

Water quality and ecological health for rivers in the Catlins area

October 2009 to September 2010



Key points

- The Tautuku and Maclennan had excellent water quality. The sites had more than 90% native bush upstream of their sampling sites reflecting pre-pastoral conditions
- The Owaka River is typically well above water quality guideline values for nutrients.
- The Owaka River had high median levels of bacteria at all sites and breached the stock drinking water guideline (1000 cfu/100ml) at upper two sites.
- The percentage of mayflies, caddis flies and stoneflies at each site was at least 55%, which indicates healthy streams.
- The condition/density of brown trout was generally good to excellent.
- Bedrock was evident at many sites, but was prevalent in the Owaka River. The Owaka also had the highest percentage of fine sediment cover.
- Most rivers in the Catlins were utilised to provide stock water. This practice obviously accelerates bank erosion and degrades riparian vegetation. Excluding stock from the water would prevent further ecological deterioration.

Why did we investigate water quality in the Catlins?

The Catlins lies between the Clutha River/Mata-Au to the north-east and the Mataura River to the west. It has the largest remaining area of native forest on the South Island's east coast, and is defined by parallel ranges of hills, which are separated by the valleys of the Owaka, Catlins and Tahakopa rivers, which flow in a south-easterly direction.

The Catlins rivers are recognised for many natural values, including high fish and macroinvertebrate diversity, rare fish, trout spawning and rearing habitat and a significant presence of eels. There is a high percentage of native bush in the catchments and the rivers are considered to have excellent water quality. Until recently, farming in the area has traditionally been sheep and beef grazing; however, land-use is changing and more intensive farming is now prevalent in the Owaka catchment and is likely to expand.



Tahakopa mid

What did the investigation involve?

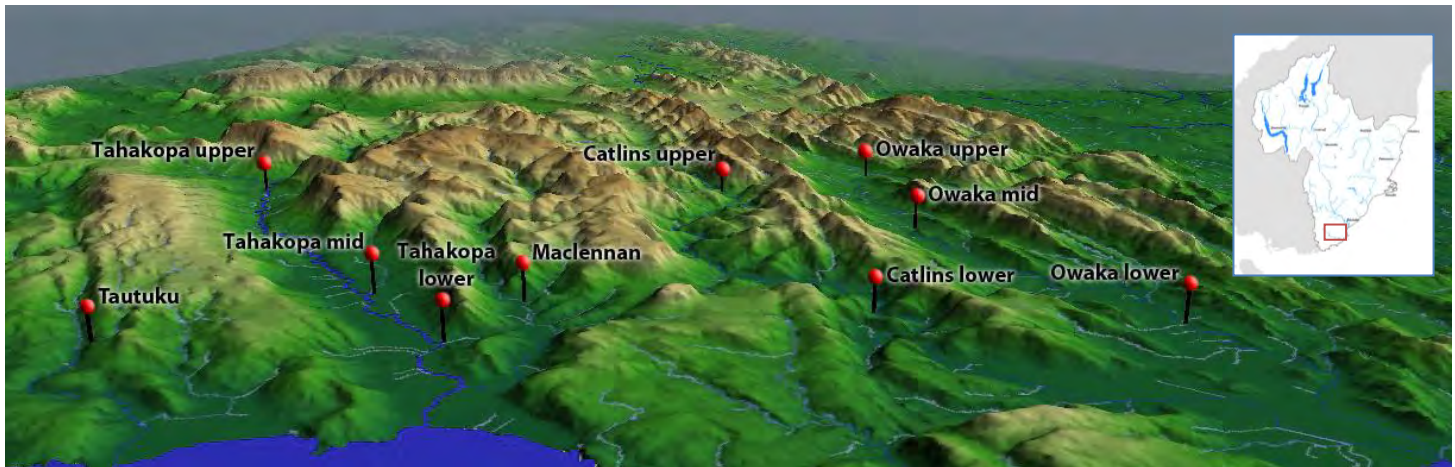
The monitoring programme ran from October 2009 to September 2010. Fortnightly water quality sampling was undertaken at 10 sites for 12 months. The samples were tested for a range of variables, such as suspended sediment, nutrients, and *E. coli* bacteria.

In addition a one-off assessment of aquatic ecological health and substrate analysis was undertaken at each site. The principal aim of the investigation was to improve understanding of surface water quality within the Catlins and to determine ecological values of the rivers in the region.



Owaka valley

Monitoring sites



Water quality – What did we find?

The table opposite shows the median concentration of each contaminant compared to the guideline value. The cells shaded in brown show that the guideline concentration was exceeded.

For each river a grade was allocated (according to the table below.)

Grades for water quality

Very Good	Median concentration of all six parameters comply with guideline values
Good	The median concentration of five parameters comply
Fair	The median concentration of three or four parameters comply
Poor	Two or fewer median values comply with guideline values

Four sites had excellent water quality. These sites all had a high percentage of indigenous forest in their catchments.

In contrast, the river with the poorest water quality was the Owaka. It had the highest percentage of pasture (>70%), in its catchment. Sheep farming and increasingly dairy farming are the main types of farming in this catchment

The table opposite shows why nutrients, sediment and faecal matter in rivers can be a problem.

	DRP	<i>E.Coli</i>	NNN	SS	TN	TP	Grade
Guideline value	<0.026 mg/l	<126 cfu/100ml	<0.295 mg/l	6.4 mg/l	0.614 mg/l	0.033 mg/l	
Tautuku	0.011	41	0.086	1.97	0.227	0.018	excellent
Catlins upper	0.011	459	0.292	2.70	0.503	0.025	good
Catlins lower	0.016	162	0.246	2.75	0.438	0.032	good
Owaka upper	0.031	1023	1.053	9.19	1.268	0.058	poor
Owaka mid	0.023	423	0.864	2.84	1.085	0.040	poor
Owaka lower	0.017	176	0.615	1.90	0.874	0.033	poor
Maclennan	0.015	112	0.168	2.81	0.341	0.029	excellent
Tahakopa upper	0.013	60	0.115	1.72	0.301	0.021	excellent
Tahakopa mid	0.013	265	0.224	6.28	0.404	0.027	good
Tahakopa lower	0.014	123	0.091	2.53	0.288	0.026	excellent

Pollutant and Source	Why is it a problem
(TN) Total Nitrogen (NNN) Nitrite-Nitrate Nitrogen <ul style="list-style-type: none"> Urine and dung from stock Nitrogen in fertilizer 	<ul style="list-style-type: none"> Feeds nuisance plant and algae growth in waterways Algae and nuisance plants affect stream life, block water intakes and make water unpleasant for swimming and drinking Ammoniacal nitrogen can be toxic to fish
(TP) Total Phosphorus (DRP) Dissolved Reactive P <ul style="list-style-type: none"> Dung from stock Phosphate in fertiliser Farm dairy effluent Soil sediment 	<ul style="list-style-type: none"> Feeds nuisance plant and algae growth in waterways Algae and nuisance plants affect stream life, block water intakes and make water unpleasant for swimming and drinking
(SS) Sediment <ul style="list-style-type: none"> Slips Stream bank erosion and trampling Tracks and races Surface of paddocks 	<ul style="list-style-type: none"> Makes water murky and affects stream life Poor water clarity Makes water unsafe for swimming
(E.coli) Faecal matter <ul style="list-style-type: none"> Dung from stock Farm dairy effluent 	<ul style="list-style-type: none"> Human health risk from swimming and drinking Can affect stock health if present in stock water

Ecological health - what did we find?

Fish and macroinvertebrate communities were surveyed as an indicator of ecological health. The ecological condition of all the streams was good. The percentage of mayflies, caddis flies, and stoneflies (EPT taxa) at each site was at least 55%, which indicates very healthy streams. The condition/density of brown trout was generally good to excellent, with Owaka mid being the best site. The other excellent sites were the Owaka upper, Tautuku (control site) and the Tahakopa upper site. The Catlins upper site had the lowest condition/density of trout, possibly due to scouring flows and a lack of flood refuge habitat for smaller trout.

The Brown Trout fishery in the Catlins River was poor compared to the other sites. This is likely to be because the sites do not provide ideal juvenile trout habitat (probably due to a lack of flood refuge habitat). The Catlins lower site had the highest Long Fin Eel density, while the Tahakopa mid site had the highest Lamprey, Common and Redfin Bully densities. The Owaka lower site, due to its proximity to the Pacific Ocean, had abundant native fish, with the highest density of Inanga and a high density of Common Bully and Longfin Eels. The highest densities of native fish were generally found in streams dominated by larger substrate (Catlins lower site, Maclennan, Tautuku, Tahakopa mid). High densities of brown trout and native fish do not co-exist.



Owaka upper



Stoneflies in the Maclennan

Substrate assessment - what did we find?

Most of the sites sampled had substrate in good to excellent condition and showed a very similar substrate composition (with the exception of the Owaka upper and mid sites). The Owaka sites contained a greater proportion of bedrock, the presence of which generally restricts the available habitat for fish and macroinvertebrates.



Owaka mid – fine sediment



Owaka upper – bedrock

The sites with more than 20% fine sediment cover were the Owaka sites and the Tahakopa mid-site. Even though the Owaka sites were dominated by bedrock, this fine sediment was visible in areas where bedrock was absent..

Stream-bank collapse caused by sheep grazing in riparian zones was a major source of sediment in these pasture catchment streams.

Collapsed banks and pugging due to stock access can have significant negative ecological effects, especially through the destruction of undercut banks, which are important native fish habitat (especially for eels). Riparian vegetation is vital as a mechanism to control sediment input and was absent from many of the rivers monitored



Catlins upper



Tautuku

The sites with least sediment cover were the Tautuku site and the Catlins upper site. The Tautuku had the largest substrate size along with the Catlins sites and the Tahakopa upper. This similarity in substrate-size class at these sites was most likely the result of frequent flushing flows reducing fine sediment build up.

Summary

Water quality and ecological values were combined to summarise each site. Each site was graded as either excellent, good, fair or poor, for water quality, physical habitat, macroinvertebrate and trout fishery values. The Tautuku, Maclellan and Tahakopa upper were classified as excellent. The Catlins sites and Tahakopa mid site were classified as good and the three Owaka sites were classified as fair. No sites were considered to be of poor health. The Owaka Stream, although compromised in terms of water quality and habitat, has an excellent trout fishery.

The table below summarises the condition of water quality, substrate, MCI and trout condition related density for each stream.

Site	Overall grade	Water Quality	Physical Habitat	MCI Score	Trout density/
Tautuku	Excellent	excellent	excellent	good	excellent
Maclellan	Excellent	excellent	excellent	excellent	good
Tahakopa upper	Excellent	excellent	good	excellent	excellent
Tahakopa mid	Good	good	fair	excellent	good
Catlins upper	Good	good	good	good	fair
Catlins lower	Good	good	fair	good	good
Owaka mid	Fair	poor	fair	fair	excellent
Owaka lower	Fair	poor	fair	fair	good
Owaka upper	Fair	poor	poor	fair	excellent
Tahakopa lower	n/a	excellent	n/a*	n/a*	n/a*

*n/a river was too wide and deep to assess effectively



Owaka lower



Tahakopa lower

What next?

A significant amount of knowledge has been gained about rivers in the Catlins area as a result of the targeted 12-month investigation. The results show that all the rivers monitored are in reasonable ecological health. However, the situation could deteriorate unless stock are excluded from water courses, or if farming becomes more intensified.

Results from this study will be used to provide baseline data and help direct ORC policy, in line with the Rural Water Quality Strategy. The results are currently being used by ORC's Land Resources team, which has started a catchment programme in the Catlins. This aims to establish joint initiatives with land managers to improve stream health through best management practices (i.e. fencing, riparian planting).

A series of meetings has already been held with key landowners in the district. Public field-days will be held to explain the study's findings to iwi and landowners within the Catlins area. These meetings will signal the start of initiatives to encourage farmers and the wider community to change their practices and improve water quality.