



# Clutha River

## Annual Monitoring Summary

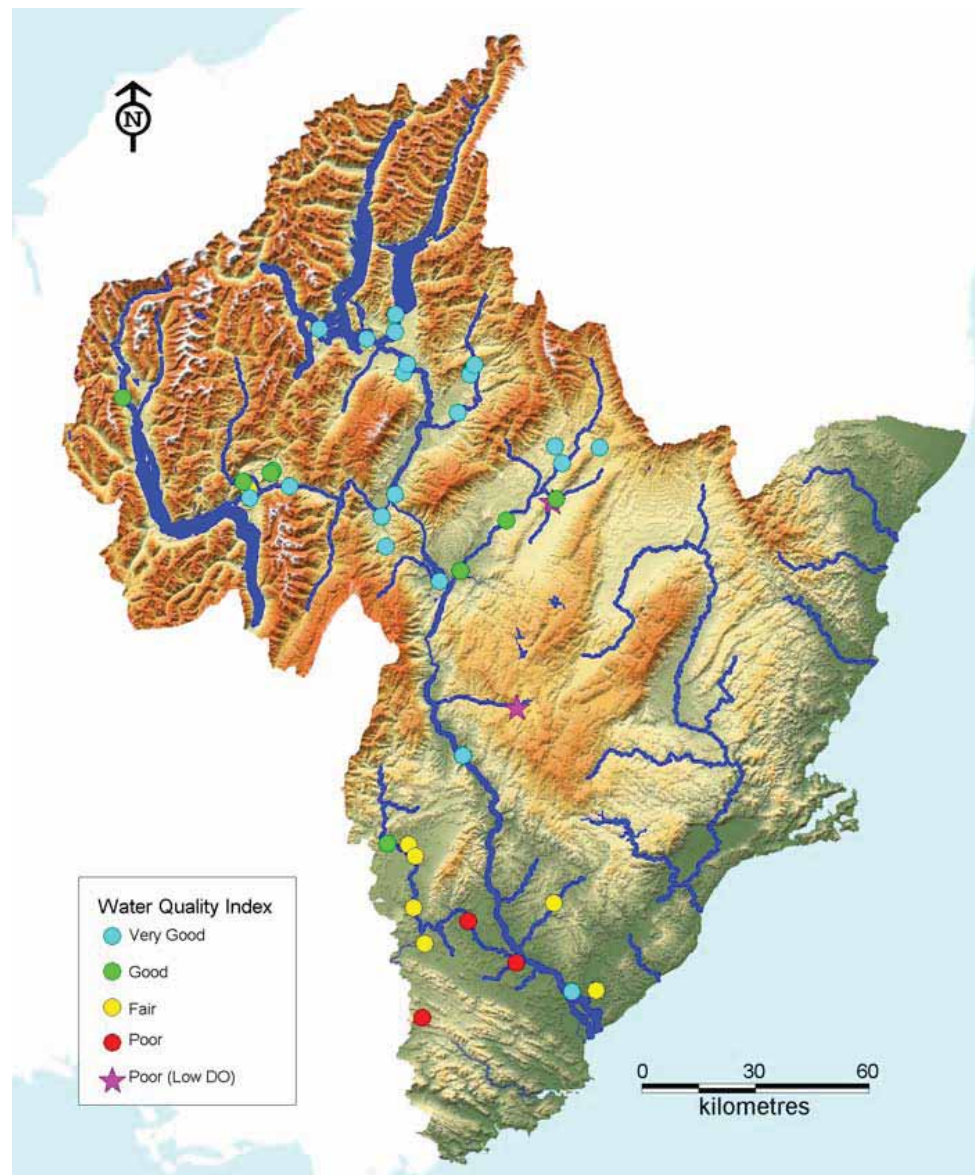
2006-2007

### Key points

- South West Otago's surface water is typically high in nutrients, exceeding the ANZECC water quality guidelines for nitrogen and phosphorus.
- The median level of *E. coli* was generally below the DoH guideline level at all sites other than in the Pomahaka catchment in South West Otago
- There is a reasonable correlation between water quality and biological health.

Between June 2006 and the end of May 2007 the Otago Regional Council monitored 35 river and stream sites in the Clutha catchment to assess the current state of water quality. NIWA monitored a further five sites (Clutha River/Mata-Au at Luggate, Millers Flat and Balclutha, the Kawarau River and the Shotover River) and ten of these sites are only monitored once every three years. All the sites are shown in the map below. Historical results and longer term trend analysis is available in the 2007 SOE report.

There are few significant point source discharges to freshwater in the Clutha catchment and land use has the greatest 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 including the large lakes and upper tributaries.



## Guidelines & standards

- The ANZECC (2000) guidelines outline trigger values for water quality aspects that put stress on river and stream health. This specifies a level below which the risk of adverse biological effect is low. Note: The ANZECC trigger values used here are for lowland 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/100 ml.

## Water quality results

Sites were classified using a water quality index, derived from median values of seven indicator variables: turbidity, dissolved oxygen (% saturation), total nitrogen, nitrite-nitrate nitrogen, total phosphorus, dissolved reactive phosphorus, and Escherichia coli (E.coli) bacteria.

Median values of these variables were compared with ANZECC and DoH guideline levels, enabling classification of water quality into one of the following groups:

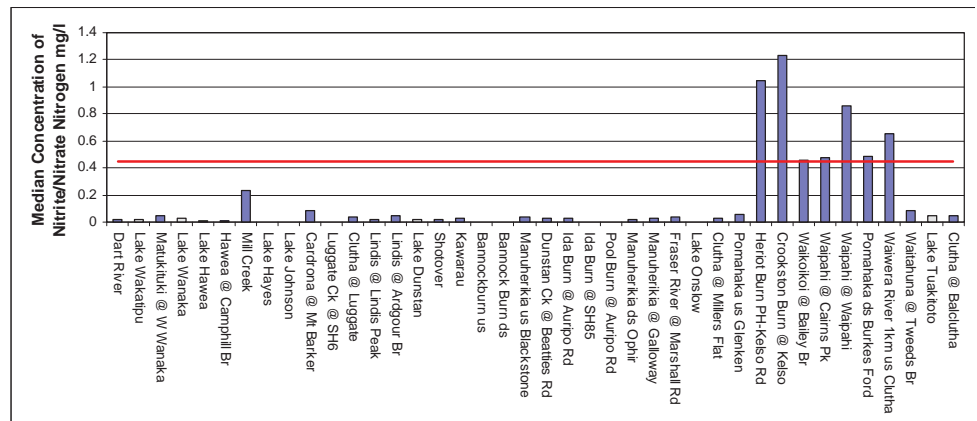
<b>Very Good</b>	All seven values comply with guideline values
<b>Good</b>	Five or six median values comply (dissolved oxygen must comply)
<b>Fair</b>	Three or four median values comply (dissolved oxygen must comply)
<b>Poor</b>	Two or fewer median values comply with guideline values
<b>Poor (Low DO)</b>	Dissolved oxygen falls below 80% saturation.

Selected water quality indicators are displayed in the graphs and discussed below. Overall these graphs show that water quality in the lakes and mainstem of the Clutha River/Mata-Au is generally 'very good', but poorer water quality is evident in the Pomahaka catchment.

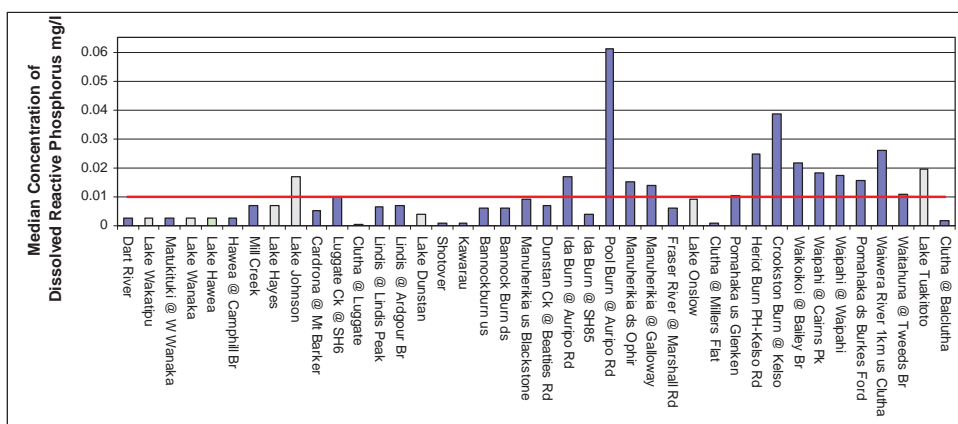
Note: The red lines on these graphs indicate the ANZECC trigger value or the DoH guideline level. The graphs represent both lakes and rivers/streams, which are colour coded white and blue respectively.

## Nutrients

Nitrite-nitrate nitrogen (NNN) is a form of nitrogen primarily derived from land drainage. It is an important nutrient for algae and other plant growth, but can be harmful in higher concentrations. The graph below highlights the fact that it is only the sites in South West Otago that have a median NNN concentration above the ANZECC trigger value. The other stream and lake sites have median values well below the ANZECC guideline.

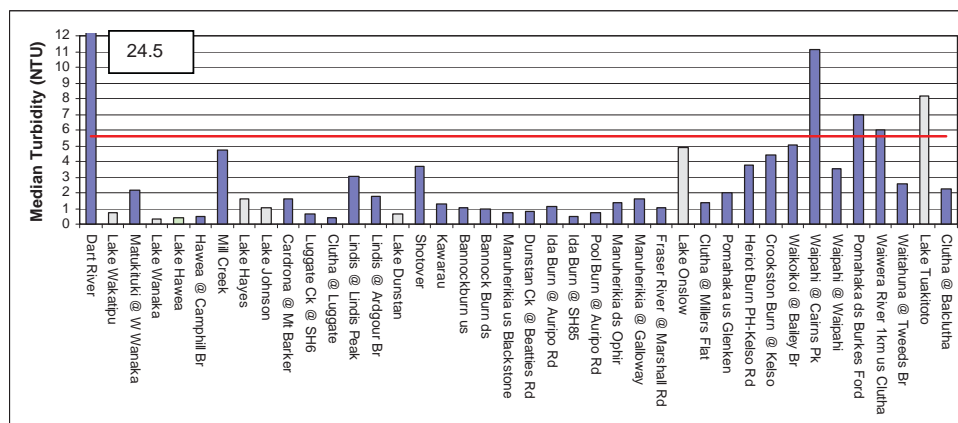


Median dissolved reactive phosphorus (DRP) concentrations were above the ANZECC trigger value at 15 of the sites monitored. These high DRP sites included Lake Johnson and Lake Tuakitoto, the Ida Burn and Pool Burn, the lower Manuherikia and most of the Pomahaka catchment.



## Turbidity

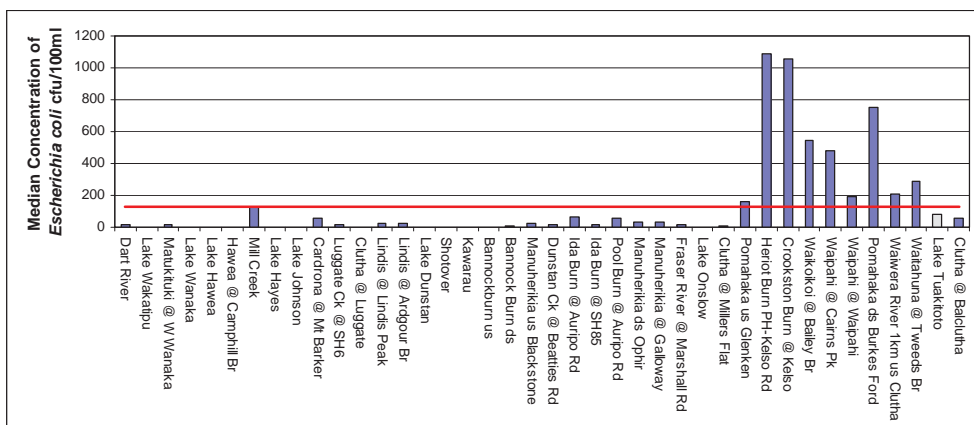
Turbidity was elevated above the ANZECC trigger value at three sites in the Pomahaka catchment, Lake Tuakitoto and the Dart River.



## Bacteria

Median levels of *E. coli* were generally above the DoH guideline (126 cfu/100ml) in the Pomahaka catchment, and the lower Clutha tributaries. Mill Creek also had elevated *E. coli* levels on several occasions.

All other sites showed bacteria levels below the trigger value indicating minimal overall health risk. However bathers should be aware that bacteria levels are likely to be high immediately following rainfall events.



## Other analytes

- Ammoniacal nitrogen is the combination of ammonium ions (NH<sub>4</sub>) and ammonia (NH<sub>3</sub>). Levels of ammoniacal nitrogen were well below the ANZECC guideline level of 0.9 mg/l in all samples analysed. NH<sub>3</sub> is the main toxic component of ammoniacal nitrogen, the toxicity of which is dependent on pH and temperature. Taking these factors into account, none of the sites other than Lake Hayes (December sample) had NH<sub>3</sub> concentrations likely to be toxic to fish (>0.021 mg/l).
- Water at all sites was neutral with respect to pH, falling within ANZECC guideline levels.
- Dissolved oxygen saturations should be above 80%, which was the case at all but two sites: Pool Burn and Lake Onslow.
- Total nitrogen was elevated above the trigger level at most sites in the Pomahaka catchment, as well as at Lake Johnson in the Wakatipu basin.
- Total phosphorus was elevated above the ANZECC trigger value in the Dart River, the smaller lakes (Lakes Johnson and Hayes in the Wakatipu basin, Lake Onslow and Lake Tuakitoto), the Pool Burn (tributary of the Manuherikia River) and most sites in the Pomahaka catchment.

## 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 (e.g. insects, crustaceans, snails, worms) and periphyton (e.g. algae).

These biological indices put a large amount of information into a compact form. They are therefore inherently coarse tools that give a broad view of general patterns. However, they are useful as the presence or absence, abundance and distribution of species can inform us greatly about the quality and condition of the site at which they live.

A key component of the MCI index is the availability of suitable habitat. As the MCI index is specifically designed 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 a catchment. However, taking this limitation into account, the MCI index is still useful for noting improvement or deterioration in water quality at an individual site over time.

## Criteria for macroinvertebrate health

Macroinvertebrate Index	Poor	Average	Good	Excellent
MCI	<80	80 - 99	100 - 120	>120
SQMCI	<4	4 - 5	5 - 6	>6
Total species	<10	10 - 20	20 - 30	>30
Total EPT species	<5	5 - 15	15 - 20	>20

## Clutha River macroinvertebrate health 2006/07

Sample Location	MCI	SQMCI	Total Species	Total EPT
Cardrona at Larches (Mt Barker)	111	6.0	9	5
Fraser River at Marshall Rd	108	5.1	15	10
Heriot Burn at Parkhill/K Rd	109	5.7	14	10
Lindis River at Ardgour Rd	96	5.2	22	10
Luggate Creek at Luggate Ck Br	96	3.1	20	6
Mill Creek at Fish Trap	96	4.3	9	3
Waipahi at Waipahi	95	4.6	15	7
Waitahuna at Tweeds Bridge	109	5.5	14	9
Waiwera	89	2.8	15	7

There is no change to previous years. Only Luggate Creek and the Waiwera River have poor SQMCI values, this is likely to be due to poor water quality as the substrate for macroinvertebrates is good. Mill Creek above Lake Hayes scores poorly for EPT species, this is likely to be due to fine sediments and marginal habitat suitability.

## Biological indices

- MCI – The Macroinvertebrate Community Index is 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.
- EPT species – this index is a sum of the total number of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) species collected.

## Recent ORC reports

- Monitoring the effects of irrigation runoff on water quality (Thompsons Creek, Ida Burn, Chatto Creek), May 2006.
- Water Quality of the Lindis and Cardrona Rivers, May 2006.
- State of Environment Report, Surface Water Quality in Otago (May 2007)

## Contact

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