



Water Quality in the Waikouaiti River Catchment

This factsheet summarises what we know about water quality in the Waikouaiti River catchment – from the upper river down to the estuary at Karitāne. It draws on monitoring and assessments by multiple organisations including the

Otago Regional Council, Dunedin City Council, OceanaGold, Kāti Huirapa Rūnaki Puketeraki and City Forests. It's designed to help landowners and the community understand how healthy the river is and where to focus management effort.

Getting to know the Waikouaiti

The Waikouaiti River is one of Otago's three major rivers draining to the coast north of Dunedin. It rises in two branches: the North Branch, originating near Macraes township, and the South Branch, originating in the Silver Peaks Scenic Reserve. The two branches join on the river flats northwest of Orbells Crossing before flowing around 4.5km into the Waikouaiti River Estuary at Karitane. The catchment covers 425km² and ranges from flat floodplains near sea level to dissected hills inland reaching over 700m.

The catchment has a cool-dry climate with relatively low and unreliable rainfall, ranging from around 500 mm in the upper North Branch to 800–900 mm in the South Branch headwaters. The underlying Otago Schist geology produces thin, stony soils and rapid runoff in the hill country, while more fertile but erodible soils are found along the river valley and lower floodplain.

Sheep and beef farming and exotic forestry are the dominant land uses. OceanaGold

operates a large gold mine at Macraes. There is a small pocket of dairy farming on the fertile lower plain near Orbells Crossing. The

lower reaches of the river provide the source of Dunedin City Council's potable water supply for Waikouaiti, Karitāne and Hawksbury Village.



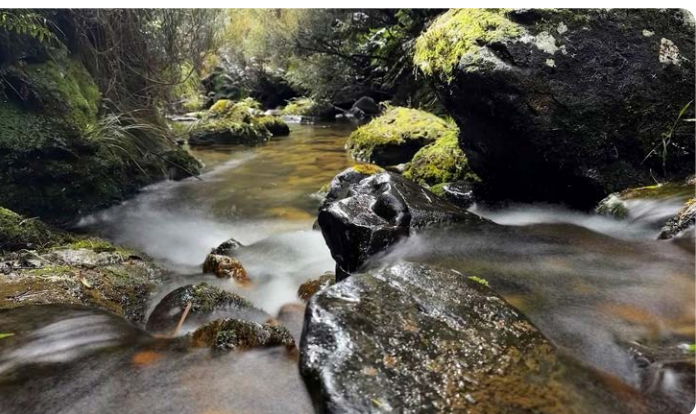
The river is prone to extended periods of low flow in summer and autumn, and these low-flow conditions – combined with warm water temperatures – are the biggest influence on the river's ecological health. Most sediment, phosphorus and faecal contamination enter the river during rain events through overland flow and bank erosion.



The Waikouaiti Estuary supports the largest remnant saltmarsh system in Otago and is important habitat for coastal birds such as the eastern bar-tailed godwit and oystercatchers. The estuary and river also support significant recreational

values including swimming, trout fishing, whitebaiting and shellfish gathering. The river and estuary are of significant cultural importance to Kāti Huirapa Rūnaka ki Puketeraki as a mahika kai and wāhi tīpuna landscape.

How healthy is the Waikouaiti River system?



- **Water quality is very good.** Based on ORC monitoring of the lower reaches over the last five years, the river has very low concentrations of suspended sediment, plant-available nutrients and *E. coli*. The Waikouaiti sits comfortably inside the top (best) 25% of monitored rural rivers in New Zealand for most commonly measured water quality indicators.
- **The water typically runs clear.** Median visual clarity is over 4.5 m, well within the top band (A) of the current National Policy Statement for Freshwater Management¹ (NPS-FM) and well above the minimum 1.6 m guideline for swimming. Suspended sediment levels spike during heavy rain but the river clears quickly.
- **Phosphorus is the limiting nutrient.** Dissolved reactive phosphorus concentrations are frequently at or
- below detection. This means phosphorus currently controls the extent of nuisance algae growth in the river, so keeping phosphorus levels low is critical.
- **Plant-available nitrogen shows a strong seasonal pattern.** Peak nitrate concentrations occur in early winter, reflecting a 'first flush' of nitrate through the soil profile once soil moisture levels are restored after the drier summer months. Although median concentrations of nitrate and other plant-available forms of nitrogen are very low compared to most rural rivers, some additional nitrogen is present in organic forms – not immediately available for plant growth, but a potential future source.
- **Faecal contamination is largely limited to wet weather.** *E. coli* levels at the ORC's monitoring site fall into band A across all four NPS-FM metrics – a result few rural river sites in New Zealand achieve. Significant contamination only occurs during heavy rainfall, when overland runoff carries faecal matter into waterways or mobilises faecal matter already deposited on streambeds and banks by stock and waterfowl.

1. The NPS-FM includes a series of indicators of river health. Results for each indicator are graded into bands ranging from A (best) to D or E (worst).



- **Periphyton (algae) growth can be significant at times, despite low nutrient levels.** At Bucklands Crossing, periphyton covered over 80% of the riverbed during parts of February and March 2024. This growth is driven by extended periods of stable low flows and warm water rather than high nutrient levels.
- **Invertebrate health is only 'fair' in the lower reaches and many parts of the North Branch.** Not scoring higher reflects warm summer temperatures (the water at ORC's monitoring site regularly exceeds 20°C, peaking at 24.7°C in February 2023), limited physical habitat diversity and algae cover – rather than pollution. Many smaller tributaries get even hotter and some dry up altogether. The upper reaches of the South Branch, with its shaded headwaters, consistently supports good numbers of sensitive mayfly, stonefly and caddisfly taxa.
- **Fish diversity is high.** The lower river supports īnaka, longfin eel, shortfin eel, pouched lamprey, bluegill bully, common bully, black flounder and brown trout,

along with occasional torrentfish and flathead grey mullet. This equates to band A (high biological integrity) under the NPS-FM, reflecting good habitat and unimpeded access to the sea. The 'threatened' Taieri flathead galaxias is regularly found in tributaries of the North Branch, and kōura (freshwater crayfish) and kākahi (freshwater mussels) – both classified as 'at risk – declining' – are also present in the catchment.

- **The Waikouaiti Estuary is in moderate ecological condition.** The mid to lower estuary has well-oxygenated sandy sediments supporting a healthy invertebrate community. In contrast, the less well flushed upper Merton Arm has higher mud content and patches of nuisance macroalgae (seaweed) growth. Sediment nutrient and metal concentrations across the estuary are low. In contrast with the river, nitrogen is the limiting nutrient for plant growth in the estuary, so both phosphorus and nitrogen need to be managed at the catchment scale.

Can I swim in the river?

Bucklands Crossing is suitable for swimming most of the time in fine weather.

Weekly summer monitoring since 2014/15 shows E. coli levels only occasionally exceed the national action threshold (550 E. coli/100mL), indicating an unacceptable health risk. This almost always occurs during or after significant rainfall when flows are high and swimming is unlikely. In dry conditions, the estimated risk of Campylobacter infection is less than 0.1%. Water clarity at typical swimming flows also meets national guidelines.

Karitane Wharf is also suitable for swimming most of the time, with enterococci levels rarely exceeding safe swimming thresholds. In dry weather conditions, the long-term 'swimmability' grade improves from 'fair' to 'good', translating to a risk of illness of less than 5%.



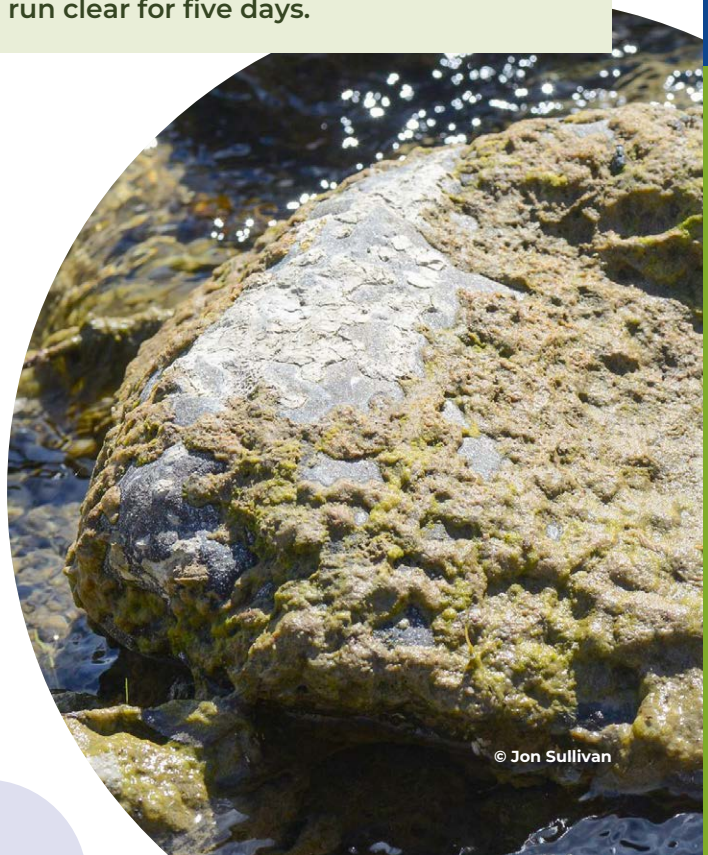
East Otago Catchment Group

However, nuisance algae growth in the river can exceed recreational guidelines at times, particularly in the lower reaches and at Bucklands Crossing during extended low-flow periods. Dark green/black mats of *Microcoleus cyanobacteria* (aka 'toxic algae') have been recorded in the river – these can be toxic to dogs and harmful to humans. Check for ORC warnings before letting dogs near the water. For warnings during summer, check the Land, Air, Water Aotearoa (LAWA) website at www.lawa.org.nz or the ORC website at www.orc.govt.nz.

The key message: avoid the river and estuary during and shortly after heavy rain, and avoid collecting shellfish until the water has run clear for five days.

Watch out for didymo ('rock snot').

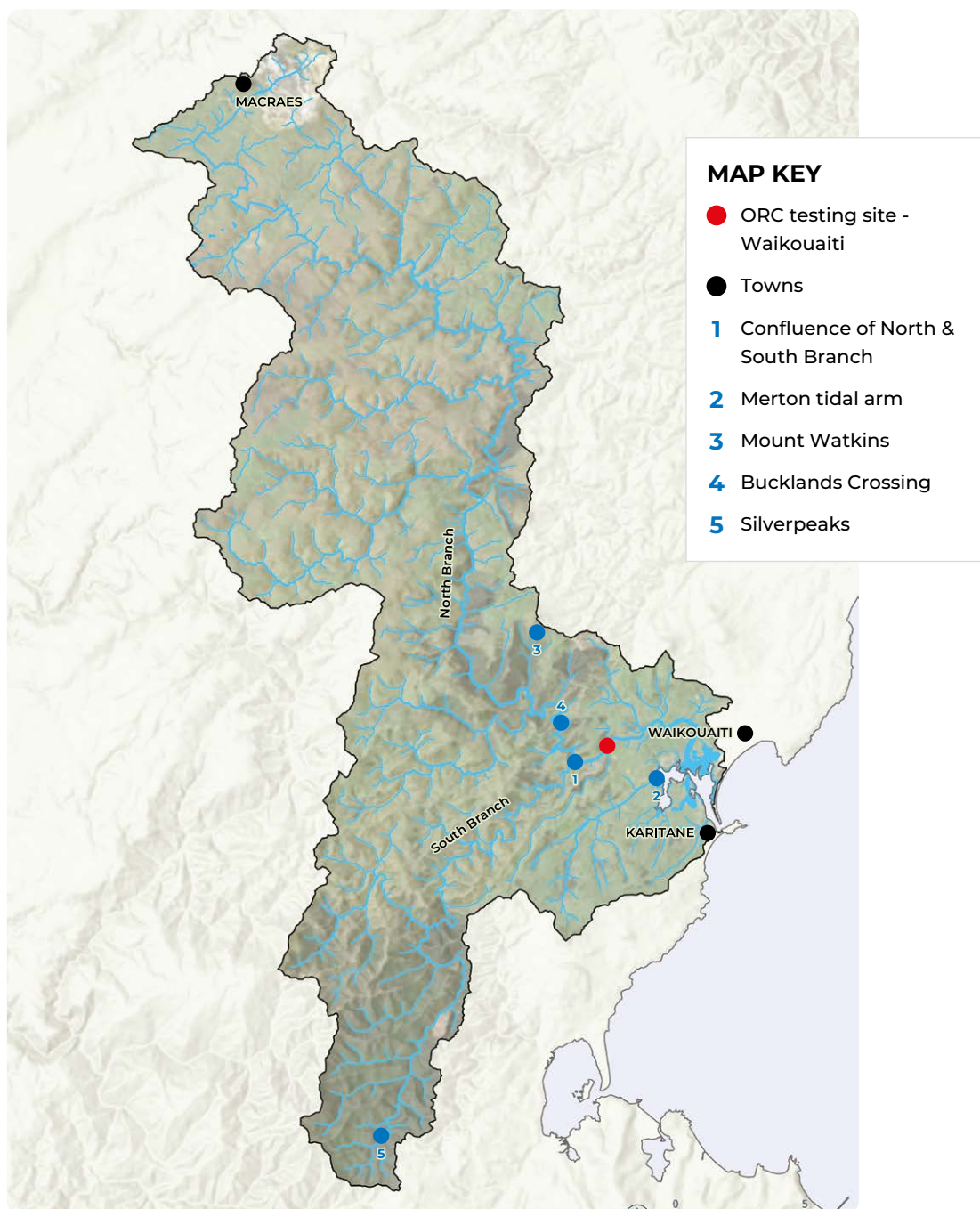
Didymosphenia geminata has been found in the Waikouaiti River. Didymo is an introduced freshwater alga that can form thick brown or white mats on riverbeds, smothering habitat for invertebrates and fish. If you are fishing, kayaking or recreating in the river, please Check, Clean, Dry all gear, footwear and equipment before moving to another waterway. For more information visit www.mpi.govt.nz.



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WAIKOUAITI RIVER CATCHMENT

Key locations in the catchment



- **Upper North Branch (Macraes area)**
– OceanaGold mine since 1990; some tributaries affected by low flows and stock access but still supporting Taieri flathead galaxias and kōura.
- **Mid Catchment (Bucklands Crossing)**
– Popular swimming site with ORC recreational monitoring; extended low flows and warm summer temperatures result in significant algal growth despite low nutrients.
- **South Branch (Silver Peaks area)**
– Native bush headwaters with excellent

invertebrate health; exotic forestry progressively being harvested and needing careful sediment management.

- **Lower Catchment (Orbell's Crossing area)** – DCC water supply intake and ORC long-term monitoring site; high native fish diversity (band A) including īnaka, eels, lamprey and bullies.
- **Estuary (Karitane)** – Otago's largest remnant saltmarsh; mid to lower estuary in good condition but upper Merton Arm muddier; swimming at Karitane Wharf suitable most of the time.

What are the trends telling us?



The ORC shifted its monitoring site in 2018, limiting the data record available for long-term trend assessment. As of July 2025, there were no strong signs that water quality is getting worse – conductivity has decreased (an improvement) and while there are early hints that nitrate-nitrogen and total phosphorus may be increasing, confidence in these trends is low.

What is clear is that the river's ecological health is shaped more by its natural flow regime than by water quality. Extended low-flow periods and warm summer temperatures drive periphyton growth

and reduce habitat suitability for sensitive invertebrates – even though nutrient concentrations are very low. These warm, low flow conditions could intensify as average summer air temperatures are predicted to increase by approximately 1°C by 2040.

Bottom line: Water quality is currently in very good shape. The key risk is that even a small increase in nutrients – particularly phosphorus in the river and nitrogen entering the estuary – could allow rapid ecological change given the river's naturally low nutrient status and susceptibility to extended low flows.

How do contaminants reach the river?

Understanding how contaminants reach the river helps target management actions:

- **Sediment** enters the river mainly through bank erosion and overland flow during rainfall. Stock access to tributary streams also disturbs streambeds and banks. Plantation forestry harvest needs careful management to prevent sediment loss. The steep terrain in much of the catchment makes managing sediment during rain events a challenge.
- **Phosphorus** inputs occur primarily during rain events, when overland flow carries sediment and attached phosphorus into the water. During normal (base flow) conditions, most of the phosphorus in the water is dissolved in organic forms. This likely comes from leaching through soils, in-stream recycling and breakdown of organic matter in riparian margins. While much of this phosphorus is 'locked up', it can be released under certain conditions where it could fuel plant and algal growth.
- **Nitrogen** shows a strong seasonal flush in early winter as rainfall restores soil moisture and carries accumulated nitrate into the river. There is some potential for nitrogen inputs to increase – the proposed mine expansion at Macraes is predicted to increase instream nitrogen concentrations, and forestry harvest has been linked with pulses of nitrogen loss.
- **Faecal contamination** comes mainly from stock access to waterways and from overland flow during rainfall. Waterfowl likely also contribute. In the estuary, strong winds can stir up bottom sediments, releasing trapped pathogens back into the water.

Water quality is in very good shape. What can we do to keep it that way?

Practical fixes to reduce runoff

- **Keep all stock out of waterways and drains on intensively farmed paddocks.**

Fence and leave rank grass along the edges of all drains and waterways – even small ones or those that only flow periodically.

- **Where fencing hill country tributaries isn't feasible**, there's a range of options that can be considered if extensively farmed stock are damaging the creeks: provide troughs away from the creek, install a culvert or rocky crossing, graze lighter stock classes rather than mature cattle in the area where there is an issue, use a hot wire to allow stock to drink but not enter the creek, create shade away from the creek, plant and maintain vegetation along the creek.
- **Manage winter grazing well** – maintain 5 m setbacks from waterbodies, avoid planting crops or grazing in 'critical source areas' such as swales and gullies – those low-lying areas of the farm where runoff can carry sediment and nutrients to waterways (unless you have a consent to do so). Follow best practices for winter grazing management including strategic grazing starting furthest from any waterways where practical.
- **Watch for sediment movement during wet weather** – look for 'critical source areas' where water gathers and runs into creeks. Where you see this, consider grassed buffers, small detainment bunds



and/or small wetlands to 'slow the flow'. Trapping or filtering sediment also helps reduce nutrients (particularly phosphorus) and faecal matter attached to it.

- **If you have plantation forestry**, plan harvest carefully to minimise sediment loss. With steep slopes in parts of both branches, maintaining sediment controls and protecting stream crossings is particularly important.
- **Check regular stream crossing sites.** Sediment and faecal matter can be mobilised with regular stock movement. Creating a ford with rock on the bed and bank will help, or consider constructing a culvert.
- **Consider riparian planting**, starting on the north bank of waterways to create shade that cools the water – given warm summer temperatures are a key pressure in this catchment. Plant more robust species on the upwind margin to shelter plantings.
- **Check for and stop runoff from bridges and culverts** entering drains or waterways, e.g. by using boards along the edges of bridges.

Note: small improvements each year add up to significant benefits for water quality.





Keep a record of your efforts

It can be useful to take photos of the actions you implement, not only as a record but also a way to reflect on what's worked well and where you might do things differently next time. Consider using farming software (like Resolution or FarmIQ) to link actions to map locations.

Record actions such as:

- length and location of new fencing
- culverts and stock crossings installed
- number, area and width of new plantings
- detainment bunds and wetlands installed.

More information

This summary is based on the report **Water quality in the Waikouaiti River catchment: A summary of monitoring activities and findings** by Traverse Environmental, 2025, prepared for the East Otago Catchment Group.

For more information on farm planning and good management practices to improve freshwater outcomes, see:

- Beef + Lamb New Zealand Knowledge Hub: beeflambnz.com/knowledge-hub
- Otago Regional Council Farmers Guide (information on rules, consents, intensive winter grazing requirements, critical source areas, and effluent management): orc.govt.nz/consents-and-compliance/the-farmers-guide
- Dairy NZ: dairynz.co.nz/environment
- NZ Landcare Trust (good management practices): <https://bit.ly/4mJiZNL>
- Our Land and Water (Farm Management resources): <https://bit.ly/42KBiJi>



To find out more about the East Otago Catchment Group and how they are supporting farmers and the programmes they are running please visit:

www.eocg.org.nz

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