

Water quality and ecological health of rivers in the Manuherikia catchment

September 2009 - September 2010



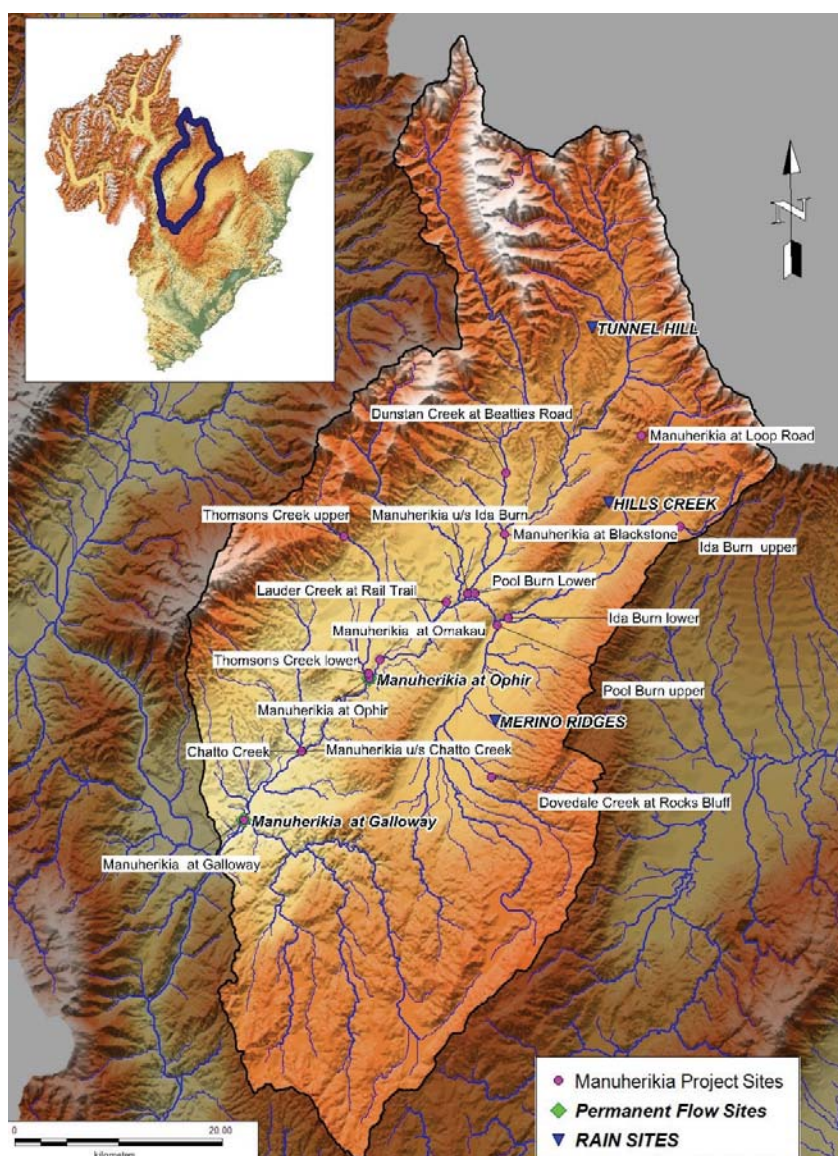
In September 2009, the Otago Regional Council (ORC) initiated an intensive investigation into water quality and ecological health in the Manuherikia River catchment

Why did we investigate water quality in the Manuherikia catchment?

Irrigation water is highly sought after in the Manuherikia catchment - one of the driest in New Zealand. Water quality in the catchment is generally very good, with land use currently dominated by low-intensity sheep and beef farming. However, a range of water harvesting and distribution schemes is planned, which may potentially see changes in land use and intensity. This will potentially drive changes in water quality and ecological values. ORC implemented a 12-month water quality sampling regime with a one-off biological and habitat assessment to identify the baseline water quality in the catchment. It is this council's position that waterways should retain good water quality regardless of whether or not land use changes.

What did the investigation involve?

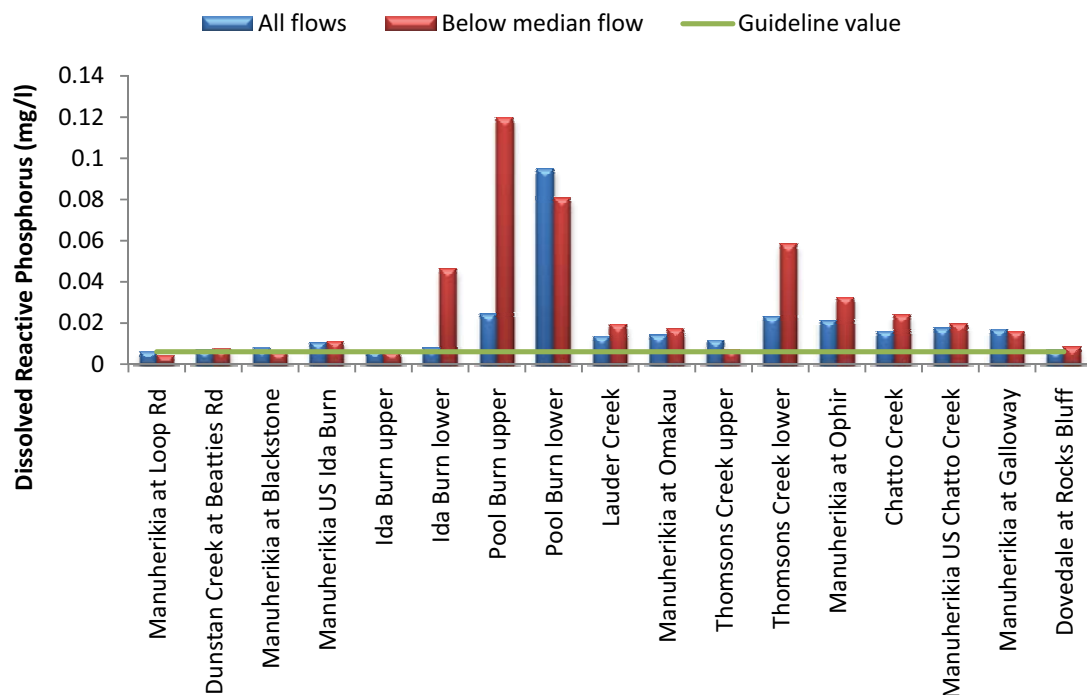
The monitoring programme ran from September 2009 to September 2010. Fortnightly water quality sampling was undertaken at 17 sites. The samples were tested for a range of variables, such as suspended sediment, nutrients, and *E. coli* bacteria. In the summer of 2010/2011 a one-off assessment of aquatic ecological health (macroinvertebrates and fish) and substrate analysis was also undertaken at each site.



The Manuherikia catchment and sampling sites.

Water quality - what did we find?

Water samples were divided into two groups: all of the samples that were collected (including low flows during summer and high flows occurring during the spring thaw or flooding) and below median flows which were typically samples collected during the summer period when flows were low. This is a period of high risk for algal growth and the time most likely for contact recreation. Compared with the other areas in Otago, the water quality was good; however, there were some areas of concern. Suspended sediment concentrations were below effects-based guidelines during the low flow period, except in the lower Thomsons Creek. Nitrite-nitrate nitrogen was low at most sites during low flows, except in the lower Chatto Creek. Dissolved Reactive Phosphorus (DRP) concentrations were elevated in most sites, particularly in the sections that received flood/border-dyke irrigation runoff. Water quality parameters were more often elevated during the low flow period when rivers received inputs from irrigation runoff.



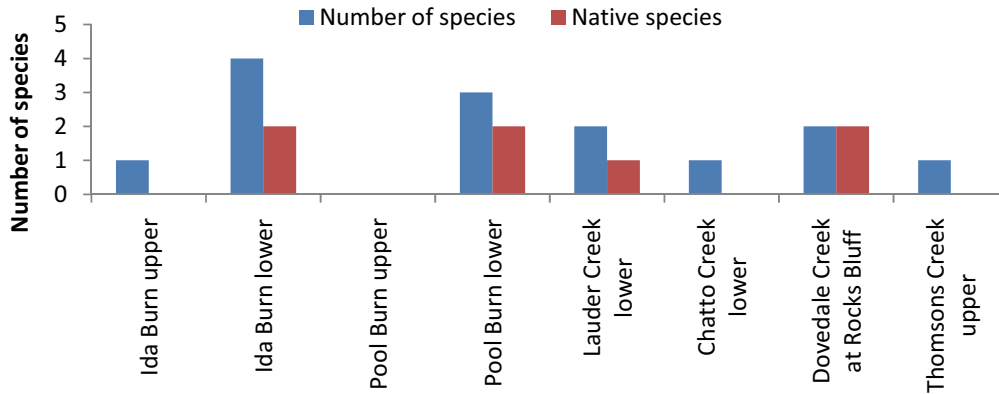
Dissolved Reactive Phosphorus (DRP) concentrations in the Manuherikia catchment.

Ecological health - what did we find?

Fish and macroinvertebrates were sampled as an indicator of ecological health. Dunstan Creek had the healthiest macroinvertebrate population with high scores for all measured indices, while the lower Ida Burn site (at Auripo Road) had the most degraded macroinvertebrate community. The upper Pool Burn site was dominated by snails and worms. This site also had 100% coverage of fine sediment, and a high coverage of macrophytes, indicating high nutrients. Manuherikia at Loop Road had a poor macroinvertebrate community, reflecting the 100% coverage of the streambed with *Didymosphenia geminata* (Didymo) which reduced habitat for macroinvertebrates. The mainstem of the Manuherikia River had macroinvertebrate communities ranging from good to poor. The poor values were reflective of the larger substrate found as opposed to degraded water quality.

In the streams where fish populations were sampled, upper Thomsons Creek had the highest densities of introduced Brown Trout, followed by the lower Pool Burn, Chatto Creek and lower Ida Burn. The nationally vulnerable Central Otago Roundhead galaxiid was only found when introduced brown trout were absent, or at very low densities, as trout prey upon galaxiids. The highest densities of these galaxiids were found in

Dovedale Creek, followed by the lower Ida Burn. Very few long fin eels were found in the catchment with only individual adults found in the lower Pool Burn, lower Ida Burn and Lauder Creek.



Number of species in the rivers that were sampled during the study.

Summary

The Manuherikia catchment has many variables which can affect ecological values. These can include: poor water quality; water abstraction; predatory competition on native fish by introduced sports fish and; hydro electricity development (this impedes Longfin eel migration).

Water quality, physical habitat, and ecological values are summarised in Table 1. Each parameter was graded as excellent, good, fair or poor. In the upper part of the catchment there was excellent or good water quality, while many of the tributaries had degraded (fair) water quality.

Water quality in the lower Manuherikia was still classified as good, compare to an excellent rating at the top of the catchment. Habitat was generally high quality, as was the macroinvertebrate community. The upper Pool Burn site had poor habitat, poor macroinvertebrates, and poor fish populations, which was likely the result of the streambed being completely covered with fine sediment. Poor macroinvertebrate communities at the tributary sites are likely to be the result of the combined effects of degraded water quality and the periodic drying of these sections, which limits the population.



Pool Burn lower with large cobble substrate



Pool Burn upper with thick macrophyte and algae growth

Table 1: Summary of water quality, habitat, and ecological value

Site	Water quality	Habitat	Macroinvertebrates	Trout	Native Fish
Manuherikia at Loop Road	Excellent	Excellent	Poor	N/A	N/A
Dunstan Creek at Beatties	Good	Excellent	Excellent	N/A	N/A
Manuherikia at Blackstone	Excellent	Excellent	Good	N/A	N/A
Manuherikia US Ida Burn	Good	Excellent	Fair	N/A	N/A
Ida Burn upper	Excellent	Excellent	Fair	Excellent	Poor
Ida Burn lower	Fair	Good	Poor	Fair	Excellent
Pool Burn upper	Fair	Poor	Poor	Poor	Poor
Pool Burn lower	Fair	Good	Poor	Good	Excellent
Lauder Creek lower	Fair	Fair	Poor	Poor	Excellent
Manuherikia at Omakau	Good	Excellent	Fair	N/A	N/A
Thomsons Creek upper	Good	Excellent	Good	Excellent	Poor
Thomsons Creek lower	Poor	Good	Good	N/A	N/A
Manuherikia at Ophir	Fair	Excellent	Poor	N/A	N/A
Chatto Creek lower	Fair	Good	Good	N/A	N/A
Manuherikia US Chatto Creek	Good	Excellent	Fair	N/A	N/A
Manuherikia at Galloway	Good	Excellent	Poor	N/A	N/A
Dovedale at Rocks Bluff	Good	Fair	Poor	Poor	Excellent

N/A These sites could not be fished due to abnormally high summer flows.

What next?

The results of this study will also be used by the ORC land resources team in their Manuherikia catchment programme, which aims to helping landholders to meet the challenges of efficient irrigation, measuring, group management of water, and best practice around waterways. Some current irrigation practices will come under pressure as efficiency calculations are implemented, with the renewal of Deemed Permits and the ORC rural water quality strategy takes effect. Wild flood systems have their place, but in some instances will not be suitable due to low efficiency and the harmful effects of runoff on waterways.