OUR FRESHWATERS

River Water Quality 2010

Summary Report

tasman district council

Our Freshwaters

Introduction

Healthy waterways enhance the beauty of Tasman's landscape and are valued for recreation and as well as for cultural and spiritual dimensions.

The entire community benefits from having unpolluted swimming holes, good quality habitat for stream life, such as insects and fish, and clean water for water supplies, irrigation, stock drinking and industrial abstraction.

Streams also serve an important purpose as drainage systems, particularly in urban areas, where they receive runoff from our roads and buildings via the stormwater system.

As part of its obligations under the Resource Management Act, Tasman District Council monitors the state of surface water quality and river health or State of the Environment (SoE) at sites throughout the Tasman District.

The Wairoa River at upstream Pig Valley

Our Monitoring Programme

The specific aims of the SoE programme are:

1. To determine the quality of surface waters in the district in reference to accepted standards (for public health, recreational and ecological reasons).
2. To identify trends in water quality.
3. To identify cumulative environmental effects from multiple discharges into surface waters.
4. To understand the nature of surface water quality problems/issues in order to provide information for defensible management responses. Such responses include seeking reviews to Council resource management plans, regulations and their enforcement and resource consent conditions.
5. To identify new issues and monitoring requirements.
6. To identify factors that cause change in surface water quality (i.e., impact monitoring).

A range of water quality parameters have been measured at 75 sites on a quarterly basis at base flow since 1999. Detailed information on the surface water quality of all sites sampled as part of the SoE programme, can be found in the "State of the Environment Report—River Water Quality in Tasman District 2010" (ISBN, 978-1-877445-09-5, TDC Report Number 10001) which is available on the Tasman District Homepage.

This Report

For this summary report, the presence and concentration of particular nutrients such as nitrogen and phosphorus as well as water clarity, pH and dissolved oxygen can indicate the aquatic ecosystem health of a site. Similarly, the presence or absence of filamentous algae (periphyton), water clarity and disease causing organisms, such as *E. coli*, can indicate whether a waterway is suitable for swimming (contact recreation) or stock drinking.

The Onekaka River, Golden Bay

Our Region

Water quality was assessed at 75 sites in five major catchments between 1999—2009 as part of the SoE Programme. The site numbers are listed in the table on Page 7.

Our waterways

Just over half the streams in the district have their source of flow in hill country, a quarter of the streams are fed by mountainous areas (>1000m) and most of the remainder (24%) are lowland-fed with a few spring-fed streams. Hill-fed streams in the Moutere area tend to have intermittent (ephemeral) flow. Flood peaks on the Buller (Kawatiri) River from Lake Rotoiti to Murchison are much more subdued than most rivers in the district due to its lake-fed source of flow.

Almost two-thirds of the district is protected in conservation estate. Indigenous forest is the main land cover in the region (60%), followed by pasture (17%) and exotic forest (9%).

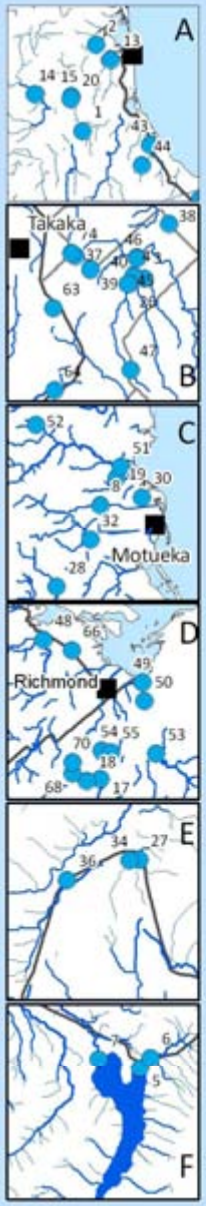
Our Climate

There are 9,253 kilometres of waterways in the district, over 90% of which drain areas that can be considered cool (mean annual temperature <12 °C) and wet and very wet (annual precipitation >500 mm). Small coastal streams between Richmond and Motueka are the only waterways in the district influenced by a 'warm dry' climate (2.5% of all streams). Moutere Hill country streams are described as being 'cool and dry' (about 3% of all streams), while several small coastal streams in Golden Bay are influenced by a 'warm wet' climate (3% of all streams).

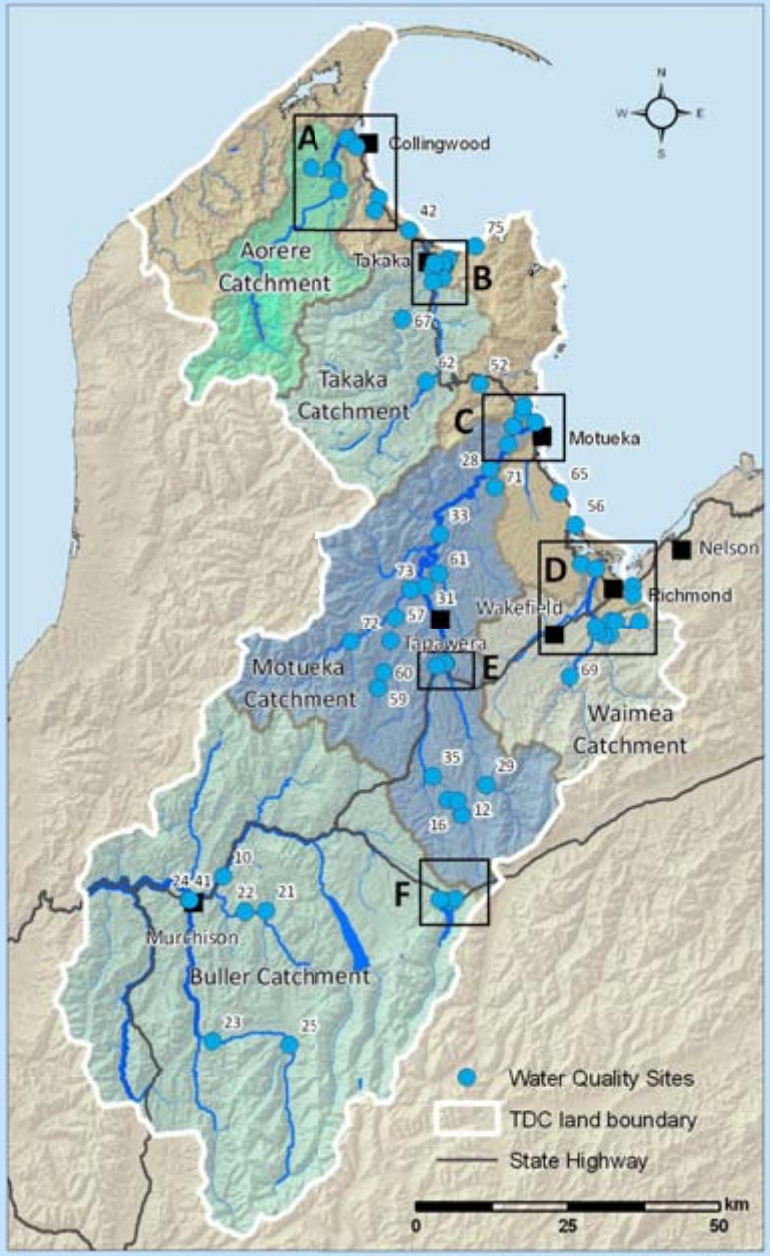
Our Geology

Geology plays an important role in shaping aquatic communities, particularly in the upper Motueka catchment where there are naturally high concentrations of heavy metals such as nickel and chromium in stream sediment. This is due to weathering of ultramafic rock (very basic rock with low acidic content) found in the Red Hills. This occurs to a lesser extent in other streams draining the Barnicoat and Bryant Ranges in the eastern part of the district. Rivers draining marble geology of the Mt Arthur Range have substantial flow during low rainfall periods (due to water storage within the fractured marble) compared to Moutere Gravel streams which commonly dry up in summer.

The Red Hills in the upper Motueka Valley



The Tasman District Council Area and its major catchments



Waterway Grades—What do they mean?

To be able to synthesize the water quality data collected over the last ten years to a single quality grade, a lowest denominator approach was used. This means that the site is graded according to the water quality indicator that scores the lowest. Detailed grades for all the key indicators are listed on Page 7. Depending on how often a site exceeded any given guidelines (percentage of total records (%)), a colour-coded 'traffic light' system was applied throughout the report which enabled council to rank aquatic ecosystem health, contact recreation and stock drinking at each site sampled over the last ten years. Different parameters for aquatic ecosystem health and contact recreation were assessed against Council water quality guidelines. The water quality ranking was determined by the following system:

The Matakitaki River near Murchison downstream of SH 6

Excellent: <5% of a site's records exceed relevant guidelines. All key processes are functional and all critical habitats are in near pristine condition.

Good: ≥5 - <10% of a site's records exceed relevant guidelines. Most key processes are functional and most critical habitats are intact.

Fair: ≥ 10 - <30% of a site's record exceed relevant guidelines. Some key processes are functional but some critical habitats are impacted.

Poor: >30% of a site's record exceed relevant guidelines. Many key processes are not functional and many critical habitats are impacted.

Monitoring at some sites involved only some water quality parameters. A white cell is shown in the table on Page 7 when there is insufficient data.

Contrasting water quality:
The Waingaro River and the Takaka River upstream Paynes Ford (2007)

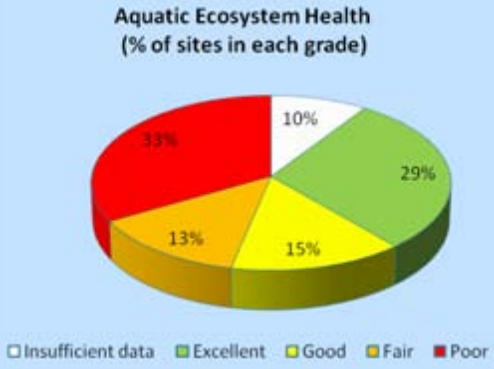
Water Quality for Aquatic Ecosystem Health

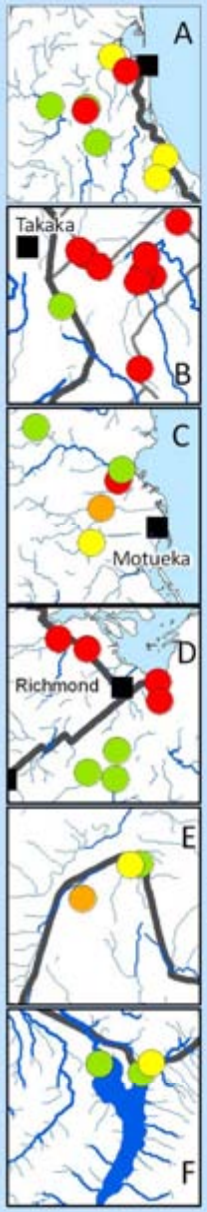
The majority of the 75 sites had excellent to good aquatic ecosystem health. These sites generally have low nutrient concentrations, high dissolved oxygen concentration and high water clarity and are often situated upstream of intensive land-use with a high proportion of their catchment in native bush (e.g., Hunters, Kaituna River and Motueka at Gorge), or large waterways with high levels of dilution (e.g., the Aorere, Buller, Lee, Riwaka, Roding and Takaka Rivers).

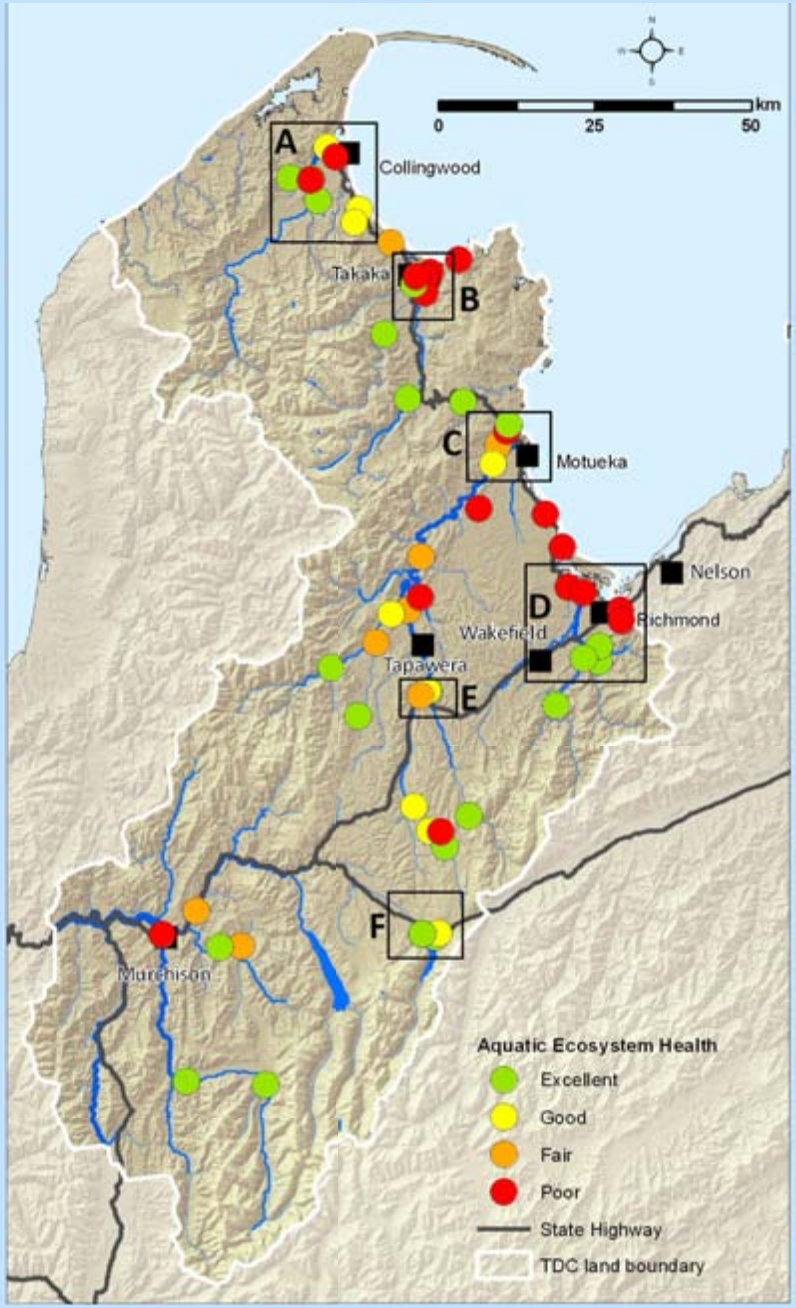
However, about a third of the waterways in the District have poor aquatic ecosystem health. These sites generally have high nutrient concentrations (e.g., Motupipi at Abel Tasman Drive, at Factory Farm and at Reillys Bridge, Stanley Brook or the Waimea River), low dissolved oxygen concentrations (e.g., James Cutting), low water clarity (e.g., Murchison Ck, Kikiwa and Tasman Vly Streams), or a combination of these parameters (e.g., Berkett Stm, Little Sydney, McConnon, Powell Stm, Waiwhero and Winter Ck). Most of these sites are small waterways that drain intensively farmed pastoral land.

The Aorere River is one of the larger waterways in the District with excellent aquatic ecosystem health.

James Cutting Creek is one of the smaller waterways with poor aquatic ecosystem health.







Water Quality for Contact Recreation and Stock Drinking

Contact Recreation

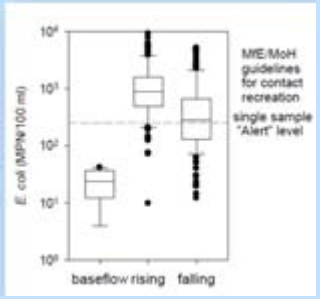
The majority of the sites tested for contact recreation (CR; for definition, see Glossary on Page 12) are suitable for swimming, as they have low levels of algal growth (periphyton), high water clarity and low levels of potentially disease causing bacteria (*E. coli*). These sites are generally located upstream of intensively used land (e.g., Mangles at Gorge, Motueka at Gorge) with a high proportion of the catchment covered by native bush (e.g., Wairoa, Wangapeka) and/or are large waterways with high levels of dilution (e.g., Motueka, Onekaka, Riwaka, Roding, Takaka).

Of all the sites tested for suitability for contact recreation, swimming is not recommended at Kaituna @ Sollys Rd, due to excessive algal (periphyton) growth and Onahau, due to high levels of potentially disease causing organisms.

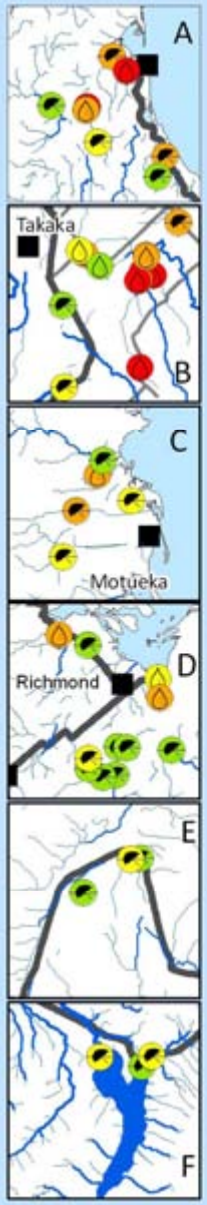
Stock drinking

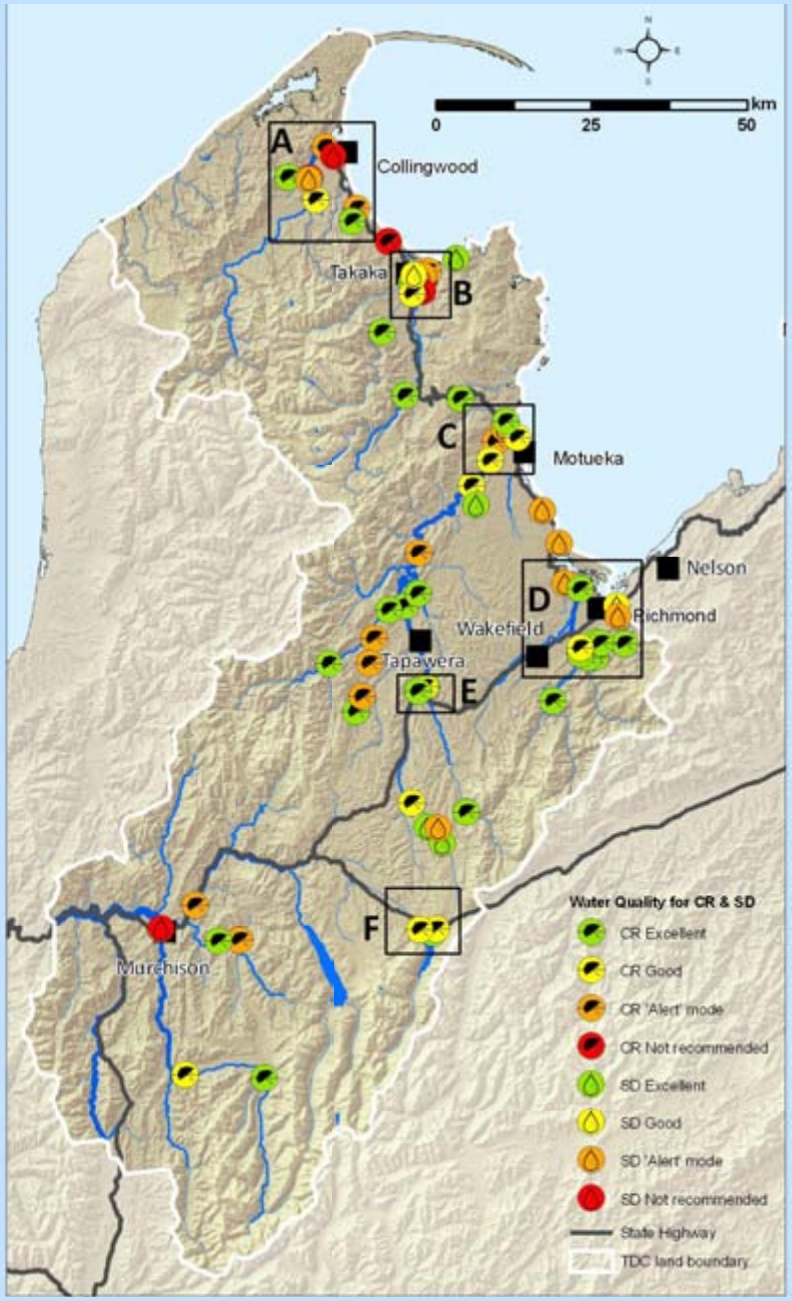
Due to high levels of disease causing organisms, stock drinking (SD; see Glossary on Page 12) is not recommended at Berkett at Reillys, Berkett at upstream Powell, James Cutting, Murchison Ck, Powell at upstream McConnon and Powell at Glenview. These site's catchments are heavily influenced by dairy or sheep/beef farming.

An extensive study in the Motueka River showed that concentrations of disease-causing organisms during rain events are typically 10-30 times higher than in base flow conditions, and contact recreation should be avoided during rising and rapidly falling flow levels (see graph below*).



* For interpretation of box plots see glossary on Page 12





Our River Health now

	Site #	Aquatic Ecosystem Health								Contact Recreation				Stock drinking
		TN*	TP	DIN	DRP	%DO Sat	pH	Water Clarity	Overall Score	Peri-phyton	Water Clarity	*E. coli*	Overall Score	
Aorere @ Devils Boots	1													
Aorere @ Le Comte	2													
Berkett @ Reilly u-s Bdy	3													
Berkett @ u-s Powell	4													
Black Vly @ 30m us Lake	5													
Black Vly @ ds Borlase	6													
Black Vly @ us Borlase	7													
Brooklyn	8													
Buller @ Lake Rotoiti	9													
Buller @ Longford	10													
Graham	11													
Hunters	12													
James Cutting	13													
Kaituna @ 500m us Track	14													
Kaituna @ Sollys Rd	15													
Kikiwa	16													
Lee @ Meads Br	17													
Lee @ Reserve	18													
Little Sydney	19													
MacKay	20													
Mangles @ 1.5 km u-s Tutaki	21													
Mangles @ Gorge	22													
Matakitaki @ Horse Terrace	23													
Matakitaki @ Murchison	24													
Matakitaki @ Nardoo	25													
McConnon	26													
Motueka @ Motupiko	27													
Motueka @ Alexanders Br	28													
Motueka @ Gorge	29													
Motueka @ SH bridge	30													
Motueka @ u-s Wangapeka	31													
Motueka @ Woodmans Bend	32													
Motueka @ Woodstock	33													
Motupiko @ Motueka Rv	34													
Motupiko @ Christies	35													
Motupiko @ Quinneys Bush	36													
Motupipi @ Watercress	37													
Motupipi @ Abel Tasman Dr	38													
Motupipi @ Factory Farm Br	39													
Motupipi @ Reillys Br	40													

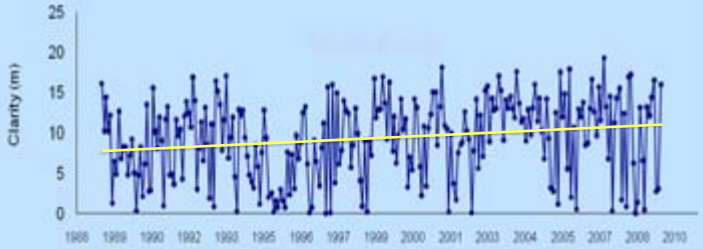
	Site #	Aquatic Ecosystem Health								Contact Recreation				Stock drinking
		TN*	TP	DIN	DRP	%DO Sat	pH	Water Clarity	Overall Score	Peri-phyton	Water Clarity	*E. coli*	Overall Score	
Murchison Ck	41													
Onahau	42													
Onekaka @ Shambala Br	43													
Onekaka @ u-s Ironstone	44													
Powell @ u-s McConnon	45													
Powell @ Motupipi Rv	46													
Powell @ Glenview Rd	47													
Redwood Vly @ Eves Vly	48													
Reservoir Ck @ Salisbury Rd	49													
Reservoir Ck @ Marlb Cr	50													
Riwaka @ Hickmotts	51													
Riwaka@Northbranch Srce	52													
Roding @ Hackett	53													
Roding @ Twin Bridges	54													
Roding @ White Gates	55													
Seaton Vly	56													
Sherry @ Blue Rock	57													
Sherry @ Matariki Br	58													
Sherry @ u-s Cave Ck	59													
Sherry @ u-s Granity	60													
Stanley Brk	61													
Takaka @ Harwoods	62													
Takaka @ Kotinga	63													
Takaka @ Paynes Fd	64													
Tasman Vly Stm	65													
Waimea	66													
Waingaro	67													
Wairoa @ Irvines	68													
Wairoa @ Pig Vly	69													
Wairoa @ WEIS weir	70													
Waiwhero	71													
Wangapeka @ 5km u-s Dart	72													
Wangapeka @ Walter Peak	73													
Watercress	74													
Winter	75													

* For explanation of abbreviations see Page 12

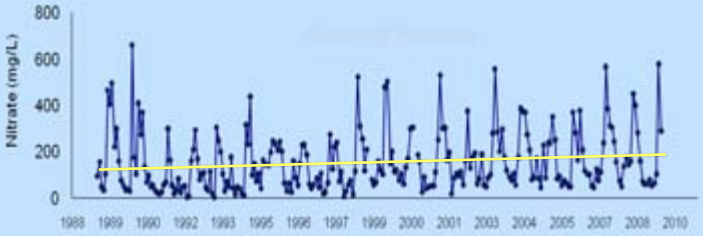
Changes in River Health

Over time

It is not only important to know the current state of surface water quality at a site, but also whether water quality has improved or worsened over the last ten years. SoE sites were tested for trends in water quality over the last ten years and three National River Water Quality Network (NRWQN) sites over the last 20 years. Nine out of twelve sites where a trend was detected showed an improvement in water quality, such as water clarity at the NRWQN site Motueka at Gorge.



However, concentrations of nitrogen increased at the NRWQN sites Buller at Longford and Motueka at Woodstock over the last 20 years and at Sherry at Blue Rock over the last ten years.



The Sherry River Story

Water quality sampling throughout the Motueka Catchment in 2000-2001 identified the Sherry River as a 'hot spot' of relatively high faecal contamination at concentrations well above swimming guidelines.

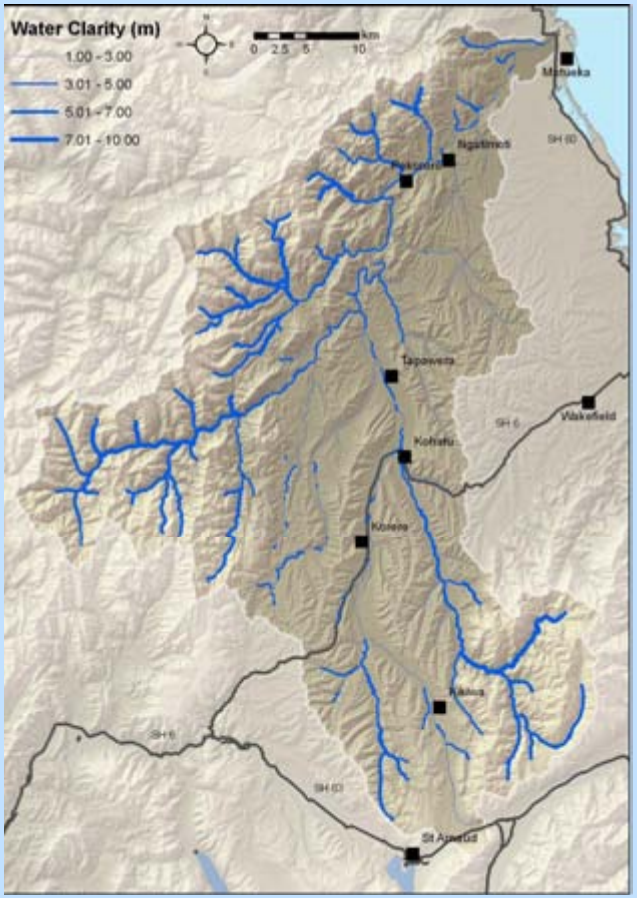
Research suggested that bridging of raceways to keep cows out of the stream water should have major water quality benefits. All four dairy farms in the Sherry Valley have subsequently constructed bridges so cows are no longer regularly crossing the river.

Cows on their way to the milking shed before and after the construction of one of the bridges in the Sherry Valley.

Water quality has been markedly improved as a result of these efforts, with faecal contamination at the Matariki monitoring site less than half of the levels seen previously. However, the lower reaches of the Sherry River are still not safe for contact recreation for much of the time and the local community is still working towards better water quality in the affected reaches. Landowners in this catchment, like many landowners in the Aorere catchment, are busy implementing actions recommended in their farm environmental plans.

Within a Catchment

To provide a picture of how water quality patterns will vary throughout a catchment we used recent research that has developed models for predicting water quality and river health based on a range of environmental variables. As expected, the models predict that water clarity in the Motueka catchment is highest in the upper reaches and decreases further downstream (see map below). The Motueka catchment has been modelled due to the comparatively large data set available over a reasonable number of sites.



What Affects Our Waterways?

Effects of Forestry

The greatest potential effect from forestry is fine sediment discharges (see Graph A) to streams and the coast between two to three years after harvesting. Reduced water yield (reduced flow in streams) due to the high rate of evaporation and transpiration from pine trees is another typical forestry effect on waterways. Harvesting large catchments within a short duration can also lead to increased nitrate concentrations (see Graph B), extensive bank erosion and stream habitat disturbance due to flooding.

Fine sediment discharge - Murchison Creek

Effects of Farming

Tasman has a total of 150 dairy farms, about 1% of the nation's farms. Although this number is relatively small in a large-scale context, the local effects appear to be significant. Intensively-farmed land, including sheep, beef and dairy farming, can produce high levels of faecal indicator bacteria (see Graph C), fine sediment (see Graph A) and nutrients (e.g., phosphorus, nitrate, see Graph B), in downstream waterways. Cows in creeks, effluent discharges (from the dairy shed, feed/stand-off pads or laneways), and pasture run-off are the biggest sources of these contaminants.

In general, such poor water quality exists in catchments whose land area is dominated by intensive farming *e.g.*, Motupipi, Sherry, Mackay and Kikiwa Stream).

Fine sediment runoff can be caused by intensive farming

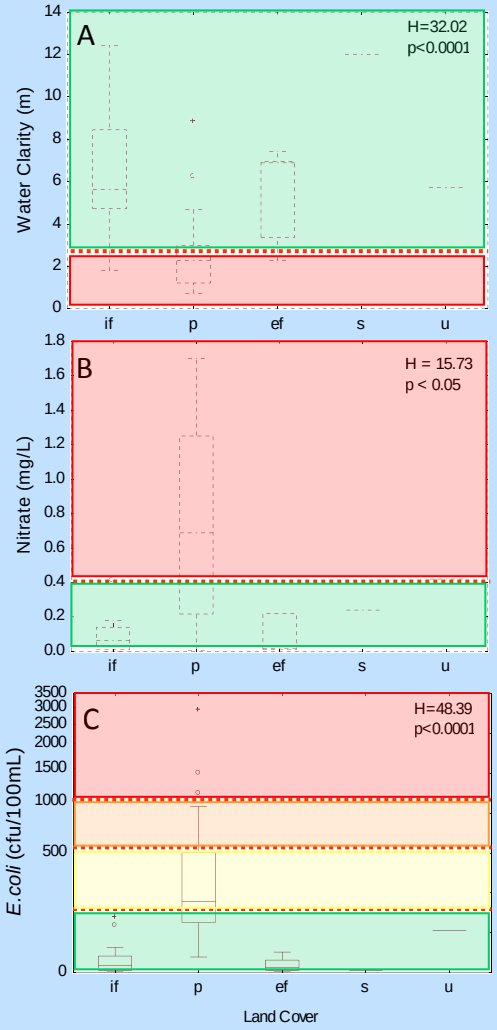
Effects of Sewage Discharge

Sewage discharges from sewage treatment plants (STPs) or household septic tanks can cause elevated levels of faecal indicator bacteria (see Graph C) and toxic ammonia in streams and the coast. The highest risk in much of Tasman is in late December to February when there are the greatest numbers of holiday-makers present in the district.

Resource consent monitoring of STPs generally shows a high level of compliance. Several small townships without a community STP, such as Tasman, experience contaminated groundwater or waterways, particularly during periods with high groundwater levels.

Murchison, Tapawera and Collingwood have had significant upgrades to their STPs and the effects of the discharges are controlled. Raw sewage overflows from sewage pipelines such as from Pohara to Takaka are much less frequent than in the past. The Takaka STP located west of Takaka township near the Takaka River and the Motueka STP located near the mouth of the Motueka River are the last to receive such an upgrade and it is hoped that these discharges can be improved in the near future.

Effect of Land Cover on Water Quality



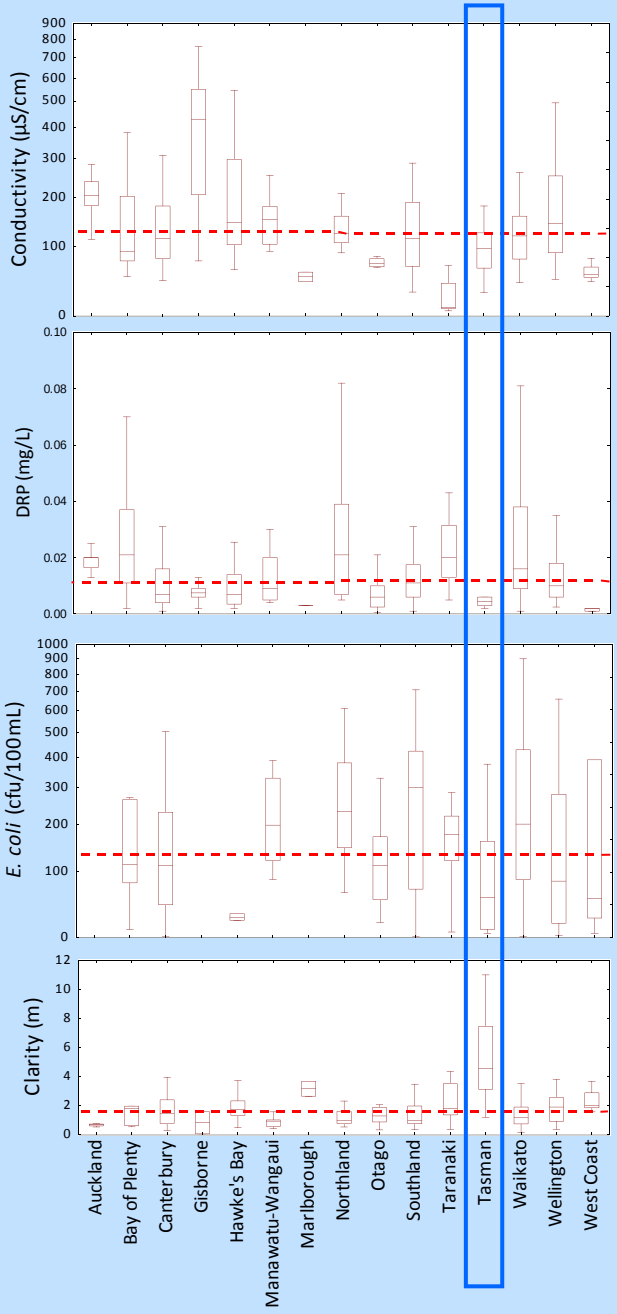
Land Cover: if = indigenous forest, p = pasture, ef = exotic forest, s = scrub, u = urban; Data in the green zone are within relevant guidelines (- - -). See glossary (page 12) for explanation of box-whisker plots.

How do we compare nationally?

To place Tasman's State of the Environment within a New Zealand context, we compared national water quality medians with Tasman's water quality data.

Tasman's rivers appear to have lower levels of conductivity, lower concentrations of DRP and disease-causing organisms (*E. coli*) and higher water clarity than rivers in other parts of the country. This is a good sign and possibly reflects the generally good health of Tasman Rivers. For the other water quality parameters, national medians were generally similar to Tasman's water quality and mostly below recommended guidelines (shown by red dotted lines in the graph on the right).

However, given the poor state of many small streams draining developed areas, restoration efforts should focus on trying to improve the quality of these systems. If improvements can be made, this will also lead to cumulative improvements in the quality of the main rivers.



Murchison Creek at State Highway 6

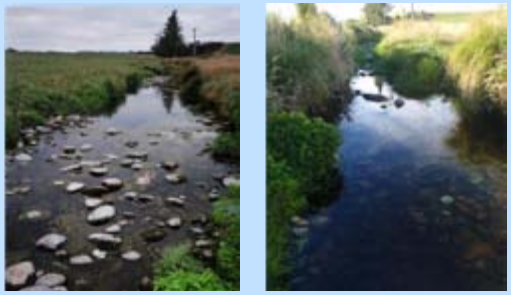
Waimea College students help to restore Reservoir Creek

Riparian restoration through riparian replanting north Pakawau

What can we do to improve our water quality?

What Council is doing to improve our water quality?

1. The Tasman Resource Management Plan aims to improve water quality of all streams that do not meet standards specified in a Water Conservation Order, do not meet stock drinking water guidelines and that do not meet microbiological water quality guidelines at locations valuable for contact recreation, or cause nuisance algal growth.
2. In order to reduce faecal and sediment contamination of waterways, council has provided funds to construct about 20 km of fencing each year for the past few years, and 175.85 km of fence over 10 years.
3. Organised a two-day workshop for sediment and erosion control with almost 120 people involved in earthworks (Sep-Dec 2009).
3. Produced a revision of Council engineering standards that is more environmentally friendly (includes a section on sediment and erosion control). This document is for planners and contractors involved in various developments.
4. Worked with several Streamcare groups to provide advice and encouragement to improve water quality. In some cases assisted in fund applications.
5. Put a stop to many operations causing significant pollution.
6. Monitoring of hazardous facilities, dairy farms, sewage treatment plants, earthworks, forestry and many other activities to ensure that pollution is prevented.
7. Planted about 8000 trees, shrubs and tussock in stream riparian zones.
8. Removal of crack willows from about 15km of waterway per year and control of priority aquatic weeds.



James Cutting Creek before and after fencing and planting of the riparian zone 2005 & 2009 respectively

What the Community can do about it?

There are many things we—as the community—can do to improve our freshwater resource. Simple things we can do include:

- Keep hazardous substances (such as oil and pesticides) out of our stormwater system and away from groundwater wells.
- Conserve water by fixing leaks, setting up water storage tanks, using water more efficiently. As most water in Tasman is taken from rivers and groundwater, reduced demand will mean more water in rivers which often results in better water quality.
- Have a go at monitoring the health of your stream (e.g., how many fish species or insect types can you see?).
- Fence off streams to keep stock outside the riparian areas.
- Replant native riparian vegetation (e.g., raupo, tussock).
- Report to Council any discharges of liquid or rubbish to water, or land where it may enter water, or any drainage of wetlands (Phone 543 8400 – after hours service available or email info@tasman.govt.nz).

If everyone who lives in the district contributes a little bit towards keeping our waterways clean, our future generations will be able to enjoy this precious resource as much as we are.

The Sherry River Catchment Group is an example of a community that cares about our water quality

Glossary and Abbreviations

Box plots: Box and whisker plots illustrate how data are distributed around the central or median value. The 'box' represents the range of the central 50% of values around the median, which is shown by the horizontal line through the middle of the box. Values that are further from the median are shown by whiskers, outliers (•) or extreme values (*). If only one data value has been collected, then the value appears as a single line (i.e., as the median value).

Contact recreation: Activities involving frequent and direct contact with water where full head immersion/ingestion of water is likely, such as swimming, kayaking, or tubing. Median *E. coli* guidelines are 150 MPN/100mL.

DIN: Dissolved Inorganic Nitrogen (mg/L)

DO: Dissolved oxygen (either saturation (%) or concentration (mg/L))

DRP: Dissolved Reactive Phosphorus (mg/L)

Escherichia coli (or ***E. coli*** for short): a bacterium found in animal wastes and human sewage that is used to indicate the possible presence of disease-causing bacteria and viruses in waters.

Medians: A statistic that describes the middle score in a range of samples or measurements (i.e., half the scores will be higher that the median and half will be lower). This is the main descriptive statistic used when describing water quality.

Periphyton: algae on the riverbed

Riparian zone: The banks of a stream

Stock drinking: Water quality is suitable for stock drinking with median *E. coli* guidelines of 1000 MPN/100mL.

TN: Total nitrogen (mg/L)

TP: Total Phosphorus (mg/L)

For further information, see 'State of the Environment Report—River Water Quality in Tasman District 2010" (ISBN, 978-1-877445-09-5, TDC Report Number 10001) or

www.tasman.govt.nz

Acknowledgements

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