Healthy Taieri

Water quality in the mid 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 improve the health of waterways in the catchment. This summary focuses on the mid catchment reaches between Tiroiti and Outram Glen. Information was drawn from monitoring and investigations carried out by various organisations and groups, including the Otago Regional Council (ORC), Dunedin City Council and the Mid Taieri Wai catchment group.

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 reaches of the river and its tributaries.

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.

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.

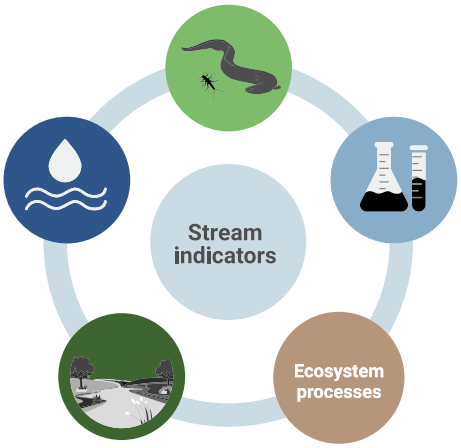
How healthy is this part of the river and its tributaries?

- The mid-reaches of the Taieri River have low levels of nutrients, in particular nitrogen, compared with other New Zealand rivers draining rural catchments. At Sutton, median concentrations of plant available dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP) rank in the top (best) 25% and 50% of monitored rural rivers in New Zealand, respectively. All of the monitored tributaries also record low nutrient concentrations.

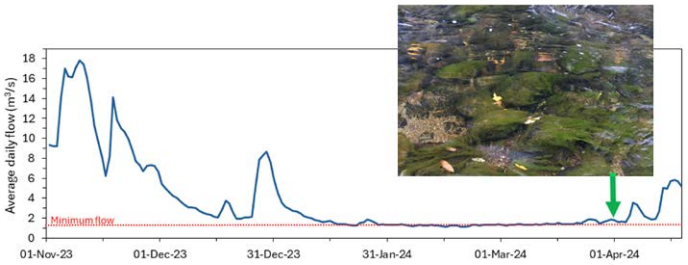
- Water clarity is poorer in the mid reaches of the Taieri mainstem compared with the upper Taieri, with the median turbidity value for Sutton placing this site in the bottom (worst) 25% of all monitored sites draining upland rural areas. Notwithstanding the natural brown colour of the Taieri, the higher turbidity indicates there is more suspended fine sediment in the water compared with further upstream.

- Faecal contamination is also higher in the Taieri River at Sutton than at Tiroiti and Outram. *E. coli* counts are regularly at warning thresholds, indicating an increased (but not unacceptable) risk to human health. This sometimes occurs in fairly dry summer weather which suggests it may be from stock access and birdlife (rather than runoff during rainfall events).

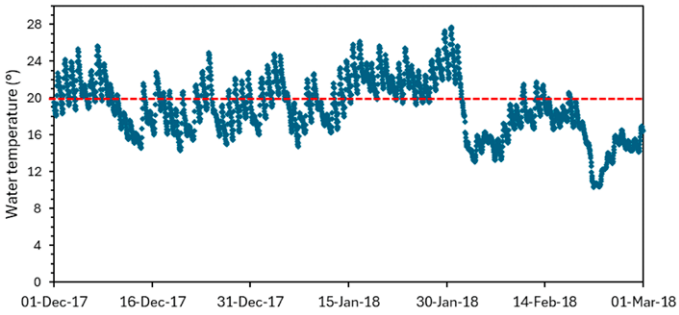
- Less is known about the river's ecological condition because this has not been monitored regularly. Recent ORC and Mid Taieri Wai monitoring of tributary streams has shown that some streams have degraded invertebrate communities. Warm water temperatures and low flows in summer contribute to this, and in-river and riparian habitat are also poor in places.



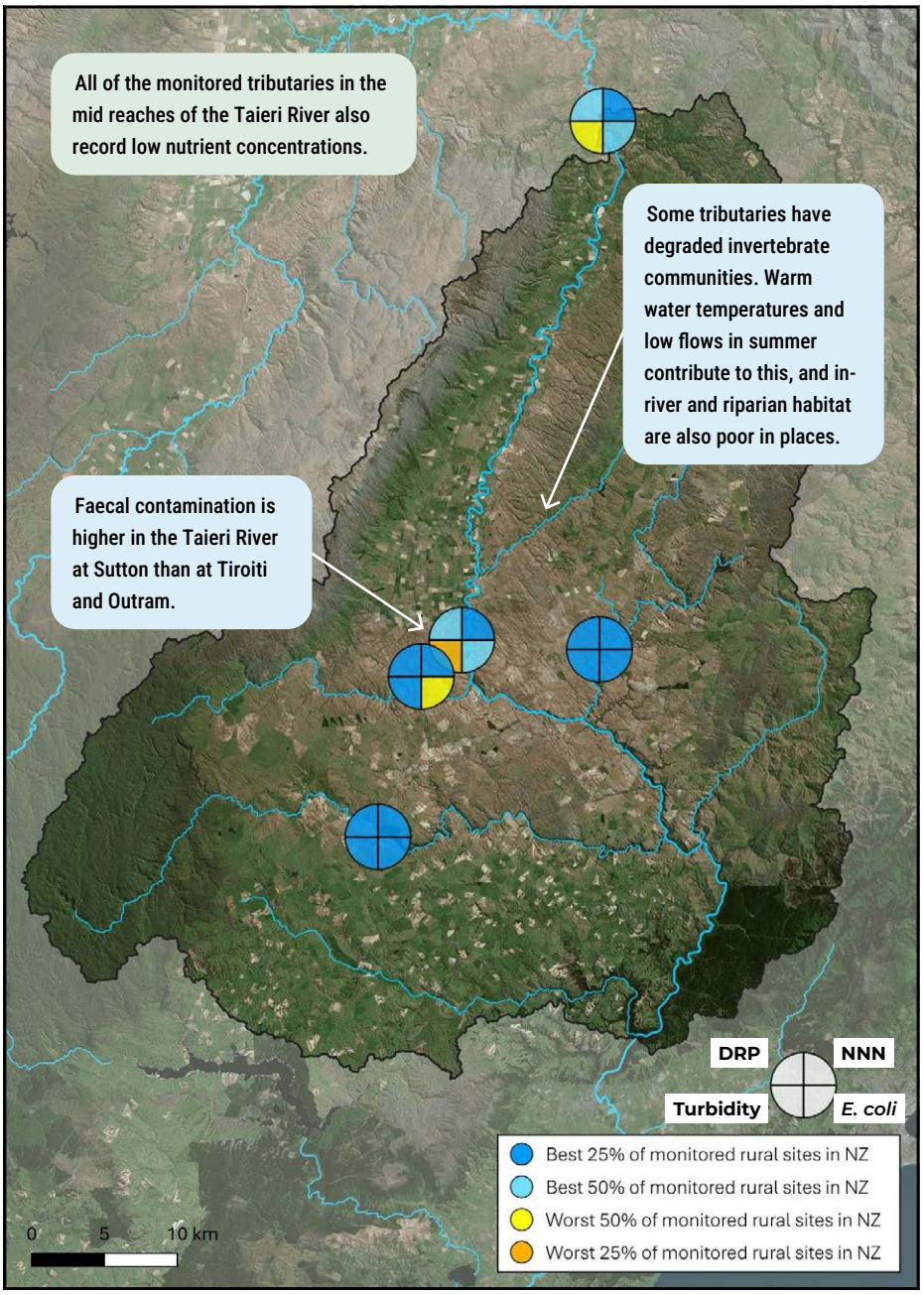
Right: Good water quality is only one element of a healthy river. The aquatic life it supports, along with key processes such as nutrient cycling, the quality of the riverbed and riparian habitat, and flow types and amount, are also important. Adapted from Milne et al. (2023) - available on the Wai Connection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



Average daily flows in the Taieri River at Sutton between November 2023 and April 2024. Despite the river having low nutrient (nitrogen and phosphorus) concentrations, the warm summer and extended period of low flows led to nuisance levels of algae on the riverbed in some locations (pictured is the riverbed upstream of the Hyde-Macraes Rd bridge).



Although water temperatures in the mid reaches of the Taieri River don't get as hot as further upstream, conditions can still get uncomfortably warm for sensitive native aquatic life and trout. The water temperature record shown here is of hourly averages at Sutton over the very warm 2017/18 summer, based on continuous measurements by the ORC. Many of the smaller streams in the mid Taieri get even hotter and some dry up altogether. Recent research completed for DOC predicts more intense droughts (and floods) in the mid catchment. See taiariwai.nz/climate-change/ to view the results of this research.



Nostoc cyanobacteria growing on a rock in the Taieri River at the Hyde-Macraes Road bridge. Its presence isn't a bad thing, in fact it is most abundant in good quality stony rivers. This is because many species of Nostoc grow well in low nitrogen waters like the Taieri as they can fix nitrogen from the atmosphere. Their "jelly-like" outer layer can also help them survive drought and other stressful environmental conditions.

Despite a lack of flow and poor habitat for some invertebrates, many of the smaller streams in the mid Taieri catchment support significant populations of native fish such as the nationally vulnerable Taieri Flathead galaxias pictured above.

Will we get sick from swimming in the river?

E. coli indicator bacteria counts in the Taieri River sometimes exceed national guidelines for safe swimming. Monthly monitoring at Sutton between January 2010 and March 2024 indicates that the risk to human health was unacceptable on 10% of sampling occasions. Most of the high *E. coli* counts occurred in summer in the absence of significant rainfall – that is, at or near base flows when swimming is more likely.

The sources of faecal contamination have not been investigated but observations and eDNA tests in some of the streams indicate ruminant (e.g. cattle and sheep) and wildfowl (e.g., ducks and geese) inputs. Based on the Dunedin City Council's monitoring data, the discharge from the Middlemarch Wastewater Treatment Plant is not the source.

Summary of human health risk from swimming in the Taieri River at Sutton based on a comparison of *E. coli* counts against national guidelines for recreation. (Source: ORC monthly data collected between January 2010 and March 2024.)

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 Taieri River over the 10 years ending in June 2022. The reasons are not clear but more marked decreases occurred upstream at Waipiata over this period, suggesting that improvements in land management practices in the upper catchment may be responsible – probably improved stock exclusion from tributary waterways and an increasing shift away from border dyke irrigation to spray irrigation.

Nitrogen trends should be watched if irrigation increases in the mid Taieri. There are some signs that nitrate-nitrogen concentrations may be increasing in the Taieri River at Tiroiti and in shallow groundwater near Middlemarch.

How are the contaminants getting into the water?

- Bank erosion and stock access in the river's tributaries are likely the main sources of fine sediment in the mid Taieri – stock access is also contributing to faecal contamination. A significant amount of sediment also comes down the river from the upper catchment, particularly when it rains. Stock camping by the river under willows is one idea being considered as a cause of faecal contamination and alternative stock management in hot dry periods may need to be considered.

- Overland flow during rain events is also a source of fine sediment to the river and picks up nutrients (especially phosphorus) and faecal matter at the same time.

- Leaching of nutrients below the root zone – especially nitrogen – occurs on farmland, particularly during winter and spring or under irrigation.

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

Act locally

Protect the waterways and gullies on your farm, as individual efforts combine to make a large difference.

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. Introducing small adaptations 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.
- Keep all stock out of waterways and drains – including by adding new troughs. Fence all drains and waterways and leave rank grass along the edges – even if they are ephemeral.
- Watch that stock don't have access to springs and wet gullies. These should also be fenced where possible.
- Check regular stream crossing sites. Sediment can be mobilised with regular stock movement. Creating a ford with rock on the bed and bank will assist to reduce sediment movement, or consider constructing a culvert.
- 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.
- 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.
- 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 could be addressed.
- Consider riparian planting, starting on the north bank of waterways to create shade that cools the water and planting more robust species on the upwind margin to shelter plantings and to assist in natural seed spread.

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:

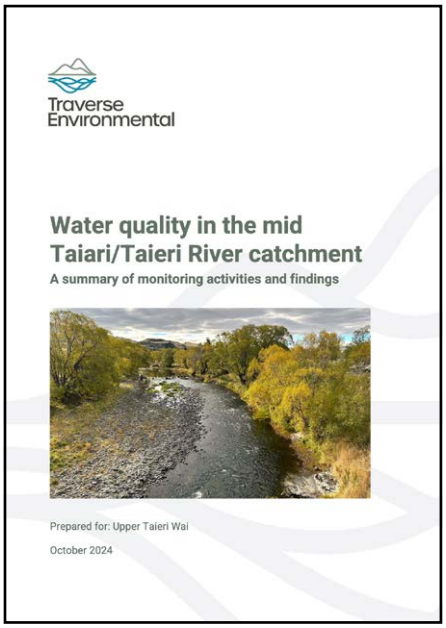
- take photos
- record the length and location of new fencing
- the number and location of new troughs
- areas and numbers of new plantings.

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.

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

The full report on water quality in the mid 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