



River and stream health

Clutha River Annual Monitoring Summary

2005

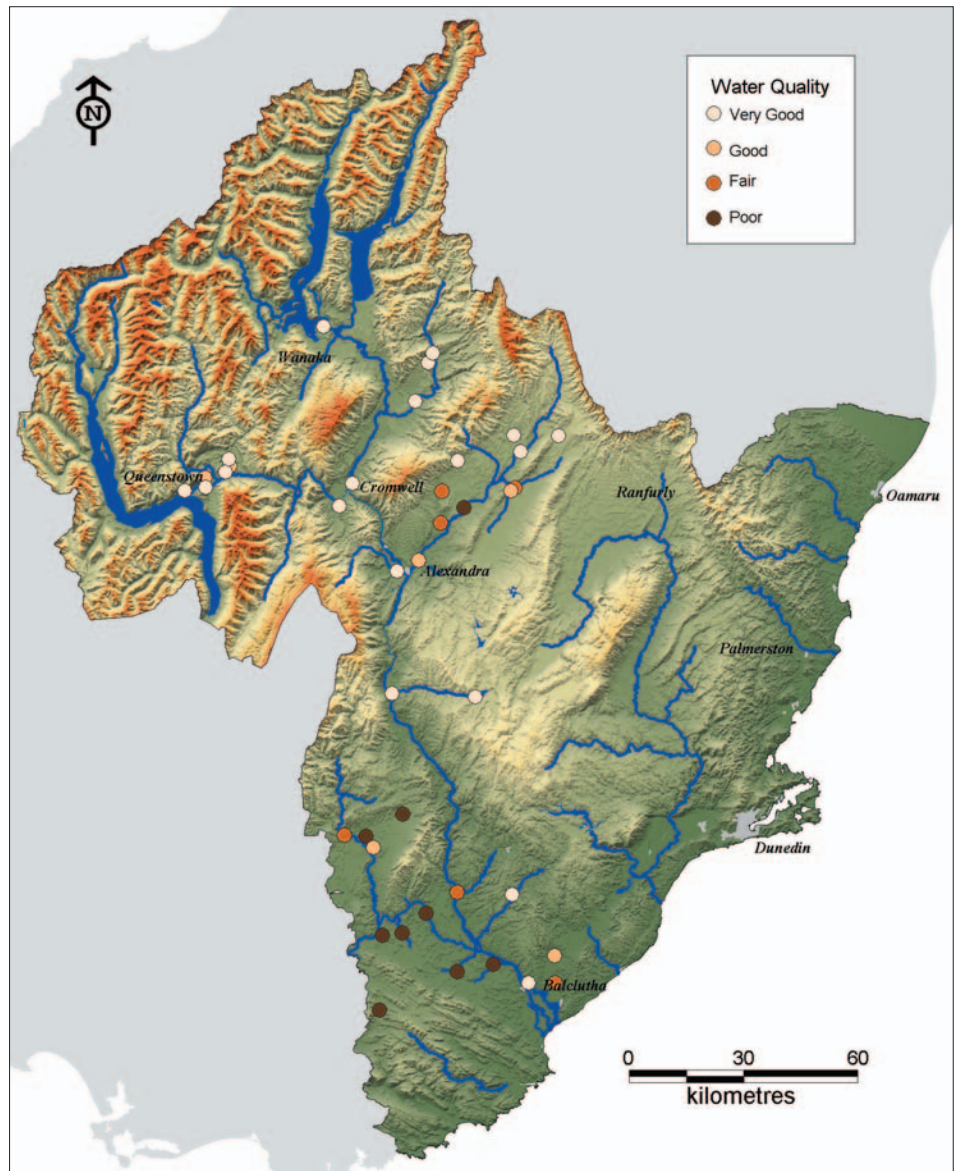
Key points

- South West Otago typically has high levels of nutrients, above the ANZECC water quality guidelines for nitrogen and phosphorus.
- The median level of *Escherichia coli* was generally below the Department of Health (DoH) contact recreation guideline level of 126 E.coli/100ml.
- There is a reasonably good correlation between water quality and biological health.
- The Report 'Surface Water Quality in South West Otago' 2004 has more details.

Water quality monitoring

In 2005 Otago Regional Council regularly monitored 41 stream and river sites in the Clutha catchment to assess the current state of water quality. The sites are shown in the map below.

There are few significant point source discharges to freshwater in the Clutha catchment and land use has the most effect on water quality. The sites with poorer water quality are generally intensively farmed, such as in South West Otago, whereas the sites with good water quality are in the upper catchment, to include the large lakes and upper tributaries.





Water quality results

The classification of sites was achieved by using a water quality index derived from the median values for six variables: turbidity, dissolved oxygen (% saturation), ammoniacal nitrogen, nitrite-nitrate nitrogen, dissolved reactive phosphorus and *Escherichia coli* bacteria.

The median values of each variable were compared to national guidelines and standards values, which enabled water quality at each site to be classified into one of the four categories below.

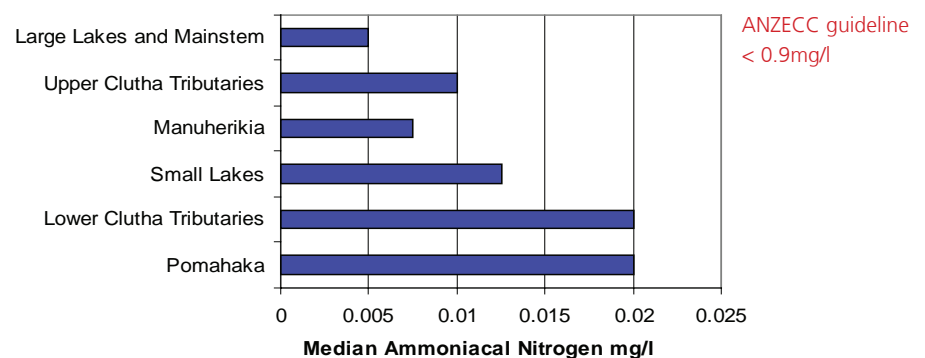
Very Good	All six median values comply with guideline values
Good	Five of six median values comply with guideline values
Fair	Three or four of the median values comply with guideline values
Poor	Two or less of the median values comply with guideline values

The water quality sites were also split into different groups, these are depicted in the graphs below. The graphs show how water quality deteriorates from the 'very good' quality of the large lakes and mainstem, with the lower Clutha tributaries and Pomahaka catchment generally having poorer water quality.

Nutrients

Ammoniacal nitrogen is the combination of ammonium ions (NH_4) and ammonia (NH_3), the ANZECC 2000 high reliability (95%) trigger value for freshwater is 0.9 mg/l. NH_3 is the main toxic component for aquatic organisms, the prevalence of which is dependent on the pH, temperature and salinity of the water. The ANZECC 2000 guideline for NH_3 is 0.021 mg/l.

At all sites the ammoniacal nitrogen levels were well below 0.9 mg/l and the ammonia component (after considering temperature and pH) was less than the guideline value of 0.021 mg/l.



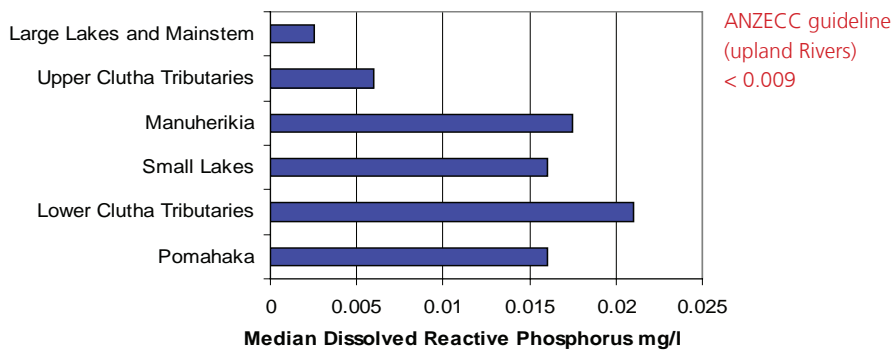
Median dissolved reactive phosphorus concentrations were below the ANZECC default trigger value for upland rivers in the large lakes and upper Clutha tributaries, however the rest of the groups had medians above the trigger level. The lower Clutha tributaries recorded the highest median. The high median in the Manuherikia was due to small tributaries which are affected by irrigation run-off. (see graph top opposite).

Guidelines and standards

- The ANZECC (2000) guidelines outline trigger values for water quality aspects that put stress on river and stream health (e.g. nutrients, dissolved oxygen and pH). This specifies a level below which the risk of adverse biological effect is low.

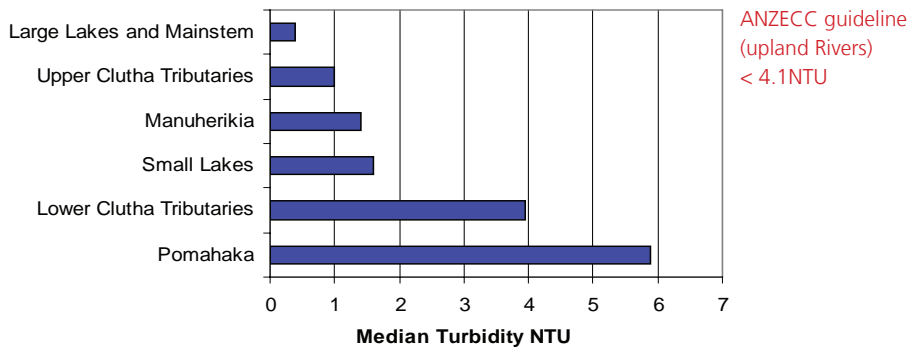
Note: the ANZECC default trigger values depicted in the graphs are for upland rivers (>150m)

- Otago's water quality standards are outlined in the Regional Plan: Water which sets targets to maintain and improve water quality within the region.
- The DoH (1992) guidelines for contact recreation waters recommend a season median of 126 *Escherichia coli*/100ml.

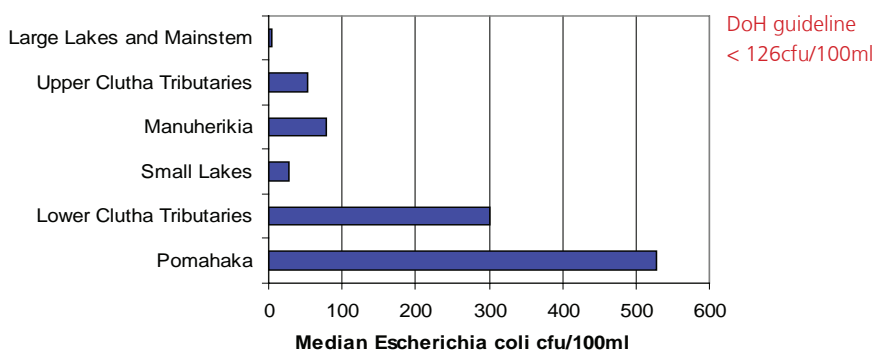


Turbidity and bacteria

Turbidity was only elevated above trigger values in the Pomahaka catchment, but it is clear that turbidity increases with distance downstream, the group encompassing the lower catchment tributaries were much more turbid than the tributaries of the upper catchment.



Median bacteria levels were above the contact recreation guideline (126 cfu/100ml) in the lower Clutha tributaries and the Pomahaka catchment. The other groups had levels below 126 cfu/100ml, which indicates overall minimal health risk, although bacteria levels were usually high following rainfall.



Other analytes

- The median result for dissolved oxygen was above 80% in all groups.
- pH levels were generally within guideline values for all groups.
- The lower Clutha and Pomahaka have elevated concentrations of total nitrogen.
- The large lakes and upper Clutha tributaries were the only groups to record median total phosphorus concentrations of less than 0.026 mg/l (ANZECC guideline upland rivers).

Recent ORC reports

- Monitoring the effects of irrigation runoff on water quality. (Thompsons Creek, Ida Burn, Chatto Creek). May 2006.
- A review of the sites chosen for the river and stream health monitoring programme, based on best information needs, best practice and Otago Regional Council's management objectives. March 2006.
- Water Quality of the Lindis and Cardrona Rivers. May 2006.
- The Report 'Surface Water Quality in South West Otago' 2004 has more details.

Available now on the ORC website under Environmental Monitoring.

Ecosystem health results

Ecosystem health takes into account a wide range of inter-linked factors, such as water quality, habitat and instream biota. It is generally assessed using two communities that are important to the food chain in rivers and streams: streambed macroinvertebrates (eg insects, crustaceans, snails, worms) and periphyton (eg algae).

These biological indices put a large amount of information into a compact form. Therefore they are inherently coarse tools that give a broad view of general patterns. The presence or absence, abundance, and distribution of species can tell us much about the quality and condition of the site in which they live.

A key component of the MCI index is the availability of suitable habitat. The MCI index is designed specifically for stony riffle substrates in flowing water, MCI values can vary due to the availability of suitable habitat and not necessarily due to water quality. As substrate type can vary greatly between riffles it is often more appropriate to compare changes in MCI values at the same site over a period of time rather than between sites throughout the catchment. However, by understanding the limitation of the MCI index it still can be useful for picking up improvements or deterioration in water quality at individual sites over time.

In 2005, due to high river flows during the critical monitoring period, ecosystem health was not monitored. The results below are from 2004.

Criteria for Macroinvertebrate Health

Macroinvertebrate Index	Poor	Average	Good	Excellent
MCI	<100	100 – 110	110 – 120	>120
SQMCI	<42	4.2 – 5.0	50 – 60	>60
Total species	<10	15 – 20	20 – 30	>30
Total EPT species	<5	9 - 15	15 - 20	>20

Clutha River Macroinvertebrate Health 2004

Sample location	MCI	SQMCI	Total Species	Total EPT Species
Mill Creek @ Fishtrap	102	6.8	13	6
Cardrona @ Mt. Barker	107	6.9	14	9
Lindis River @ Lindis Peak	117	6.9	14	9
Manuherikia @ Blackstone Hill	105	6.0	12	9
Manuherikia at Shaky Bridge	90	5.3	8	4
Fraser River @ Marshalls Rd	108	6.0	24	13
Tuapeka @ Tuapeka Mouth	102	5.6	17	9
Kaihiku Stream @ Hillfoot Rd	112	5.8	15	8
Kaihiku Stream @ Clifton	68	3.3	13	4
Wairuna @ Waipahi-Clydevale Rd	90	2.4	14	7
Waiwera River u/s SH1	106	4.0	16	8
Waipahi River @ Cairns Peak	99	4.4	16	7
Waipahi River @ Waipahi	91	5.0	18	7
Heriot Burn @ Parkhill Kelso Rd	93	5.1	19	8
Heriot Burn @ SH90	98	3.4	16	7
Pomahaka @ Burkes Ford Rd	89	3.2	19	7
Pomahaka River @ Glenken	111	3.5	16	9



Biological Indices

- **EPT species** – this index is a sum of the total number of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) species collected.
- **MCI** – the Macroinvertebrate Community Index is an index based on adding the “pollution tolerance” scores of all species found at a site. Species that are very sensitive to pollution score highly whereas more pollution tolerant species receive a low score.
- **SQMCI** – the Semi-quantitative Macroinvertebrate Community Index is a variation of the MCI that accounts for the abundance of pollution sensitive and tolerant species.

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