



Taieri River

Annual Monitoring Summary

2006-2007

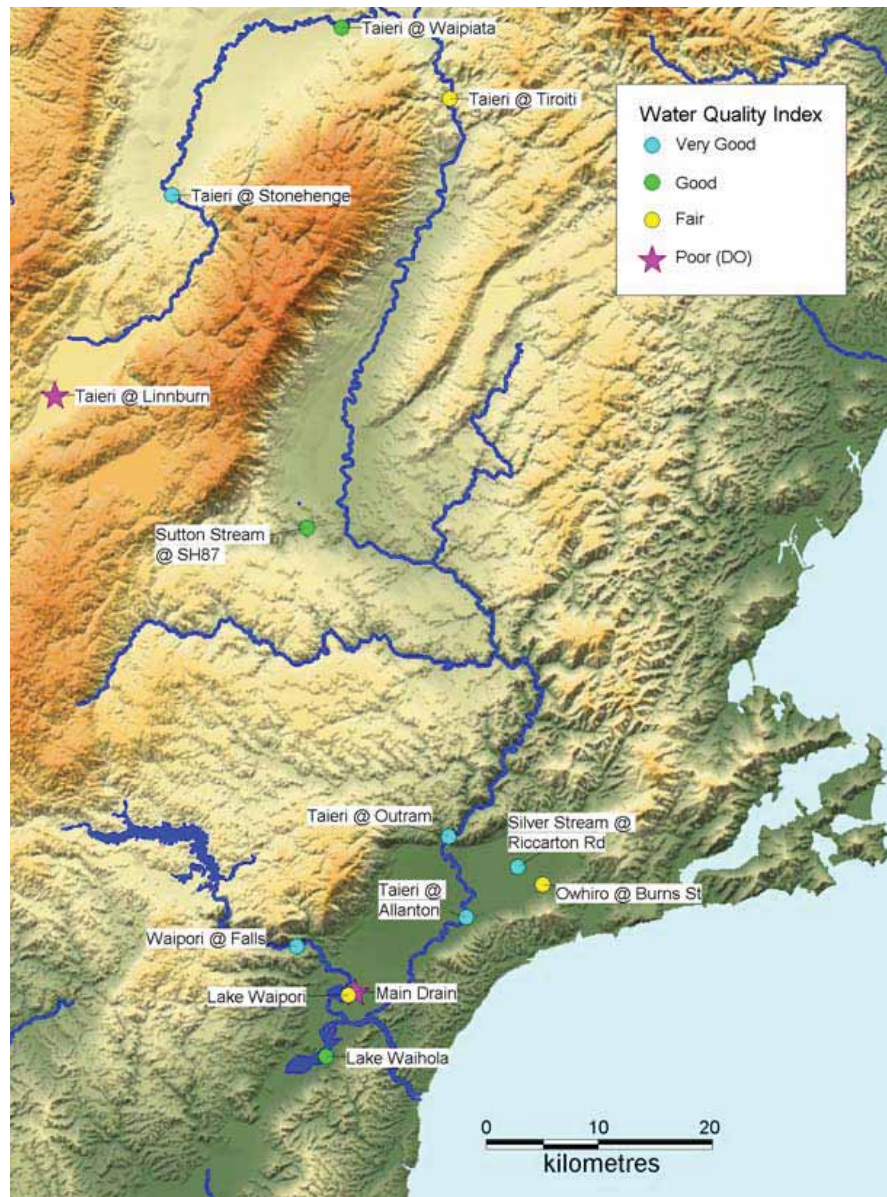
Key points

- Water quality in the mid Taieri deteriorated, then improved further downstream.
- The median concentration of dissolved reactive phosphorus exceeded the guideline at two mainstem Taieri monitoring sites.
- The median level of E. coli in the Sutton Stream exceeded the Department of Health (DoH) contact recreation guideline level of 126 E.coli/100ml.

Water quality monitoring

Between June 2006 and the end of May 2007 the Otago Regional Council monitored 10 river and stream sites in the Taieri catchment to assess the current state of water quality. NIWA monitored a further three sites (Taieri at Tiroiti, Taieri at Outram and the Sutton Stream at SH87). Historical results and longer term trend analysis is available in the 2007 SOE report.

The most important factor influencing water quality is land use. In the Taieri catchment sites with poorer water quality are generally found in areas which are more intensively farmed such as the lower Taieri plain, whereas sites in the upper catchments generally have better water quality. There are few significant discharges into freshwater in the Taieri catchment, however Ranfurly, Naseby, Middlemarch, Waihola, Dunedin Airport and Waipori Falls all have consented sewage discharges.



Guidelines & standards

- The ANZECC (2000) guidelines outlines trigger values for water quality (e.g. nutrients, dissolved oxygen, pH etc). The trigger levels specify 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) guideline for contact recreation recommends a season median of 126 E. coli/100ml.

Water quality results

Sites were classified using a water quality index, derived from median values of seven indicator variables: turbidity, dissolved oxygen (percentage 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:

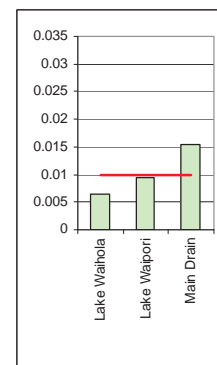
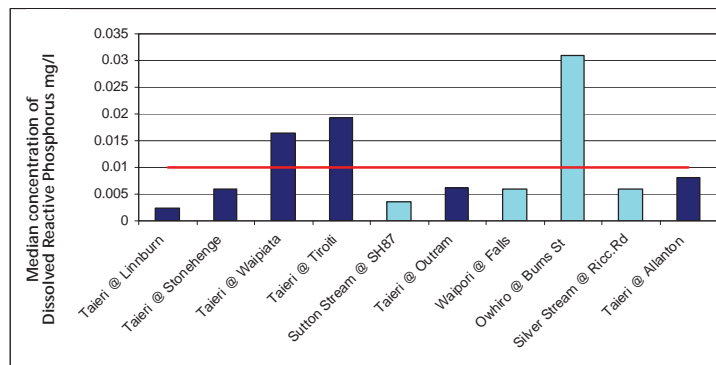
| | |
|---------------|---|
| Very Good | All seven values comply with guideline values |
| Good | Five or six median values comply (dissolved oxygen must comply) |
| Fair | Three or four median values comply (dissolved oxygen must comply) |
| Poor | Two or fewer median values comply with guideline values |
| Poor (Low DO) | Dissolved oxygen falls below 80 percent saturation. |

Selected water quality indicators are displayed in the graphs and discussed below. Overall water quality is generally very good or good for the entire catchment, however the Main Drain and the Taieri at Linnburn are classified as 'poor DO' due to low dissolved oxygen levels (low gradient, meandering, slow flowing, pool like conditions), and two sites are classified as 'fair'(Owhiro Stream and Lake Waipori).

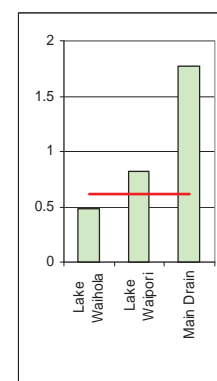
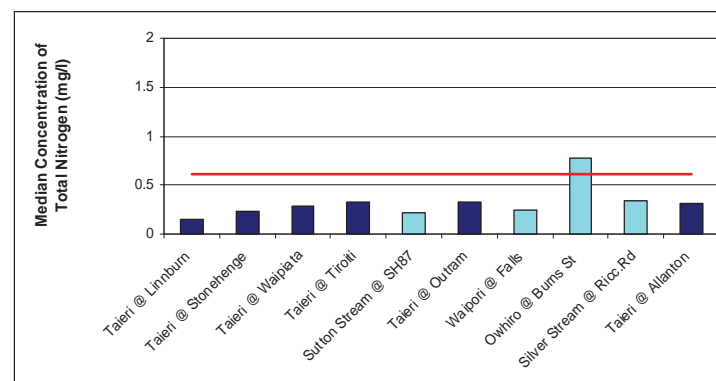
Note: The red lines on these graphs indicate the ANZECC trigger value or the DoH guideline level. The graphs are colour coded: blue represents the Taieri mainstem; turquoise represents Taieri tributaries and green represents sites on the lower Taieri plain.

Nutrients

Dissolved reactive phosphorus levels in the Taieri mainstem exceeds the ANZECC default trigger value at Waipiata and Tiroiti, concentrations further downstream then drop below this trigger value. The Owhiro Stream and the Main Drain also exceed the trigger value. Total phosphorus median values followed the same pattern.

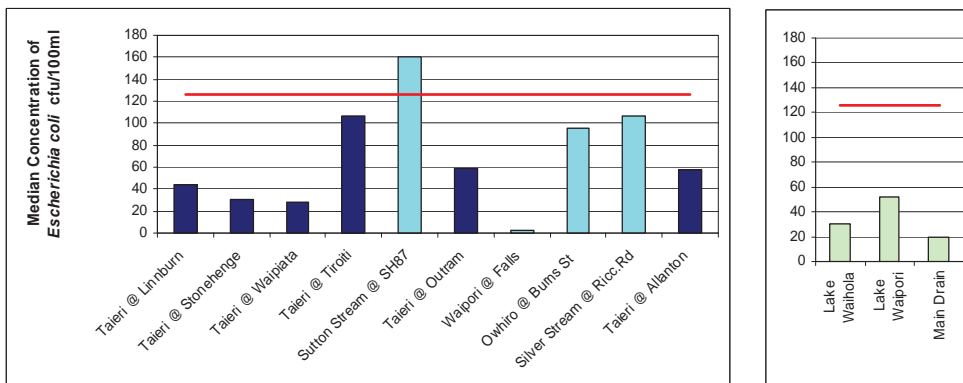


Nitrite Nitrate Nitrogen levels in the Taieri mainstem were all below the ANZECC default trigger value of 0.444 mg/l (lowland rivers), however total nitrogen levels were elevated in the Owhiro Stream, Lake Waipori and the Main Drain. Ammoniacal nitrogen levels were all well below 0.9 mg/l (ANZECC 95% high reliability trigger value for freshwater) and the ammonia component (after considering temperature and pH) for all sites was less than ANZECC 2000 guideline of 0.021 mg/l.



Bacteria

The Department of Health (1992) guidelines for contact recreation waters recommend a season median of 126 E. coli/100ml. In 2006/7 this was exceeded at the Sutton Stream. Over the monitoring period only four of the sites exceeded the MfE/MoH guideline of 260 cfu/100ml for a single sample (Owhiro Stream, Taieri at Tiroiti, Sutton Stream and Taieri at Outram).



Ecosystem health results

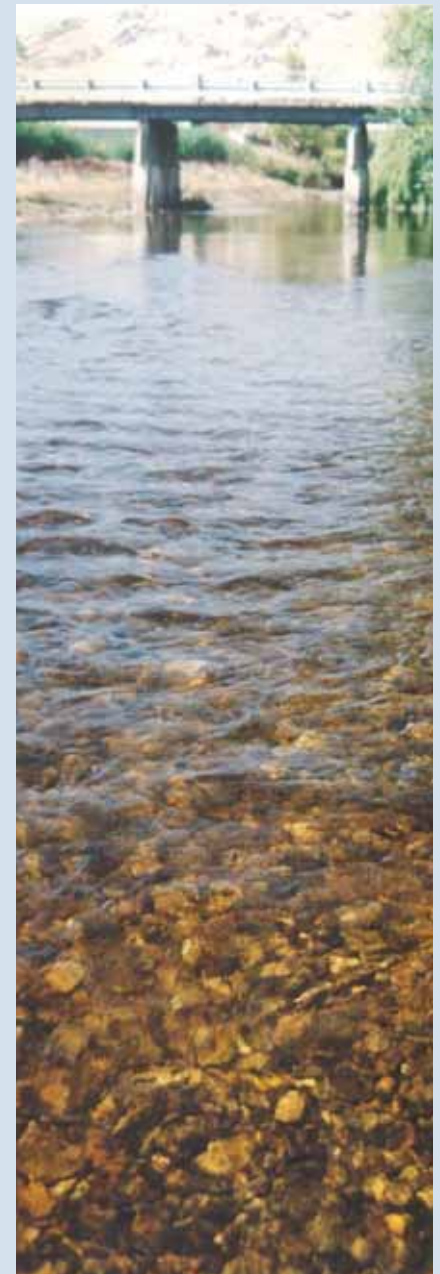
Ecosystem health takes into account a wide range of inter-linked factors, such as water quality, habitat and instream biota. It is generally assessed using two communities that are important to the food chain in rivers and streams: stream bed macroinvertebrates (eg insects, crustaceans, snails, worms) 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. However, they are useful as 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 limitations of the MCI index it can still be useful for picking up improvements or deterioration in water quality at individual sites over time.

Other analytes

- The upper mainstem Taieri site (Linnburn) dropped below 80 percent dissolved oxygen saturation (less than 80 percent is considered insufficient for biological health, RMA 1991).
- pH levels all fell within the ANZECC 1992 guideline values (pH 6.5 to pH 9.0).
- The highest recorded water temperature was in the Silverstream at Riccarton Road at 20.6 °C.



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 |

Taieri River macroinvertebrate health 2006/07

| Site | MCI | SQMCI | Total species | Total EPT |
|--|-----|-------|---------------|-----------|
| Owhiro at Burns St | 60 | 1.4 | 7 | 1 |
| Silver Stream at Riccarton Rd | 85 | 3.8 | 15 | 4 |
| Waipori River at Waipori Falls Reserve | 106 | 3.7 | 27 | 15 |

There is no change to previous years. The Owhiro Stream is a very silty slow flowing stream unsuitable for macroinvertebrates. The Silverstream has good water quality but marginal habitat due the modified system (flood banks, straightened channel). The Waipori River is also a modified system, it has good water quality but macroinvertebrate health would be limited due to the hydroelectric scheme and the rapid rise and fall of water level.

Biological indices

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

Recent ORC reports

- Lake Waiholo and Lake Waipori: Trophic Level Status March 2005.
- Monitoring the effects of irrigation run off on water quality (Gimmerburn, Sowburn and Pigburn), May 2006.
- State of Environment Report, Surface Water Quality in Otago May 2007.

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