

Freshwater biomonitoring

- methods and usage



Chris Fowles

Scientific Officer

Taranaki Regional Council

Macroinvertebrates

Usage

- biomonitoring can be used in conjunction with traditional physicochemical methods
- biological indicators show a degree of ecological impact while physicochemical methods measure concentrations of pollutants
- biological methods can integrate many environmental factors over a longer period of time

Biological

- Periphyton
- SHAP
- Macroinvertebrates
 - > 9,000 site surveys since late 1970's at > 1,100 sites
 - overlap with physicochemical programme
 - utilised in other programmes (riparian/consents/baseline)



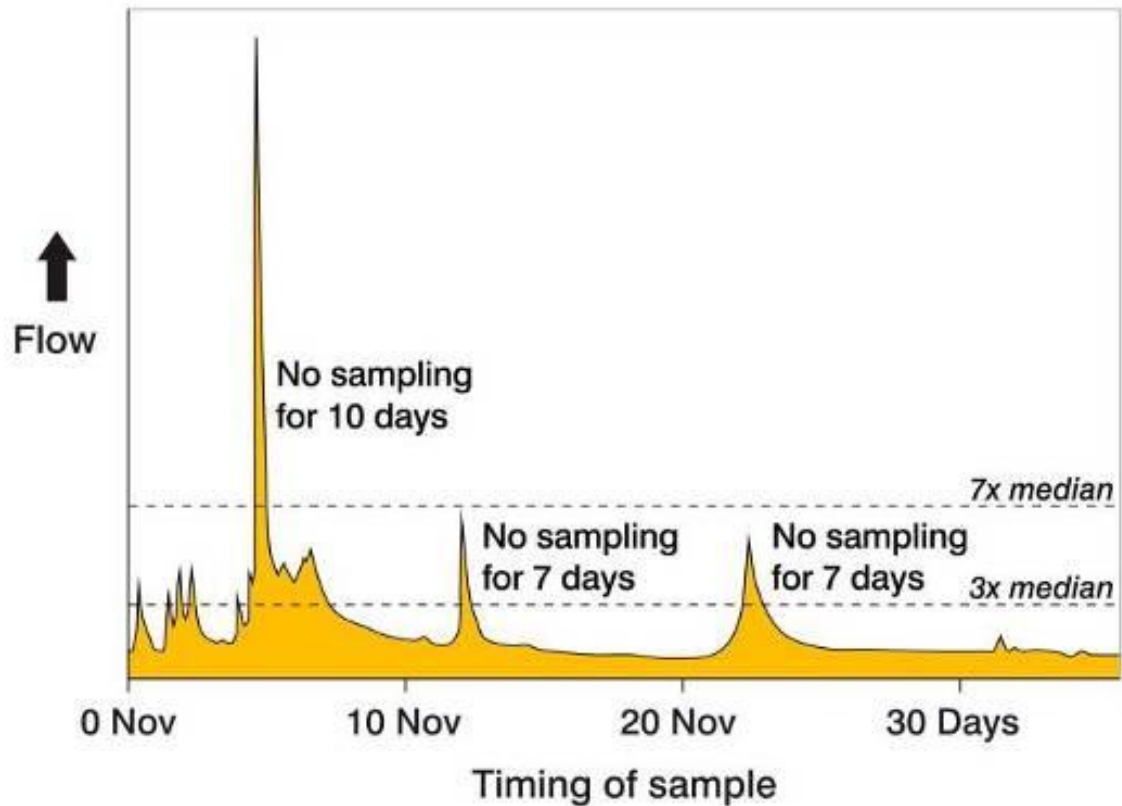
Kick sampling field protocol



Macroinvertebrates

Sampling protocols

- methods
- timing
- processing
 - QC
 - archiving



Sample processing



Sample from pottle is washed and sieved before sorting



Sorting and identification

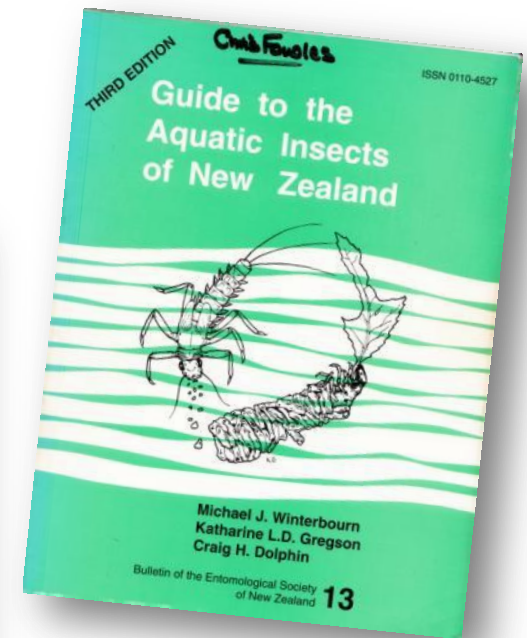
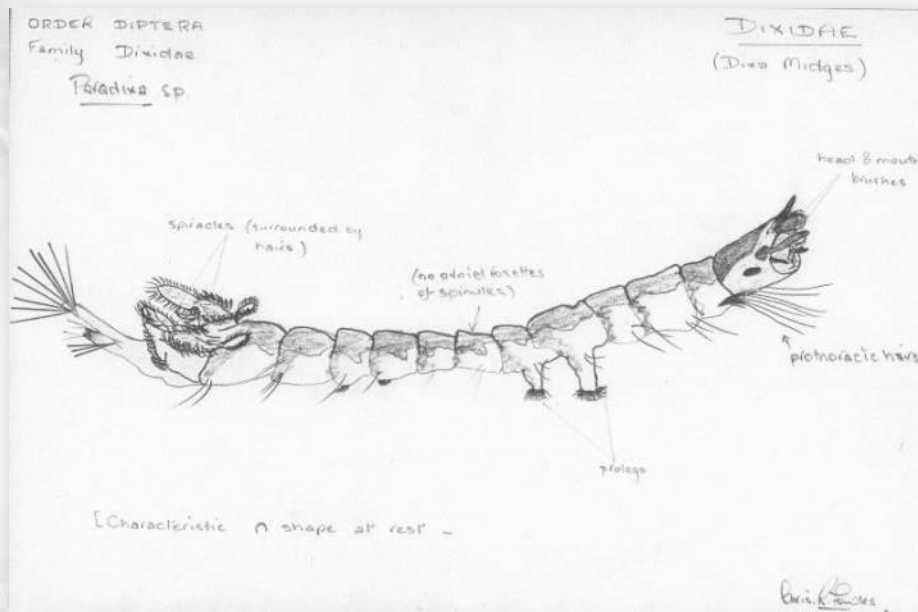


Samples are archived in labelled vials at completion

Pre 1990s

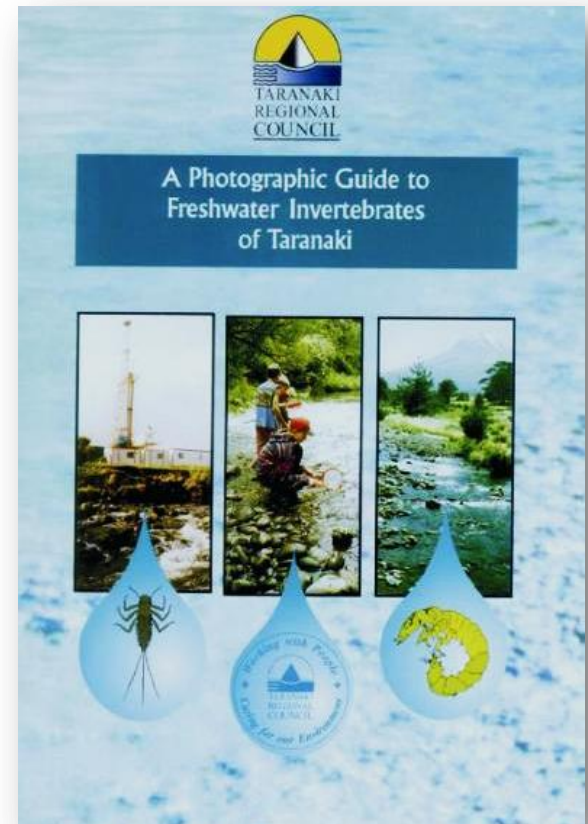
Identification of critters dependent on:

- individual keys
- pen and ink illustrations



Post 1990

- Photographic guides
- Updated keys
 - Bulletins
 - NIWA guides
- Landcare Research Resource



Landcare Resource

Freshwater invertebrates guide - Windows Internet Explorer

http://www.landcareresearch.co.nz/research/biocons/freshwater/

File Edit View Favorites Tools Help

Favorites Freshwater invertebrates guide

Landcare Research
Manaaki Whenua

HOME | ABOUT US | RESEARCH | SUSTAINABILITY | DATABASES | SERVICES | PUBLICATIONS | EDUCATION | NEWS

SEARCH SITE:
All categories
GO

FRESHWATER INVERTEBRATES

- Home
- Identification guide
- Species list
- Sampling tips
- Stream quality
- Help & feedback

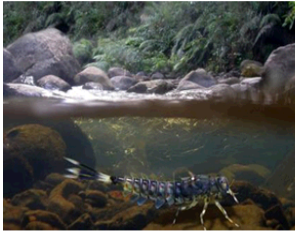

Home > Research > Biodiversity and Conservation > Freshwater invertebrates guide

A guide to the freshwater invertebrates of New Zealand


This web resource is designed to assist community groups monitoring freshwater invertebrates in New Zealand. Freshwater invertebrates (insects, crustaceans, snails, worms and other small critters) are often used as indicators of the state of streams, rivers, lakes and ponds. In Auckland alone there are approximately 100 community groups monitoring stream invertebrates under the Wai Care programme, and thousands more school students taking part in stream studies every year in a programme run by Watercare.

If you've collected freshwater 'bugs' from your local stream, you'll hopefully be able to use this site to identify them and learn about what they may reveal about their habitat. Such information can indicate whether a stream should be preserved in its existing good condition, or whether there may be a need for some form of restoration.


The creation of this web resource was funded by the Ministry for the Environment's Community Environment Fund, Auckland Council and Taranaki Regional Council.




Identification guide



Species list




Sampling tips




How best to take and process samples in different environments


Stream quality




Sponsors:



Auckland Council
Te Kauhāhā o Tāmaki Makaurau



Taranaki Regional Council



Ministry for the Environment
Community Environment Fund

Auto-Montage set-up for freshwater subjects



Typical Taranaki taxa: mayflies



Deleatidium (8)



Zephlebia (7)



Coloburiscus (7)



Nesameletus (9)

Typical Taranaki taxa: stoneflies



Stenoperla (10)



Zelandoperla (8)

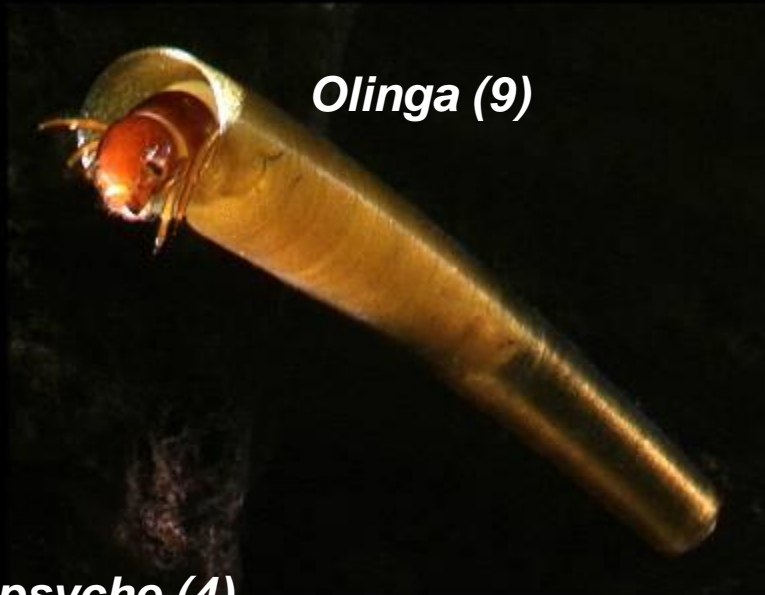


Megaleptoperla (9)



Taraperla (10)

Typical Taranaki taxa: caddisflies



Freshwater Invertebrates of New Zealand Riverbeds

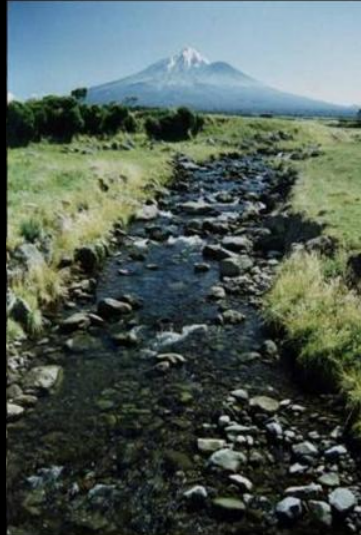
Small, bush-covered
headwater streams



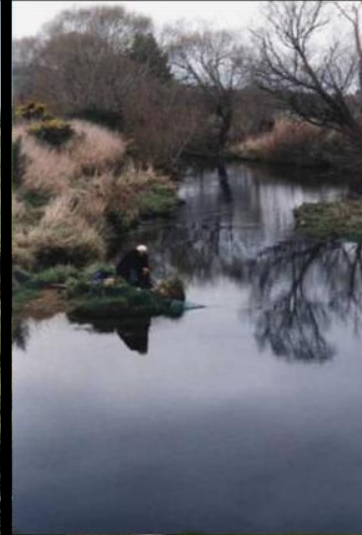
Larger, fast-flowing,
bush-covered rivers



Middle reaches
draining farmland



Lowland, slow-
flowing rivers



Estuaries and river
mouths



TRC usage of the resource

Pukeiti

Stream critters day



MACROINVERTEBRATES

in the streams of Pukeiti

Sensitivity
Tolerant
Moderate
High

FLATWORM Neppia 6



Neppia is usually found in higher water quality on stony habitats. Typical size 6mm.

WORM Oligochaeta 1



Oligochaete worms are found everywhere, from pristine streams, to the most polluted waterways. Their ability to thrive in many polluted habitats gives them a low score. Typical size 15mm.

WORM Lumbricidae 5



Lumbricidae; larger than oligochaete worms. The aquatic earth worm. Widespread distribution.

MOLLUSCA Potamopyrgus 4



Potamopyrgus is the widespread 'pond snail' found in most freshwaters especially amongst weedbeds and streambed algae. This snail can tolerate various water qualities. Typical size 3.5mm.

MAYFLY Acanthophlebia 9



Acanthophlebia, the orange-brown mayfly, found in forested streams amongst gravel and silt (only found in the North Island).

MAYFLY Ameletopsis 10



Ameletopsis is generally a rare mayfly and is a good indicator of 'clean' water in stony streams. Typical size 10mm.

MAYFLY Austroclima 7



Austroclima mayflies are another sensitive group and are often abundant in Taranaki. Typical size 15mm.

MAYFLY Coloburiscus 7



Coloburiscus mayflies are very common in most clean, streams and rivers. They are the bulkiest of the mayflies. Typical size 18mm.

MAYFLY Deleatidium 8



Deleatidium is a common mayfly in the region. It is presented in clean, stony, fast-flowing waters. Typical size of fully developed larvae 15mm (incl tail).

MAYFLY Nesameletus 9



Nesameletus is the swimming mayfly found in high quality waters. Typical size 16mm.

MAYFLY Zephlebia group 7



Zephlebia mayflies are often common in Taranaki, in good to high quality waters and common in high quality soft-bedded streams. Typical size 18mm.

STONEFLY Acroperla 5



Zelandoparila can be recognised by the very long antennae, tail and hairy legs. Like all of the large stoneflies they prefer high quality waters. Typical size 18mm.

Taranaki Regional Council - working with people, caring for our environment

Working with people | caring for Taranaki

Macroinvertebrate community index (MCI)

10

Highly sensitive to pollution

- stoneflies, mayflies, few beetles and few caddisflies

9

8

7

Moderately sensitive to pollution

- some mayflies, few caddisflies and beetles

6

5

4

Tolerant to pollution

- some crustaceans, bugs, midges and snails

3


2

1

Very tolerant to pollution

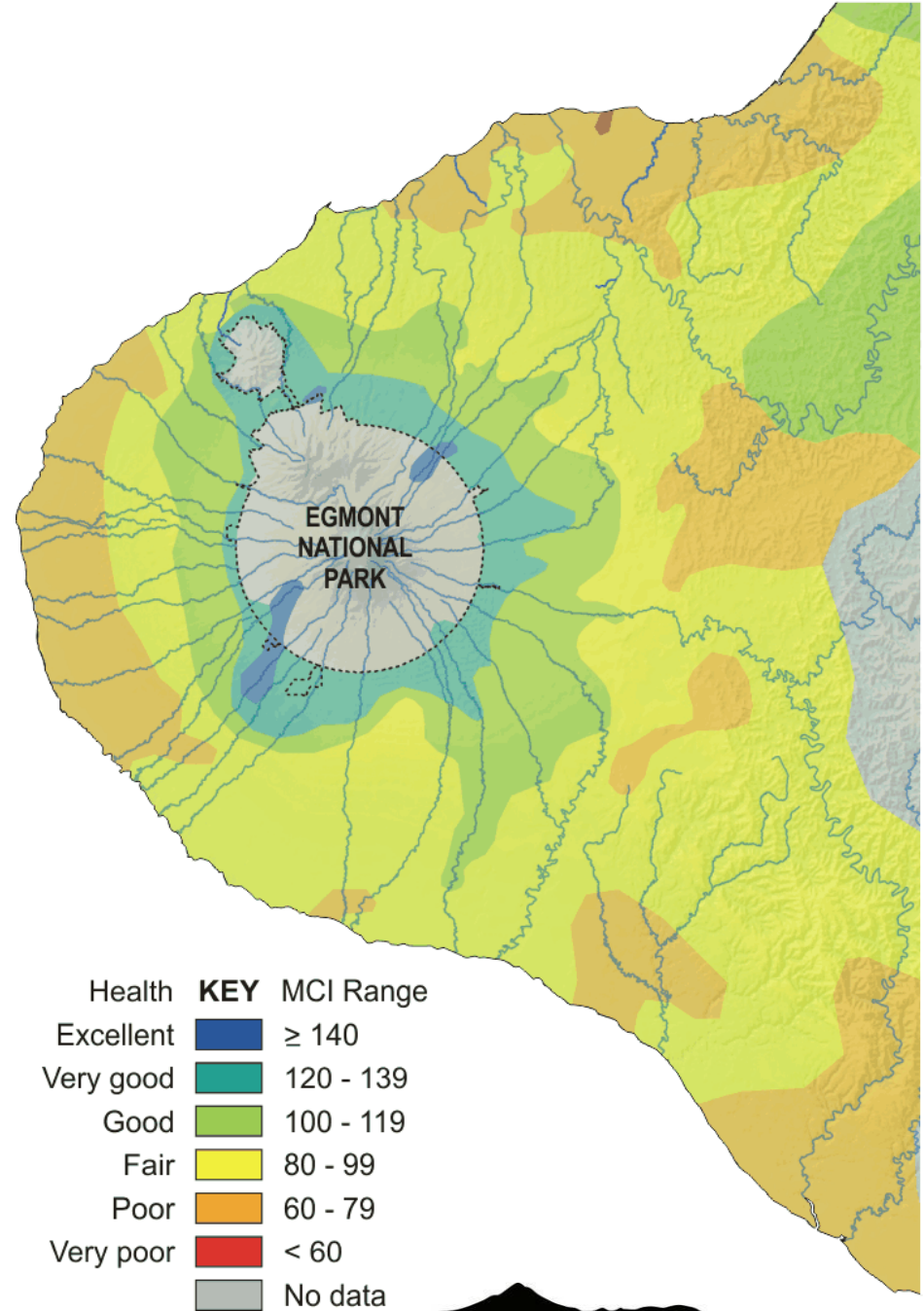
- midges worms, flies / maggots

MCI gradation of biological water quality conditions adapted for Taranaki streams and rivers

Grading	MCI	Code	Stark's classification
Excellent	>140		Excellent
Very Good	120-140		
Good	100-119		Good
Fair	80-99		Fair
Poor	60-79		Poor
Very Poor	<60		

MCI values

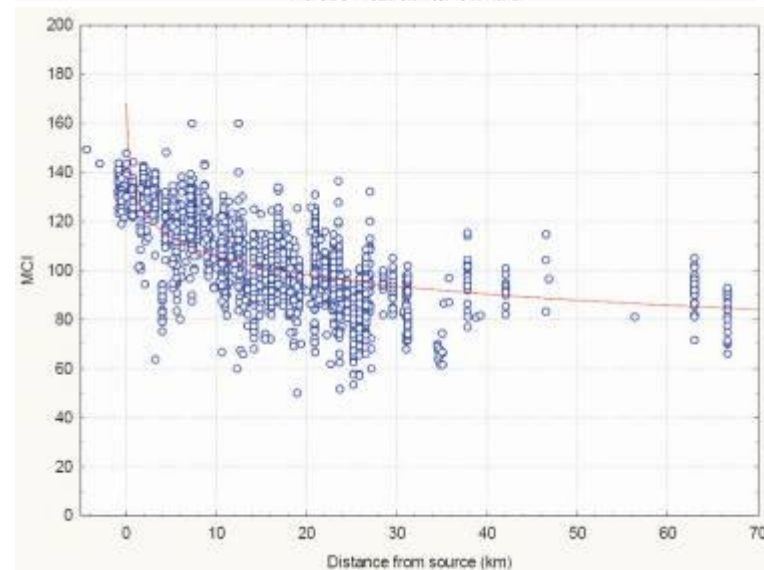
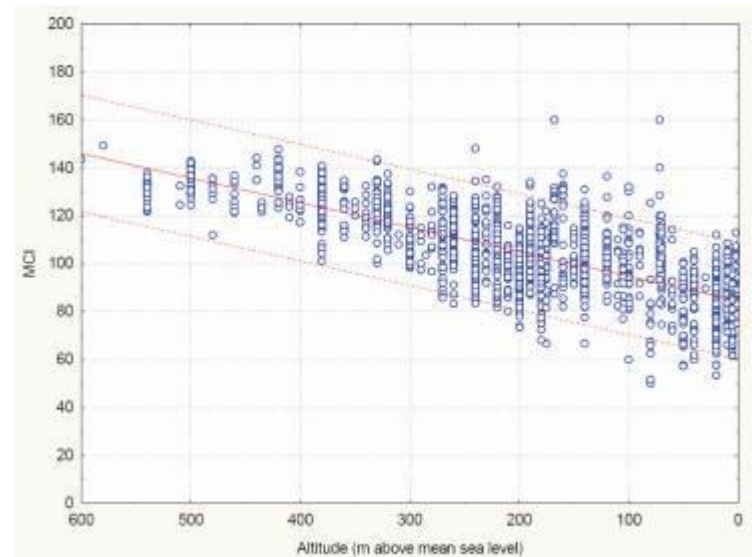
- ecological 'health' is good to excellent in upper catchments but only fair further down catchments (more intensive land use)



TRC/Stark, 2009 MCI ringplain relationships

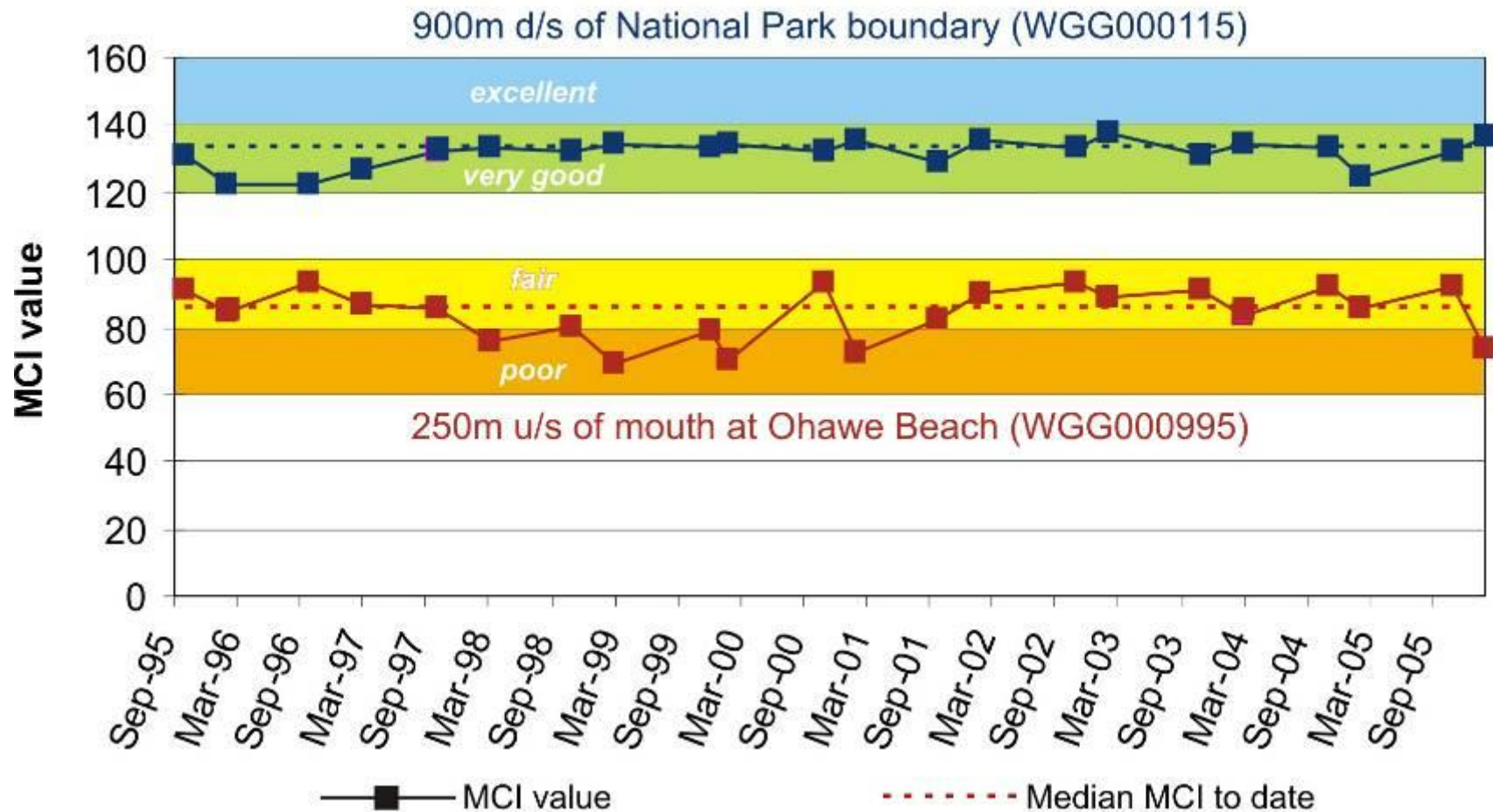


- NPk-sourced streams
1640 “control” site surveys
- Altitude:
 - $MCI = 84 + 0.102A$
 - range: 84 – 135 [over 500m]
- Distance from NPk bdy:
 - $MCI = 132 - 25.83\log_{10}D$
 - range: 93 – 132 [over 30km]



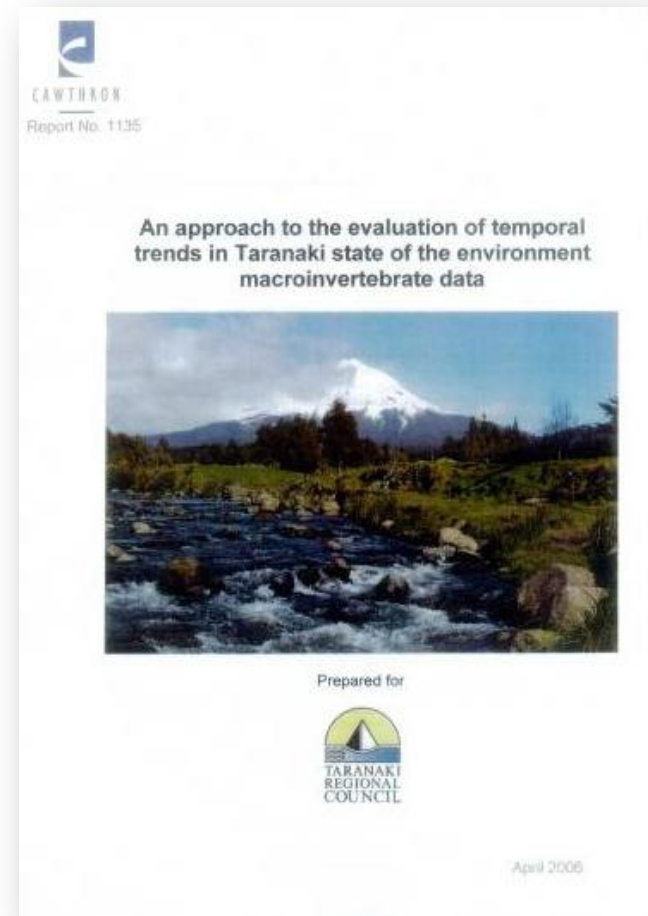
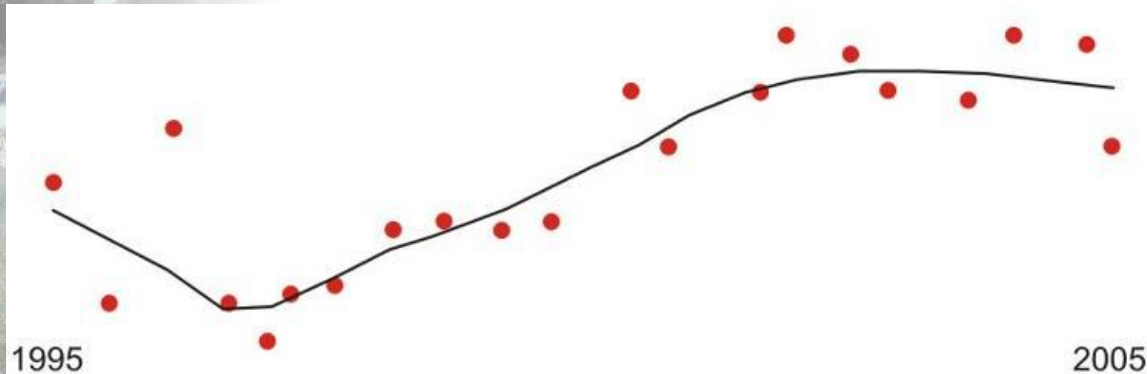
SEM: trends in river 'health'

SEM: MCI values in the Waingongoro River



Trending of State of the Environment monitoring data

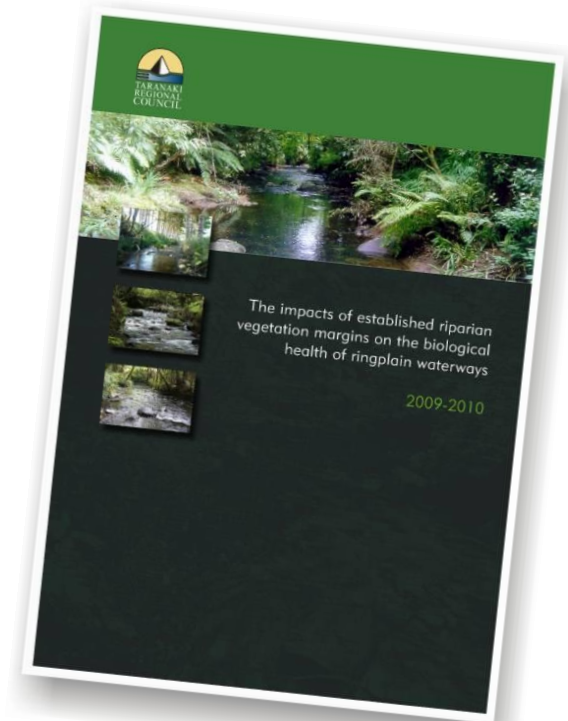
Kurapete Stream



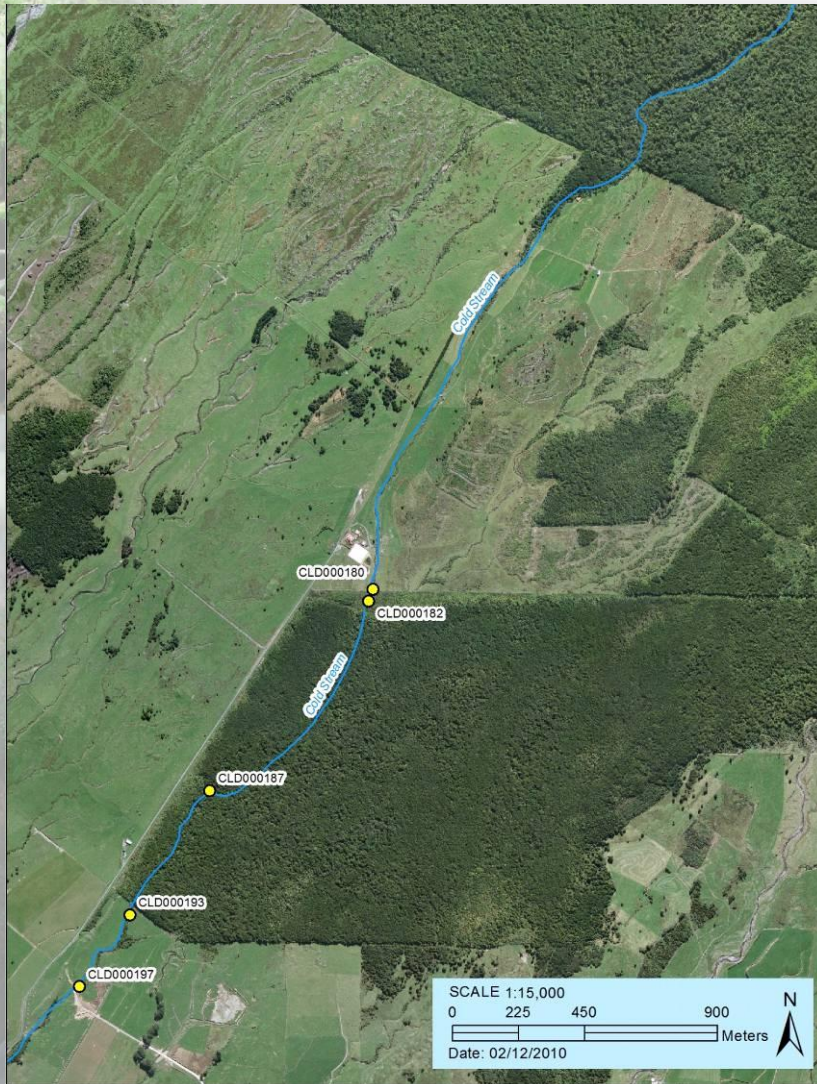
Some recent investigations

'Impacts of established riparian margins on stream biological health'

- upper catchment (Cold Creek)
- mid catchment (Dunn's Creek)
- lower catchment (Huatoki Stream)



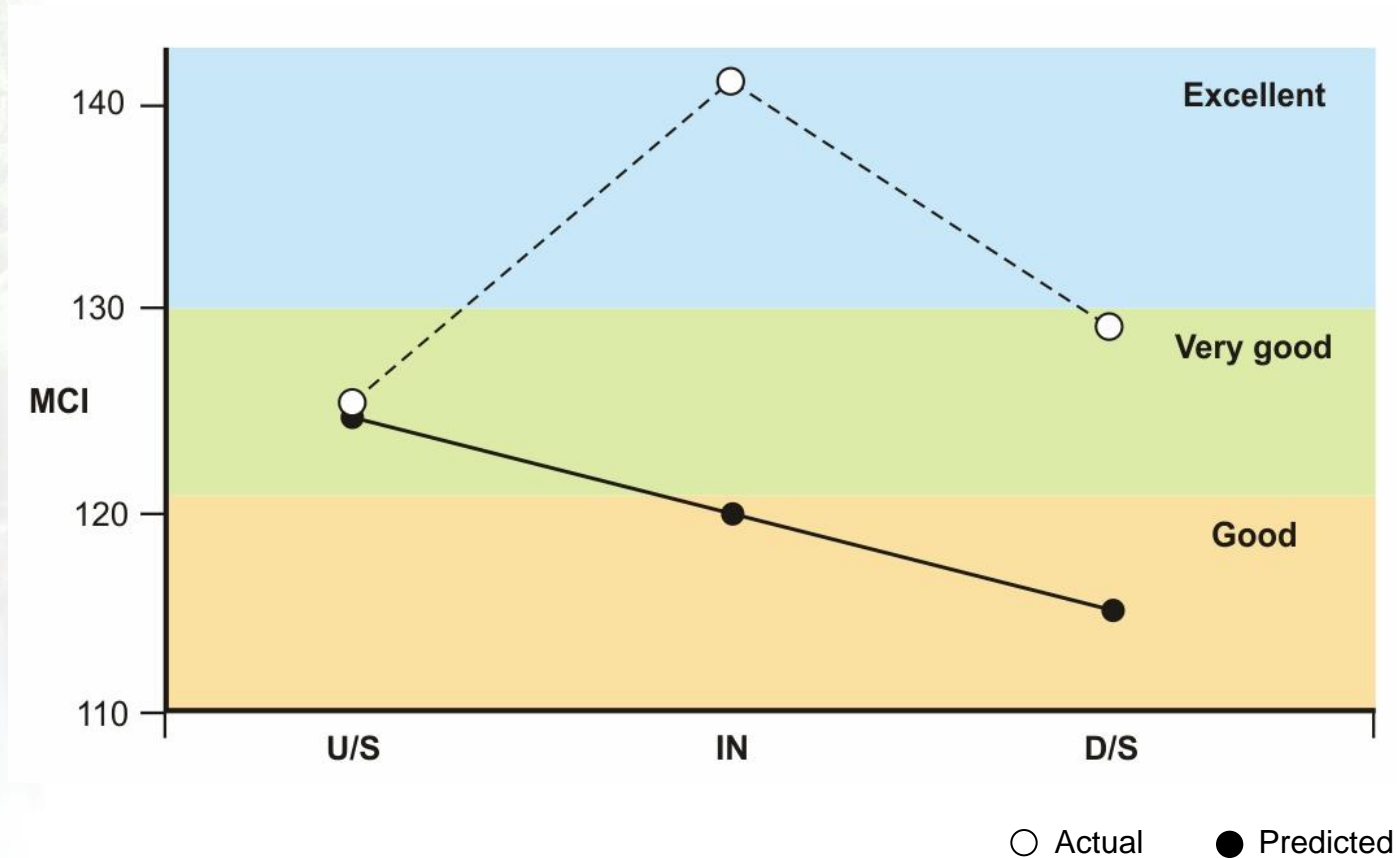
Cold Creek



elevation: 325 masl

distance from National Park: 1.8 km

Cold Creek



Periphyton index: 9.8 (u/s) – 10.0 (in) units

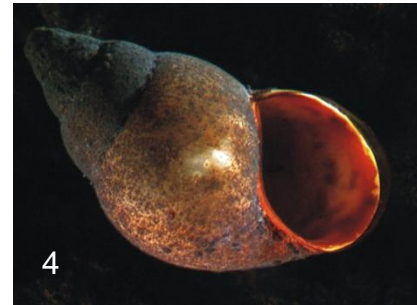
[= low nutrients / good habitat]

Cold Creek – taxa changes

Gains



Losses



- very 'sensitive' taxa already present + a few others
- 'tolerant' taxa less abundant or gone