Water Quality in the Waihemo Shag River Catchment

East Otago **Catchment Group**

WAIHEMO SHAG RIVER CATCHMENT

This factsheet summarises the current state of water quality across the Waihemo Shag River catchment – from the upper river down to the estuary at Matakāea Shag Point, and the shallow groundwater aquifer beneath the valley floor. It is based on monitoring data collected by the Otago Regional Council, Waitaki District Council and OceanaGold. It is intended to help landowners and the community understand what the data is telling us and where action matters most.

What shapes water quality here

The Waihemo Shag River catchment drains 544 km² from the Kakanui Mountains to the coast at Matakāea Shag Point.

> **Much of the catchment is hilly or rolling country, which creates rapid runoff during rain events.**

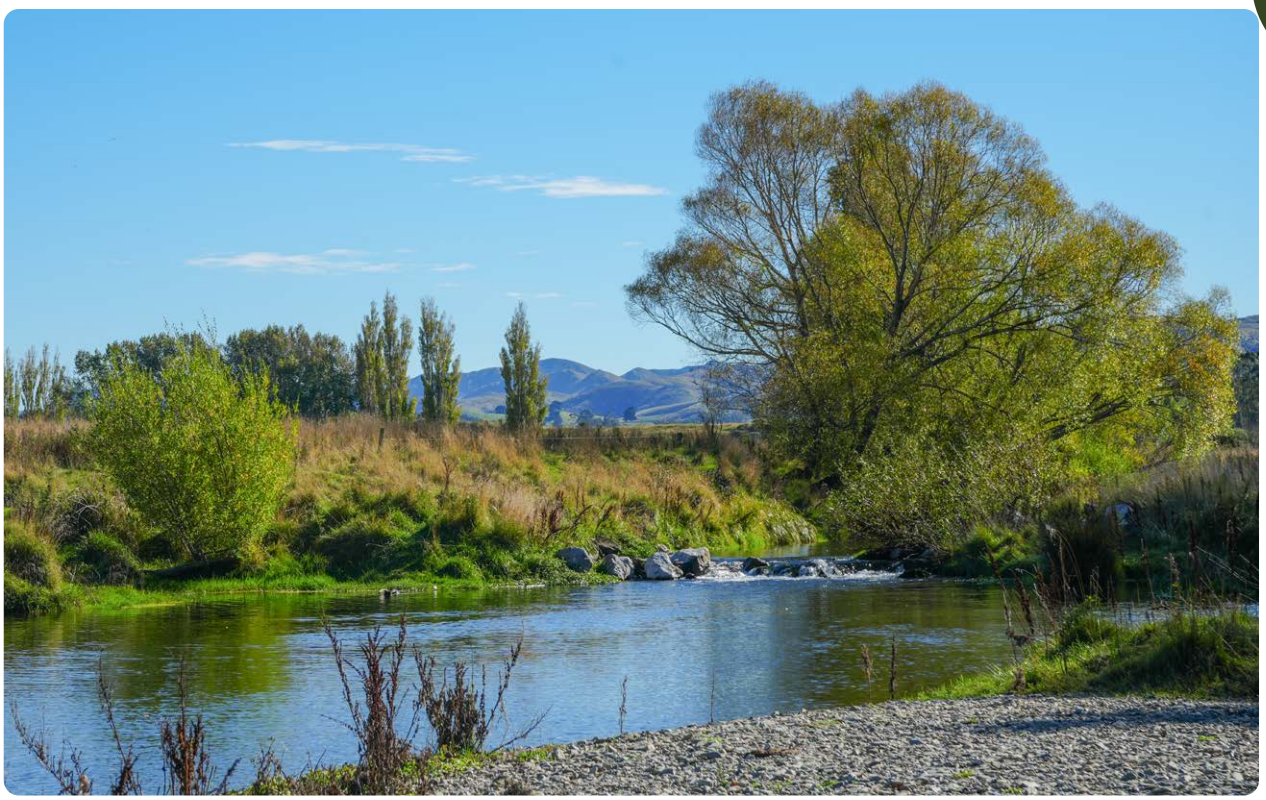
The terrain flattens and widens into a valley floor in the lower reaches. The catchment is naturally water-short, with potential evapotranspiration exceeding rainfall for multiple months of the year, which can stress aquatic life during summer low flows.

In the lower catchment a short distance downstream of Craig Road (Glenpark), the river is closely connected to the Shag Alluvium Aquifer, a shallow groundwater aquifer. This connection means that nutrients leaching through soils can enter groundwater and then flow into the river. In some river reaches, this reverses – river water is lost to groundwater.

Most sediment, phosphorus and faecal contamination enters the river during rain events through overland flow and bank erosion, while nitrogen enters mainly through leaching to groundwater.

The Waihemo Shag Estuary, just south of Matakāea Shag Point, is the receiving environment for everything from the catchment upstream. The estuary mouth stays open, and the system has a high flushing rate, which together support water exchange with the sea and reduce the risk of nutrient build-up.

How healthy is the Waihemo Shag River system?



- Water quality in the main river in the upper catchment (around SH85) is excellent, with very low concentrations of nutrients and sediment. Water quality is good further down the catchment at Craig Road, and drops to fair in the lower reaches at Goodwood Pump (Chisholm Road near SH1).

- The river typically runs clear most of the time. Sediment levels spike during heavy rain but likely flush fairly quickly through the system.

- Some small tributaries in the hill country are facing challenges. Where monitoring has been undertaken in streams around Macraes, low flows, increasing sediment accumulation and aquatic plant growth are degrading habitat quality. Stock access to streams is a contributing factor. While these tributaries still support native fish like Taieri flathead galaxias and kōura (freshwater crayfish), keeping stock out of waterways and managing sediment would help protect these populations.

- Nitrogen concentrations increase steadily with distance downstream, reflecting increasing land use intensity and groundwater inputs enriched with nitrate. Increases in phosphorus concentrations are less marked with distance downstream and, overall, phosphorus remains low throughout the main river. However, because phosphorus is the limiting nutrient in this river system, even small increases in phosphorus can promote algae blooms – so keeping P levels low is critical.

- *E. coli* levels (indicating faecal contamination) in the main river are generally low and indicate the water is suitable for swimming most of the time. Significant contamination only occurs during very wet weather when swimming is unlikely.

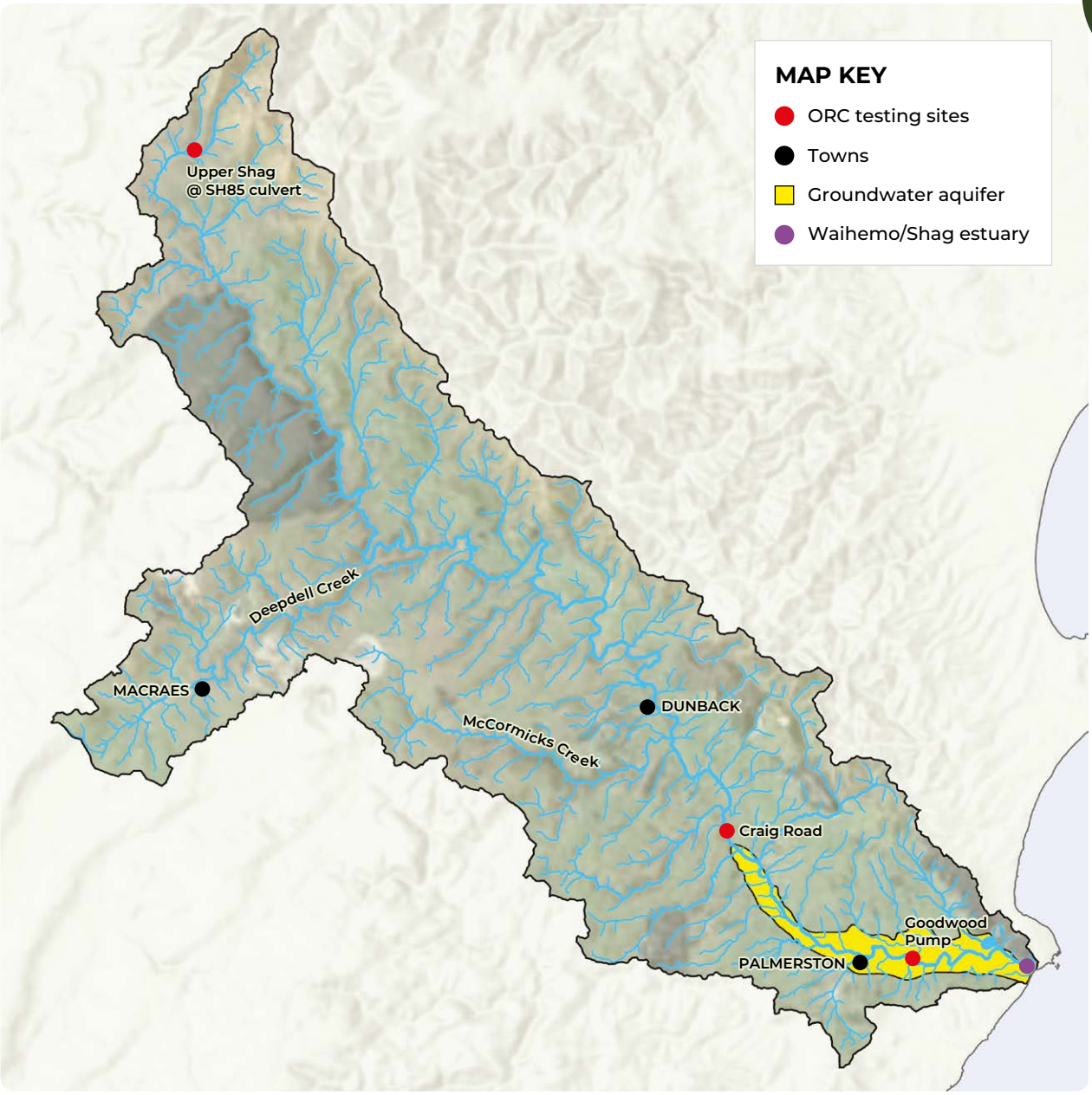
- Periphyton (algae) growth is high in the lower reaches, particularly in summer and autumn, reaching levels that exceed national guidelines for healthy streams. The high algal growth is driven by plentiful nutrients, stable low flows, warm temperatures and good sunlight. While the amount of algae present reduces streambed habitat quality, a diverse range of aquatic life, including trout, are still present.

- Fish diversity is high. The catchment supports īnaka, longfin eel, shortfin eel, pouched lamprey, redfin bully, bluegill bully, common bully, upland bully, brown trout, torrentfish, Canterbury galaxias and Taieri flathead galaxias.

- The shallow Shag Alluvium Aquifer has elevated nitrate concentrations – around 2.5 mg/L compared to 0.2 mg/L in the river. Groundwater close to the river moves quickly through porous river gravels and can reach the river in about two years. Further out in the aquifer, older clay-rich sediments slow groundwater movement, meaning water (and nitrogen) can take around 20 years to reach the river.

- The Waihemo Shag Estuary is in moderate ecological condition. The main issue is the amount of intertidal area with muddy, poorly oxygenated sediments which limit the diversity of shellfish and other bottom-dwelling creatures. The estuary provides important habitat for birds, including migratory species that use the mudflats for feeding and roosting.

Key locations in the catchment



GENERAL PATTERNS

- Water quality is excellent in the upper catchment and declines to fair condition in the lower reaches as land use intensifies.
- The river and shallow aquifer are strongly connected in the lower catchment creating a direct pathway for groundwater nutrients to enter the river.
- Contaminants enter the river in two main ways: sediment, phosphorus and *E. coli* mostly arrive during rainfall through overland flow and bank erosion, while nitrogen enters through leaching to groundwater, predominantly in winter and spring when rainfall helps flush it through the soil profile.

UPPER CATCHMENT

- Kakanui Mountains Kakanui Peak (1,528m) – headwaters, excellent water quality.
- SH85 area – ORC monitoring site, near-pristine condition.
- Macraes area – gold mining operation (OceanaGold).
- Deepdell Creek and tributaries (Tipperary, Highlay creeks) – challenges with low flows, sediment and stock access; home to Taieri flathead galaxias and kōura.

LOWER CATCHMENT

- Craig Road – ORC monitoring site, good water quality, high fish diversity.
- Dunback – township (~200 people), most are on reticulated drinking water from the aquifer and a handful draw directly from the river.
- Shag Alluvium Aquifer zone – shallow groundwater under valley floor, connected to river, elevated nitrate but improving.
- Fertile gravelly soils along river flats – high nitrogen leaching risk, needs careful management.
- Palmerston – township (1,080 people), drinking water supply from aquifer, wastewater treatment plant (disposal to land).
- Goodwood Pump (Chisholm Road) – ORC monitoring site, fair water quality, high algae growth (NPS-FM band "D").

ESTUARY

- Waihemo Shag Estuary, moderate condition, important bird habitat, muddy sediments accumulating and expanding across the intertidal area.

Is river health getting better or worse?

Water quality trends are mixed.
Monitoring at Craig Road and SH1 showed real improvements from 2012 to 2022, with nutrients and sediment in the river and groundwater nitrate all decreasing – reversing deteriorating trends seen over the previous 20 years.

However, more recent and detailed analysis indicates total nitrogen concentrations are now trending upward again at both Craig Road and Goodwood Pump, and suggests an underlying deterioration in nitrogen over the longer term. Nitrogen management needs ongoing attention. Although less certain, invertebrate community health in the lower reaches also shows signs of declining, reinforcing the need for action.

In tributaries around Macraes, monitoring shows declining conditions, with increasing sediment accumulation and aquatic plant growth degrading habitat quality.

Muddy sediment coverage in the estuary increased by around 7 ha between 2016 and 2023, with mud now covering more than 40% of the intertidal area.

While the river runs clear most of the time, large pulses of sediment are carried downstream during storms and some of this sediment is accumulating in the estuary.

How are contaminants getting into the water?

Understanding how contaminants reach the river helps target management actions:

- **Sediment** enters the river mainly through bank erosion and overland flow during heavy rainfall and soil erosion from the hill country. Much of the catchment is naturally erosion prone due to its hilly terrain and thin soils. Sediment carries phosphorus and pathogens attached to it.

- **Nitrogen** losses occur largely through leaching down through the soil into groundwater, which then enters the river. The fertile, free-draining soils along the river flats in the lower catchment are particularly prone to nitrogen leaching and need careful management.

- **Winter grazing** on vulnerable soils poses the highest risk for nitrogen leaching. Peak nitrate concentrations in the river occur in winter, reflecting a flush after the drier summer period.

- **Faecal contamination** comes mainly from stock access to waterways (especially in tributaries) and from overland flow during rainfall. Waterfowl likely also contribute.

Actions you can take to help water quality

Farm planning, improved winter grazing, stock exclusion, and careful nutrient management have all helped deliver benefits in river water quality. However, the most recent ORC assessments indicate total nitrogen is still increasing in the lower river and fine muddy sediments have increased in coverage across the estuary's intertidal flats.

Along with continued nutrient management, controlling sediment during storms are the key priorities - from winter grazing, hill country, and forestry.

What to look for and some options:

- **Winter grazing** poses a high risk and needs particular attention – maintain 5m setbacks from waterbodies, avoid planting crop or grazing swales and follow best practices for winter grazing management. Check paddocks regularly in wet weather for areas where water gathers before leaving the property.

- Check your property during or after heavy rain to find **'critical source areas'** – spots where muddy water flows into creeks. Where you see this happening, allow for long ungrazed grass buffers before the runoff gets to creeks, consider long vegetation, small detainment bunds and/or small wetlands to "slow the flow" in swales and gullies. Light rain shouldn't cause sediment flow.

- If you have **plantation forestry**, forestry roads and the 5-7 years after harvest are the highest-risk periods for sediment loss. Maintain sediment controls, protect stream crossings, and avoid harvest during very wet weather.

- **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 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.

- **Watch that stock don't have access to springs and wet areas.** These should be fenced where possible.

- **Check for and stop runoff entering creeks** from steep tracks, bridges and culverts. Small cut-offs into the paddock help redirect water, and a board on the edges of the crossing helps reduce runoff into the creek.

- **Manage all farming and cropping activities carefully on the fertile, free-draining soils near the river and over the shallow aquifer.** These areas are most at risk of nitrogen leaching.

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 Waihemo Shag River catchment: Current state, trends and issues** by Traverse Environmental (March 2026), 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**
- ORC Intensive Winter Grazing (government resources - search for "intensive winter grazing"): **orc.govt.nz**
- 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**

Funding provided by: Ministry for Primary Industries Manatū Ahu Matua

East Otago Catchment Group

Version: 2026.06