverbed. 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 same applies to the Waipōuri River.

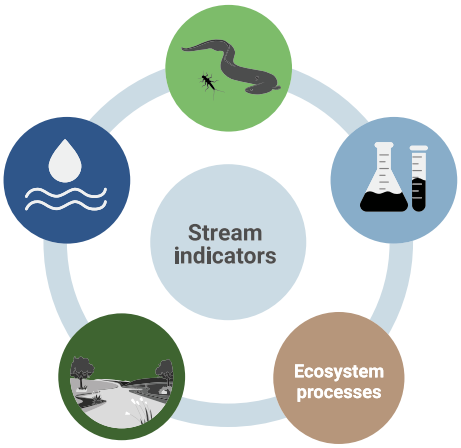
Another feature of the Taieri River is the balance between the forms of nitrogen and phosphorus that can fuel nuisance algae or plant growth (often referred to as plant-available forms). Unlike most New Zealand rivers, the Taieri River's plant-available nitrogen levels are very low compared to plant-available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

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

- Water quality in the Taieri River at Outram compares favourably with many other NZ rivers draining rural catchments. Median concentrations of dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP) rank in the best (lowest) 25% and 50% of monitored rural rivers in New Zealand, respectively. However, water quality in the river and its many tributaries deteriorates across the Taieri Plain due to multiple inputs from agricultural and urban drainage and, in East Taieri, nitrate-enriched groundwater. Water quality in the Taieri River at Allanton is poorer than at Outram.

- Faecal contamination is frequent and significant at monitored sites in the middle and western end of the Taieri Plain, including the Silver Stream at Taieri Depot, Meggat Burn at Henley-Berwick Road and Taieri River at Allanton. The Ōwhiro Stream is not currently monitored but historically has also recorded very high faecal contamination.

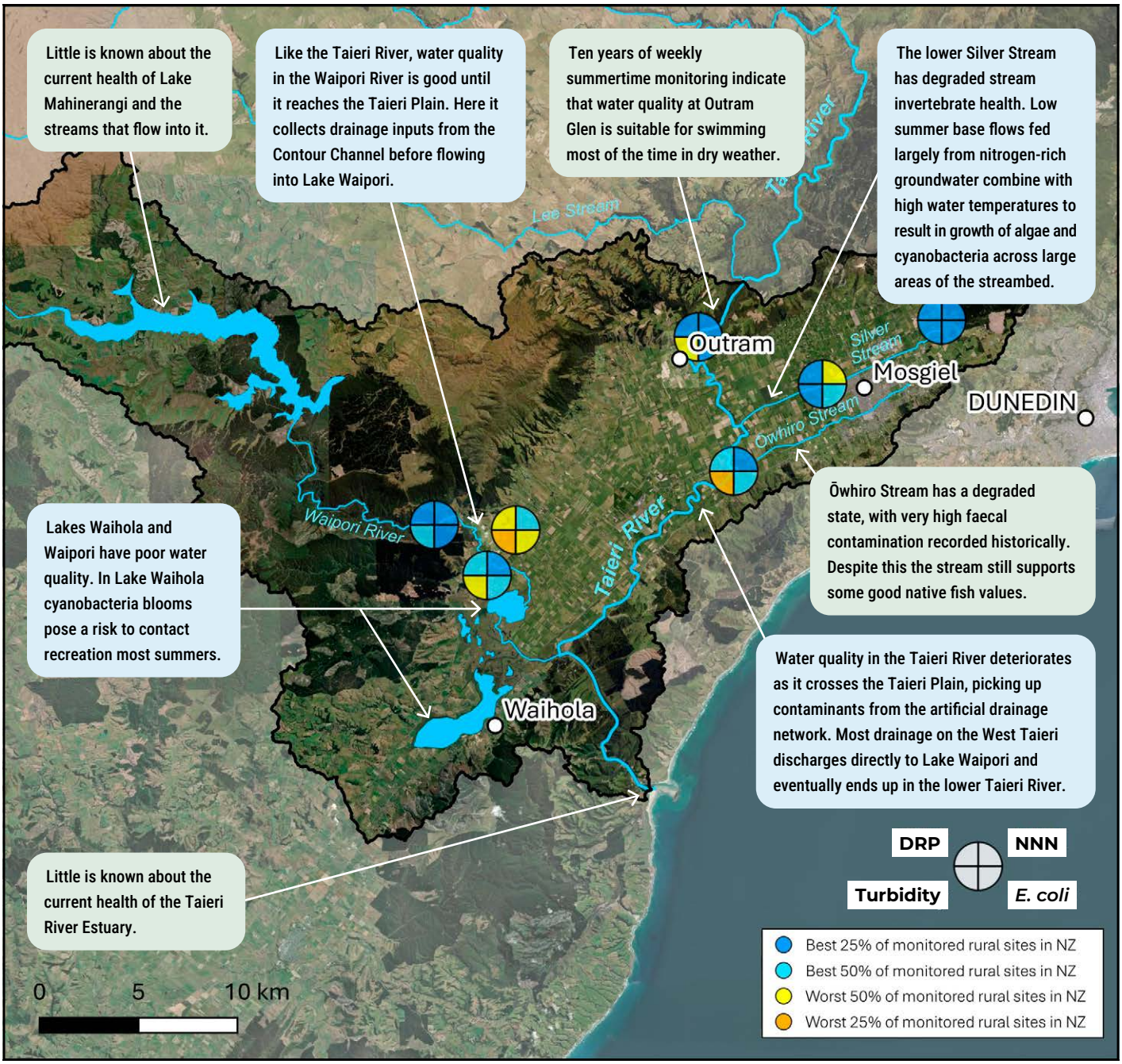
Right: Good water quality is only one element of a healthy river. The aquatic life it supports, along with key processes such as nutrient cycling, the quality of the riverbed and riparian habitat, and flow types and amount, are also important. Adapted from Milne et al. (2023) - available on the Wai Connection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



- The health of stream invertebrate communities (aquatic insects, snails, worms and other small critters) on the Taieri Plain is poor. Most streams have too much silt on their beds, and not enough shade and variation in flow features to support a healthy range of invertebrates. The Silver Stream has a bed of clean gravels, favourable for trout spawning, but invertebrate health in the lower reaches is poor – here, low summer base flows fed largely from nitrogen-rich groundwater combine with high water temperatures to result in growth of algae and cyanobacteria that can cover large areas of the streambed.

Microcoleus cyanobacteria, commonly referred to as toxic algae, is often seen in the lower reaches of the Silver Stream. Under certain conditions, these dark green/brown or black mats can release natural toxins that can pose a health risk to humans and animals. The toxins are known to be deadly for dogs which are attracted to the musty odour the mats produce – keep dogs on a lead when toxic algae are present and don't let them eat any algal material.

Despite the degraded state of much of the Ōwhiro Stream, monitoring by the Department of Conservation and schools indicate the stream still supports some good native fish values. Fish recorded include inanga, giant kōkopu (pictured), common bully, and both shortfin and longfin eel.



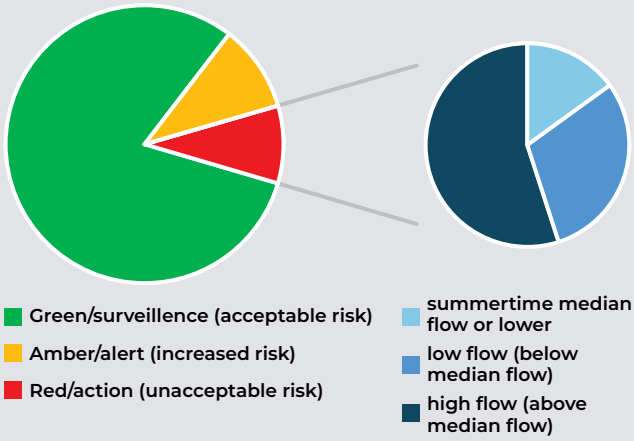
Most of the natural streams, including the lower Silver Stream (left) and the Ōwhiro Stream (middle left) are managed as part of the Taieri flood drainage network, which restricts activities such as enhancements adjacent to them. Currently, similar to the artificial drains (right), a combination of contaminated drainage inputs, bank erosion and streambed silting plus a lack of shade mean the health of the aquatic invertebrate communities is poor.

Will we get sick from swimming in the river?

While most sites on the Taieri Plain, including the main stem at Allanton, are unsuitable for swimming due to high levels of faecal contamination, the picture is better at Outram Glen. Weekly monitoring of *E. coli* indicator bacteria at this site over the last ten summers indicates that the risk to human health was unacceptable on less than 10% of sampling occasions. Of these, only a handful of occasions coincided with dry weather when the river flows were low enough for safe swimming.

In most cases, high *E. coli* counts at Outram Glen occur when the river is flowing high after rainfall in the upper and mid Taieri catchment. As it can take several days for this 'dirty' water to reach Outram, sometimes it may be hot and dry – ideal weather for swimming – but water quality at Outram will still be poor. Both river water clarity and water level will provide clues about when water quality will be safest for swimming.

Water quality at Taieri Mouth is not routinely monitored. Limited historical data suggest it is likely to be suitable for swimming except when the river is running high or dirty.



Summary of human health risk from swimming in the Taieri River at Outram Glen based on a comparison of *E. coli* counts against national guidelines for recreation. However, the breakdown of river flow for the red/action level (when there is unacceptable risk to human health) shows that it is mostly high flow conditions – following rainfall in the upstream catchment – when water quality is unsuitable for swimming – this means that people are unlikely to be swimming in the river at these times. (Source: ORC data for the summer months between December 2014 and March 2024.)

Is river health getting better or worse?

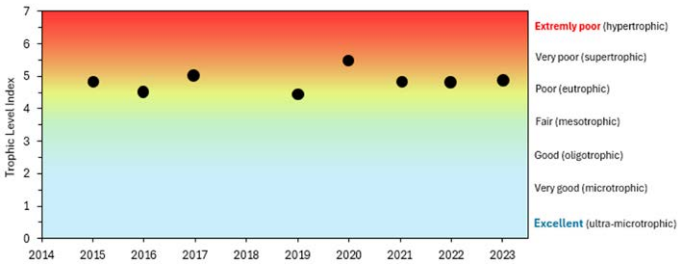
State and trend reporting by the ORC indicates that turbidity and phosphorus levels decreased (an improvement) at both sites on the Taieri River (Outram and Allanton) and the lower Silver Stream over the 10 years ending in June 2022. The reasons for the trends are not clear but improving trends in turbidity and phosphorus were also reported for the upper and middle reaches of the Taieri River.

Over the same 10-year period, nitrate-nitrogen concentrations increased at a rate of over 9% per year in one shallow groundwater well north of Mosgiel. This enriched groundwater interacts with the overlying surface water and ultimately enters the river. Little information is available on trends in ecological health owing to limited monitoring data.

What about the lakes and estuary?

Water quality is monitored in Lakes Waipori and Waihola, but not in Lake Mahinerangi.

Water quality in Lake Waihola is poor and this hasn't really changed in the 20+ years it has been monitored. The lake water has high levels of phosphorus and algae (phytoplankton) and is classified as eutrophic based on the widely applied index of lake water quality. Cyanobacteria blooms are common in most summers, creating a health risk to dogs and people carrying out water-based recreation activities.



Annual grades of water quality in Lake Waihola between 2014 and 2023, based on a commonly reported index of lake condition. (Source: ORC data for a mid-lake site, as reported on the LAWA website in September 2024).

Lake Waipori is also eutrophic with poor water quality. The condition of Lake Mahinerangi is likely much better but there has not been any routine monitoring to confirm this.

The current health of the Taieri River Estuary is not known. An assessment in 2007 found some signs of nutrient enrichment but, based on the full suite of estuarine health indicators assessed, overall the estuary was described as being in "good health".

While water quality in Lake Waihola is poor, a survey by NIWA in 2023 found some good native plant values still exist. The most abundant native plants included blunt pondweed (left) and stonewort. The invasive Canadian pondweed (right) was also widespread but in much smaller amounts.

How are the contaminants getting into the water?

- Bank erosion and collapse in the river's tributaries, including the artificial drainage network, is likely a significant source of fine sediment in waterways in the lower Taieri catchment.

- Overland flow is a key source of fine sediment to the river in wet weather when large areas of the Plain can be ponded. Large amounts of sediment can also enter the Taieri main stem after heavy rainfall in the upstream catchment. Fine sediment entering the river carries with it nutrients (especially phosphorus) and faecal matter.

- In Mosgiel and North Taieri, the shallow groundwater is a source of nitrogen to some surface waters, including the lower Silver Stream. In the West Taieri area, the groundwater has greater protection from nitrogen and other contaminants arising from the overlying land use – here the soils are mostly poorly draining and so contaminants enter surface water from overland runoff and the artificial drainage network.

- As well as contaminant inputs entering via the lower Waipori and Taieri Rivers, Lake Waipori also receives intermittent pumped discharges of nutrient-rich agricultural drainage water (that currently also includes treated wastewater from Dunedin International Airport). Treated wastewater from Waihola township also enters the wider wetland system through an outlet channel of Lake Waihola and both lakes support large populations of waterfowl that contribute to faecal and nutrient contamination.

What actions should we take?

Act locally

Protect the waterways and drains on your farm, by restricting stock access and maintaining some riparian vegetation where this can be done without impeding flood flows. Remember drains lead to waterways and lakes.

Keep updating management practices

Review the farm annually and during the wet season, scanning for areas where water gathers and leaves the property, or other risky locations (termed 'critical sources areas'). 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. Ensure there are 5m setbacks from waterbodies.
- Look for any sediment or contaminant movement during light rain. Capture or reduce this run-off by adding grassed buffers and adding camber to tracks that directs water towards paddocks.
- Identify any muddy areas caused by regular traffic and take action to reduce these and the risk of sediment and manure movement.
- Keep all stock out of waterways and drains. Fence and leave rank grass along the edges of all drains and waterways – even if they only flow periodically.
- Watch that stock don't have access to springs and wet areas. These should be fenced where possible.
- Check for and stop runoff from bridges and culverts entering drains or waterways e.g. by using boards along the edges of bridges.

Keep a record of your efforts

Take photos, record the actions and projects implemented such as: the length and location of new fencing, the number and location of new stock troughs, the culverts and stock crossings, or the number and area of new plantings.

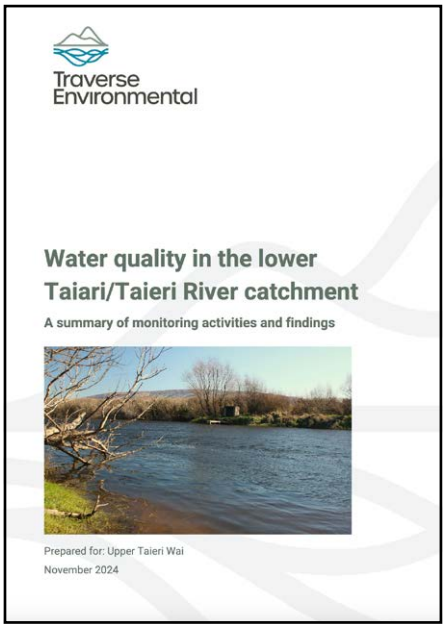
A record of the actions with before and after photos over the years is a great reminder of management efforts made to help improve river health and provides a method of reflecting on what has worked well or not so well.

Farming software packages (such as Resolution, FarmIQ) could be used for electronic storage with actions linked to farm map locations.

Reviewing the success or failures of changes provides information on where next to make adjustments.

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 lower Taiari/Taieri River catchment: A summary of monitoring activities and findings" (Traverse Environmental, 2024).



The full report on water quality in the lower 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.

ORC Flood Protection Management Bylaw 2022

Don't forget to check if your drain or waterway is part of the ORC's Flood Protection Management Bylaw 2022 before undertaking any significant works near waterways in the lower Taieri area. Check the maps at: **www.bit.ly/3ZoxXi8**. You can contact the ORC's catchment advisor team for further help at **catchments@orc.govt.nz** or **0800 474 082**.

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

DairyNZ - Environment resources:
https://bit.ly/4mtETok

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

Our Land and Water - Farm Management resources:
https://bit.ly/42KBiJi