



River and stream health

Taieri River Annual Monitoring Summary

2005-2006

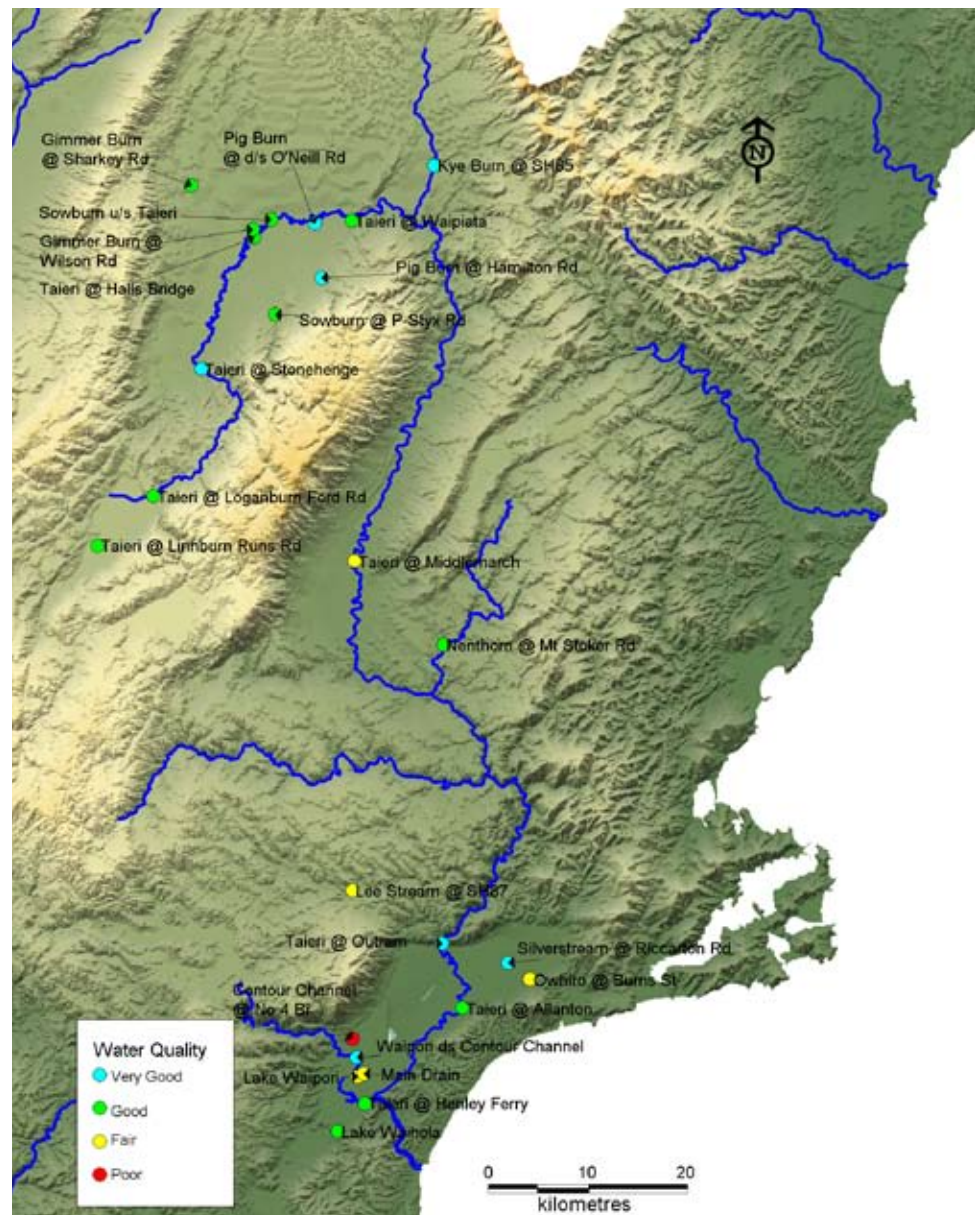
Key Points

- Water quality in the mid Taieri deteriorated, then improved further downstream.
- The median concentration of dissolved reactive phosphorus exceeded the guideline at three mainstem Taieri monitoring sites.
- The Gimmer Burn, Sow Burn and Pig Burn were monitored more frequently during the summer months as part of an irrigation run-off study.
- The median level of *Escherichia coli* was generally below the Department of health (DoH) contact recreation guideline level of 126 E.col/100ml.

Water quality monitoring

Between June 2005 and the end of May 2006 Otago Regional Council regularly monitored 19 sites in the Taieri catchment as part of the State of Environment monitoring programme. Six additional sites were also monitored as part of a catchment programme investigating irrigation run-off.

The most important factor influencing water quality is land use, sites with poorer water quality are generally found in areas which are more intensively farmed such as the lower Taieri plain. Water quality monitoring 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 into the Taieri catchment.



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Water Quality Results

The classification of sites was achieved by using a water quality index derived from the median values for seven variables: turbidity, dissolved oxygen (% saturation), total phosphorus, total 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 four categories:

Guidelines and Standards

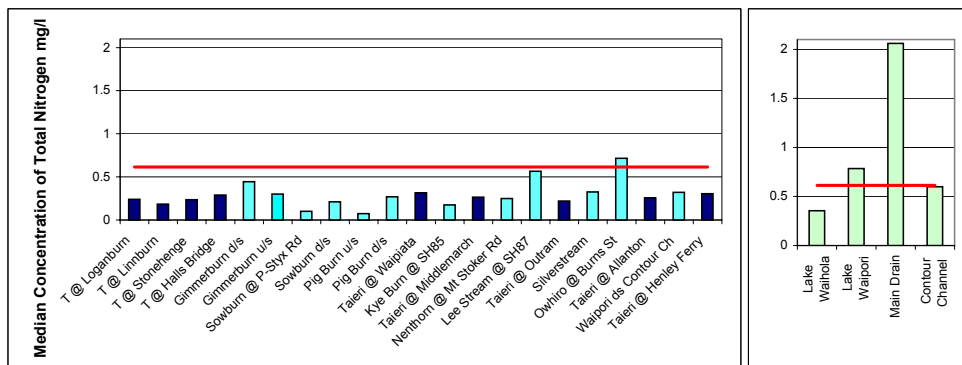
- The ANZECC (2000) guidelines outlines trigger values for water quality (e.g. nutrients, dissolved oxygen, pH etc). The trigger levels specify a level below which the risk of adverse biological effect is low. Note: The ANZECC trigger values used here are for lowland rivers (<150m)
- Otago’s water quality 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 *Escherichia coli*/100ml.

Very Good	All seven median values comply with guideline values
Good	Five or six of the 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

All the sites are plotted on the map and show how water quality is generally very good or good for the entire catchment, however the main drain, Lake Waipori, Lee Stream and the Taieri at Middlemarch have ‘fair’ water quality, whilst the Contour Channel is graded ‘poor’.

Nutrients

Dissolved reactive phosphorus levels in the Taieri mainstem exceed the ANZECC default trigger value at Halls Bridge, Waipiata and Middlemarch, concentrations further downstream then drop below this trigger value. The Gimmerburn and Sowburn were

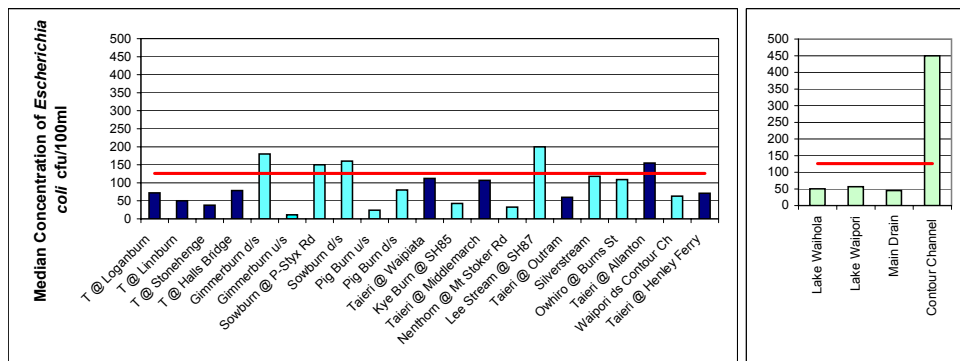


monitored as part of an irrigation run-off study and the elevated results downstream highlight the cumulative effect run-off has on water quality. The Lee Stream, Owhiro Stream and both drains also exceed the trigger value. Total phosphorus median values followed the same pattern.

Nitrite Nitrate Nitrogen levels in the Taieri were all below the ANZECC default trigger value of 0.444 mg/l (lowland rivers), however total nitrogen levels were elevated in the Owhiro, 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 *Escherichia coli*/100ml. In 2005/6 this was exceeded at six sites, Gimmerburn d/s, Sowburn (both u/s and d/s), Lee Stream, Taieri at Allanton and the Contour Channel. Water quality is compromised at most sites after rainfall, and this is shown by the fact that over the monitoring period 18 of the sites exceeded the MfE/MoH guideline of 260 cfu/100ml for a single sample.

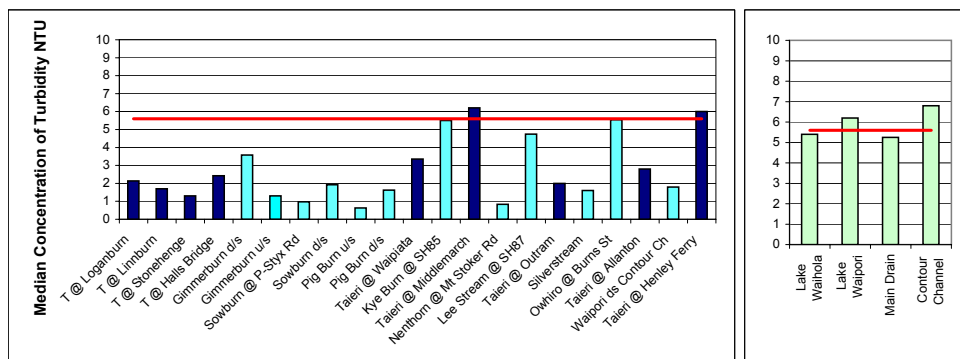


Recent ORC reports

- Monitoring the effects of irrigation runoff on water quality on tributaries in the Upper Taieri (Gimmerburn, Sowburn and Pigburn). May 2006
- A review of the sites chosen for the river and stream health monitoring programme, based on information needs, best practice and Otago Regional Council's management objectives. March 2006
- Lake Waihola and Lake Waipori: Trophic Level Status March 2005

Turbidity

Turbidity was elevated above the ANZECC trigger value of 5.6 NTU at four sites: Taieri at Middlemarch, Taieri at Henley Ferry (tidal), Lake Waipori (resuspension of sediment by wind) and the Contour Channel. The Kye Burn, Lee Stream and Owhiro Stream also showed high median values, as did the other shallow Lake (Waihola) and the Main Drain.



Other analytes

- The upper mainstem Taieri sites (Linnburn and Loganburn) dropped below 80% dissolved oxygen saturation (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 Gimmerburn at 19.76 °C and the lowest recorded water temperature was in the mainstem Taieri at Linnburn (3.01°C).

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, 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 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 2006, 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	<80	80 - 99	100 - 119	>120
SQMCI	<4	4 - 4.99	5 - 5.99	>6
Total species	<10	15 - 20	20 - 30	>30
Total EPT species	<5	9 - 15	15 - 20	>20

Taieri River macroinvertebrate health 2004

Sample location	MCI	SQMCI	Total species	Total EPT
Stonehenge Main Stem	100	5.1	19	8
Waipiata Main Stem	98	5.6	20	9
Middlemarch Main Stem	93	5.3	24	9
Outram Main Stem	97	4.3	18	8
Allanton Main Stem	81	2.6	14	6
Kye Burn Tributary	104	6.7	18	7
Sutton Stm Tributary	115	5	25	12
Silver Stm u/s Tributary	110	4.8	26	14
Silver Stm d/s Tributary	73	2.8	9	1
Waipori Tributary	104	4.6	19	10
Owhiro Tributary	71	3.7	21	3.6



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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