One Plan Evidence Associate Professor Russell Death

For Wellington Fish and Game and Royal Forest and Bird Protection Society of New Zealand.

Introduction

- Freshwater ecologist for 19 years. Conducted research on the ecology of rivers in this region for 16 years.
- Lived in region most of my life. From dairy farming family, but prefer sheep.
- Run sheep on 30 acres of land in Pohangina Valley.
- World expert on flow variability /invertebrate relationships. Extensive international publications.
- I have been involved in water management research in Spain, Finland, Sweden and USA.

Presentation plan

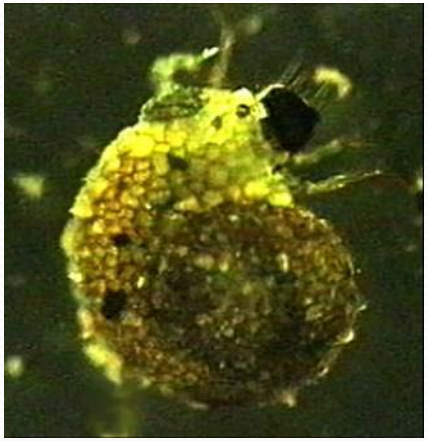
(follows format of my evidence in chief EIC)

- Why is ecology worth considering?
- Conclusion of my 16 years research on the ecological condition of this regions waterways
- General approach of POP
- Water quality
- Water quantity
- Beds of lakes and rivers

Supplementary evidence considered with each section

Principal area of expertise- invertebrate ecology

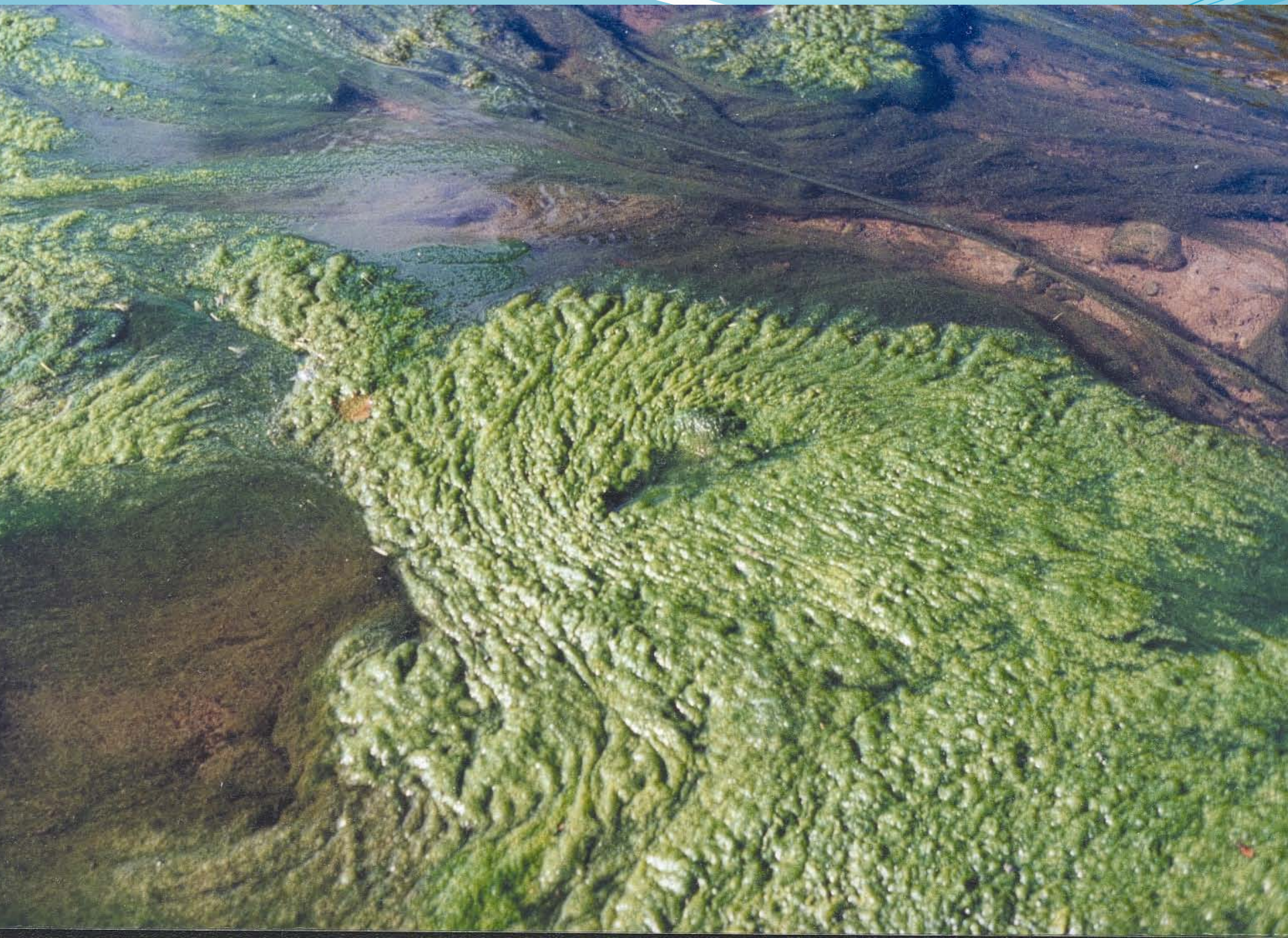
- Time lapse photograph of stream health.
- Principal measure of river health worldwide.
- “Canary in the cage”
- Most are endemic and only occur in New Zealand



Major issues for aquatic ecosystems

1. Sediment
2. Nutrients
3. Flow pattern
4. Habitat diversity

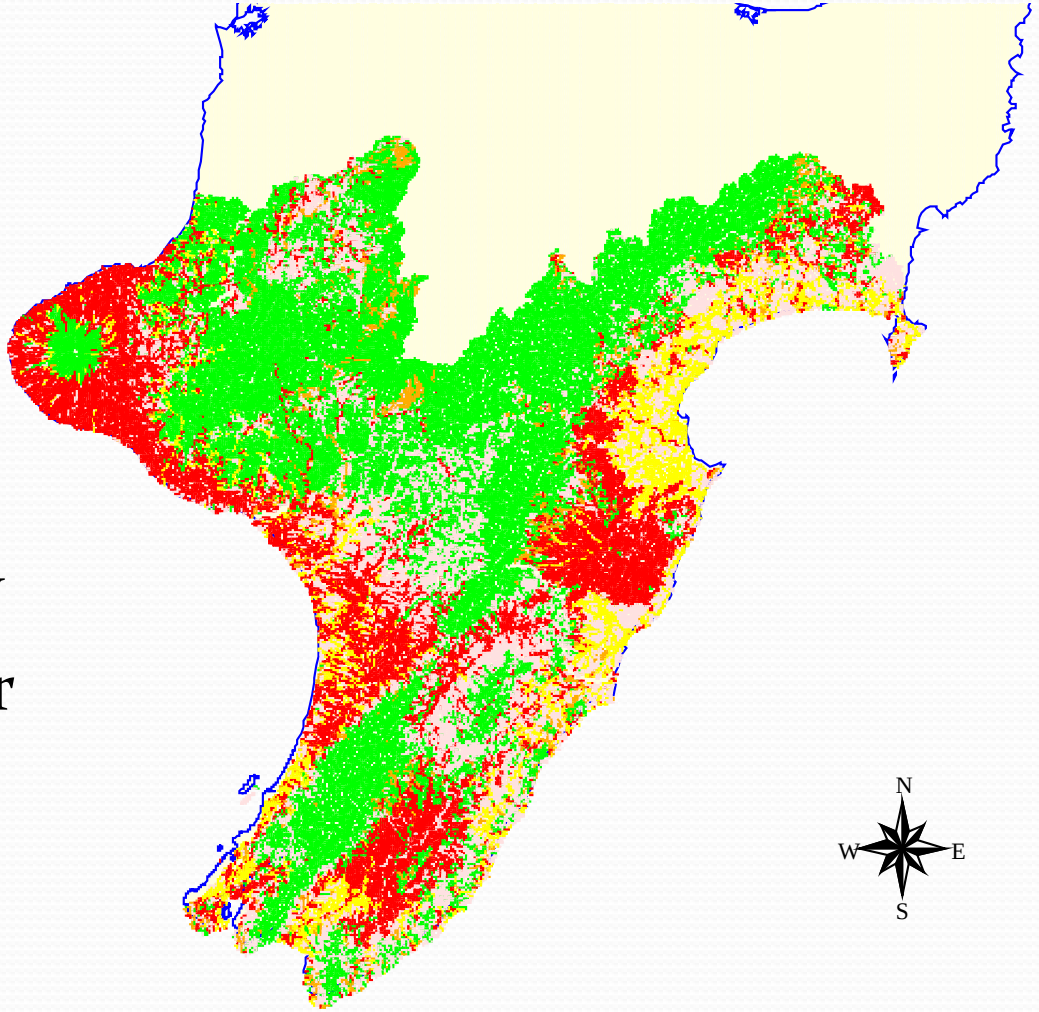
P 4 & 5 EIC



My scientific evaluation of water quality in region (pg 6 & 7 EIC)

Green = good water quality

Red = poor water quality



They do not need to be this degraded.

Good water quality and agriculture are not mutually exclusive

(Pg 9).

Philosophical approach of the Proposed One Plan (Pg 12 EIC)

- Generally supportive (18).
- "Clean water is set to become the world's scarcest but most-needed natural resource" USA National Intelligence Council (2008).
- Although there are major issues in the Manawatu Whanganui region we are clearly in a better position than many (e.g., Murray-Darling, Aral Sea, Great Lakes). It is not too late to do something.

Aral Sea

- Once the world's 4th largest lake in Uzbekistan and Kazakhstan.
- In 1930s USSR inflow rivers were diverted to irrigate cotton fields. Short term benefit at the expense of long term benefit.
- The mean sea level dropped 20cm per year for 10 years, then 60cm/year in the 70s, then almost a metre per year in the 80s.
- By 1990, salinity increased from 10 grams per litre to 45.
- 20 fish species, 350 invertebrates and 12 higher plants became extinct.
- Annual fish-catch dropped from 40,000 tons to zero.

The Aral Sea

Image sources: www.alexandre.leroux.net/water/pictures/boat_over_aral_sea.jpg
and maguires.com/patupe/ photos.htm


DESPERATE MEASURES

Concerns – general (pg 12)

1. I believe the numerical standards should be rigorous thresholds NOT targets. Targets are too easy to overlook (21).
2. I think there should be emphasis on biological measures rather than chemical ones as they are better integrators of health (23).
3. More, and specific, focus needs to be placed on adaptive management (24).
4. I would like to see a formal mechanism for interaction, within the adaptive management framework, between Horizons, local freshwater ecologists, DOC, F&G and Forest and Bird.
5. The splitting of water quality, quantity, biodiversity and land use makes the plan very difficult to use (25).

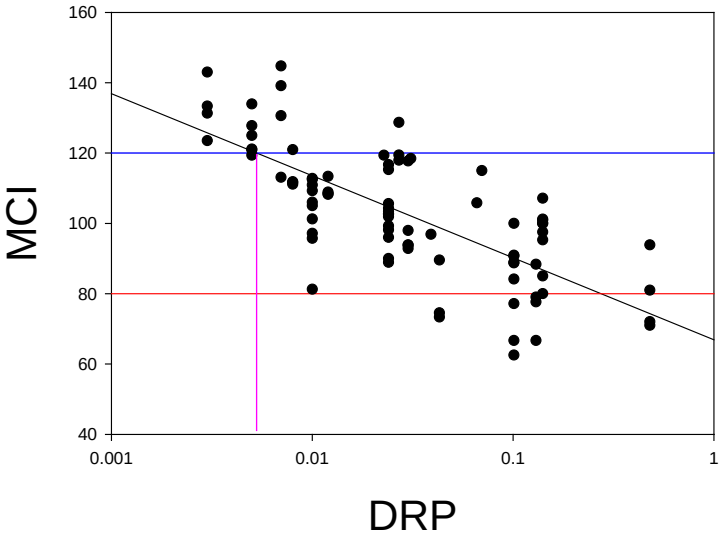
Water quality (pg 13)

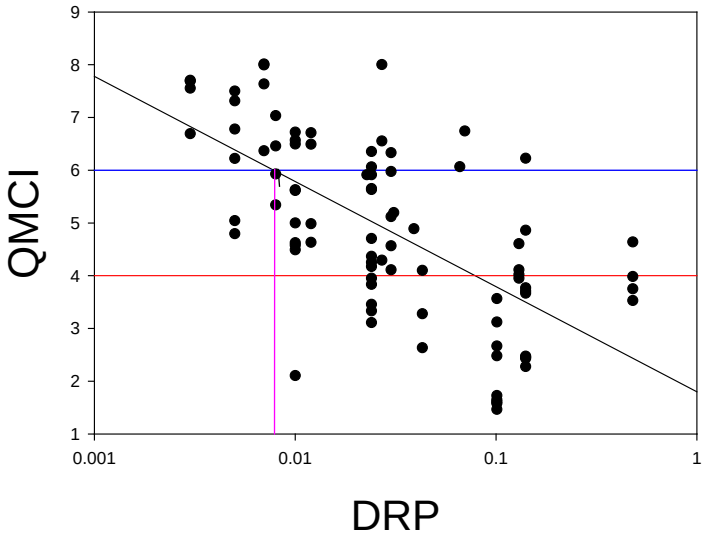
- The conclusions of Horizons scientists are in general consistent with my research findings (26).
- I think the method of selecting sites of significance – aquatic is a bit primitive (27).
- From an ecosystem perspective, nutrients and sedimentation are the biggest issues in the regions waterways (28-32).
- From my experience I believe the QMCI (although even that is very primitive) is a better biotic index than MCI. But any biologically based standard would be a huge advance (34-35).

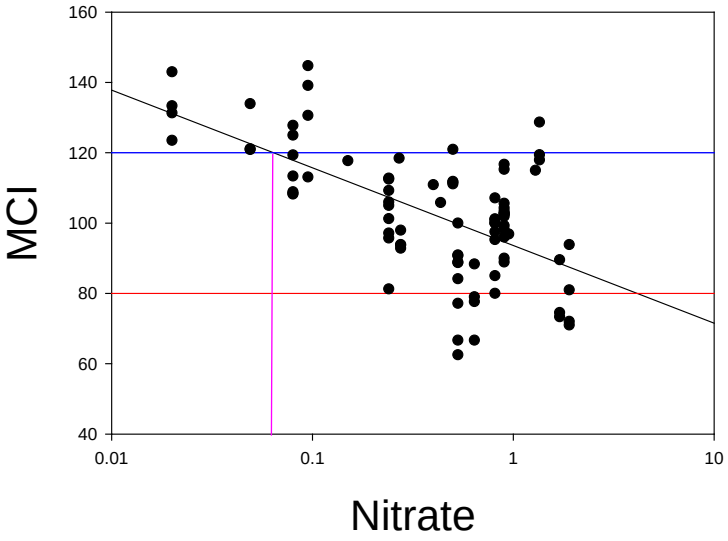
Nutrients (pg 15)

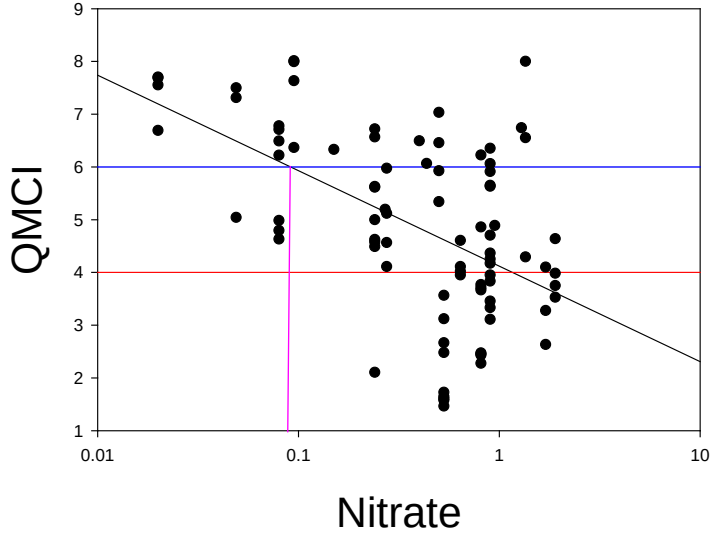
- Concerns me that data used to set nutrient standards comes from Dr Biggs research. Only 2 of his 30 study streams were from this region (Turakina, Moawhango) (36).
- However the nutrient standards are consistent with my own research on nutrient thresholds in local streams (37-40).

Nutrient data from 24 Manawatu streams





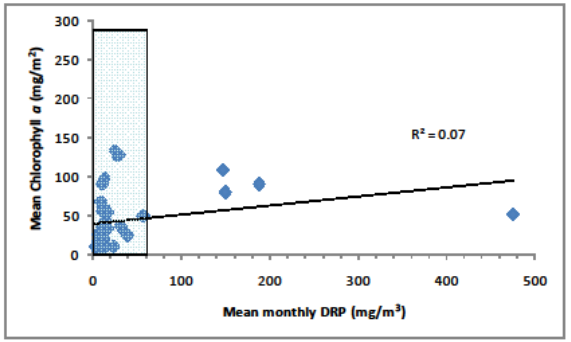


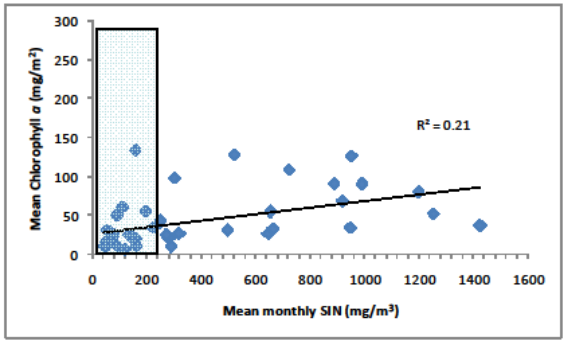


Do nutrients lead to high levels of periphyton or is it something else?

- Dr Scarsbrook in his supplementary evidence seemed to raise doubt about the link between nutrients and periphyton.
- No relationship because he has not accounted for flood events (subject of his PhD!)

Figure 1: Data on mean Chlorophyll *a* biomass and mean monthly nutrient concentrations (DRP & SIN) for 41 Manawatu-Whanganui sites (data obtained from Ausseil & Clark 2007). The blue boxes show the range of data values used by Biggs (2000; Table 1) to develop a model of periphyton biomass response to varying nutrient concentrations.





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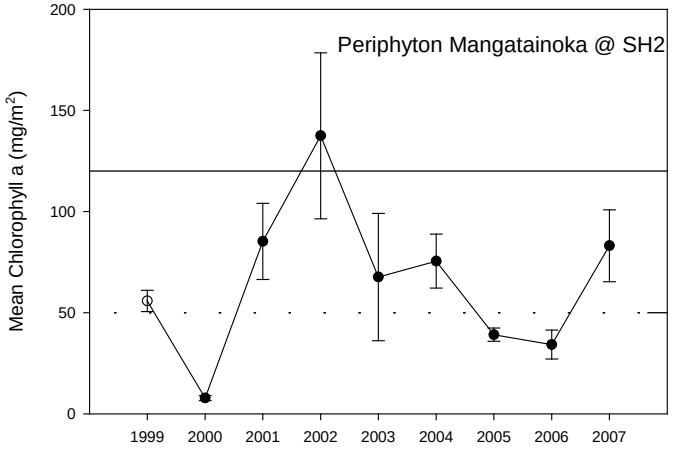
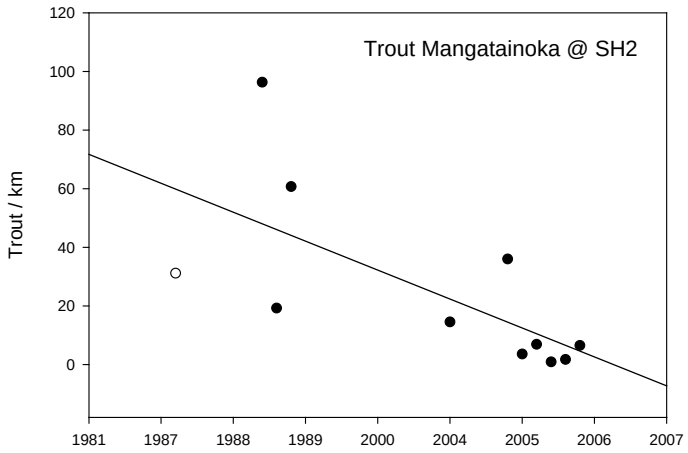
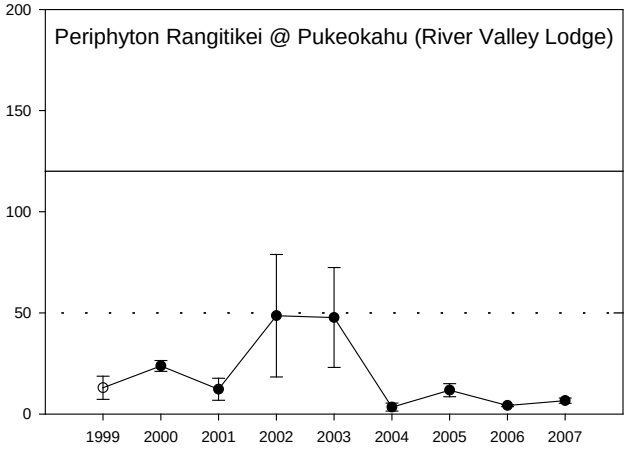
Maybe trout?

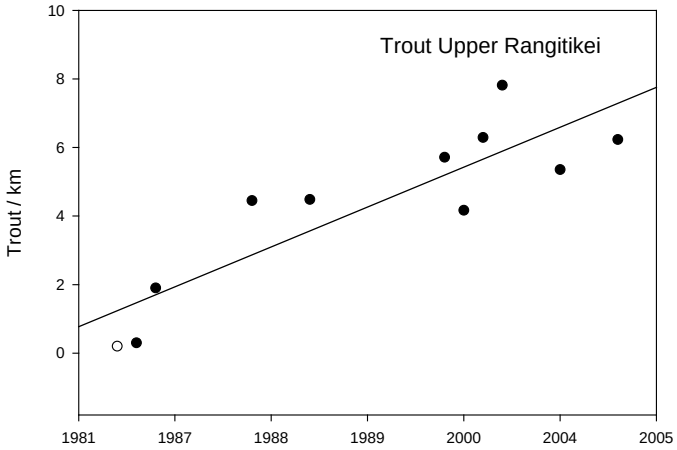
- Mr Barrows introduced some Otago University research on trophic cascades.
- In some low nutrient Otago streams trout have been shown to increase periphyton growth by eating all the insects that normally eat periphyton.
- May occur in pristine conditions but does not if nutrient levels are high (Biggs et al. 2000).
- In the Hautapu River for example, nutrients are high from Taihape sewage discharge and periphyton biomass is high even though there are lots of invertebrates

Trout and periphyton trends





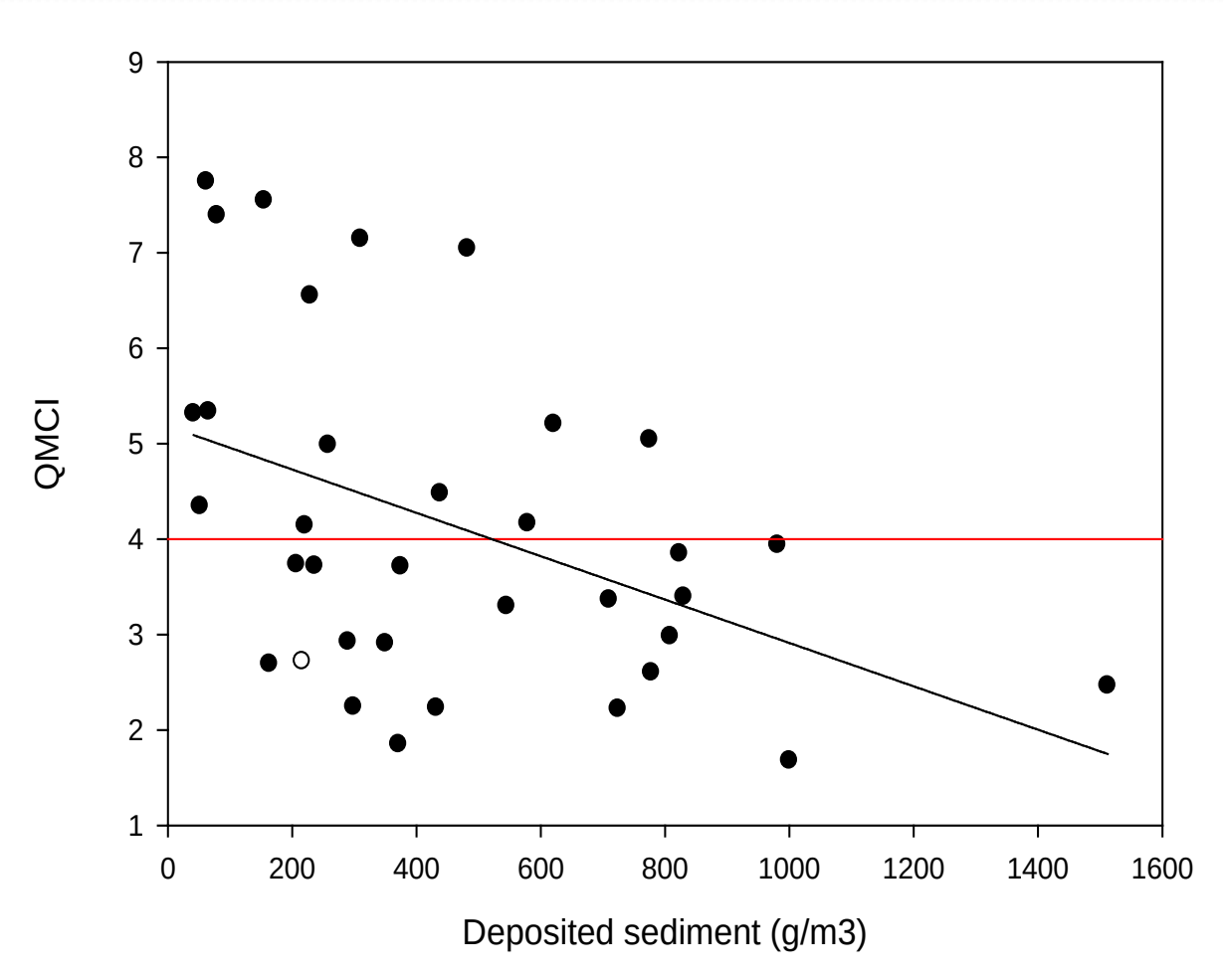




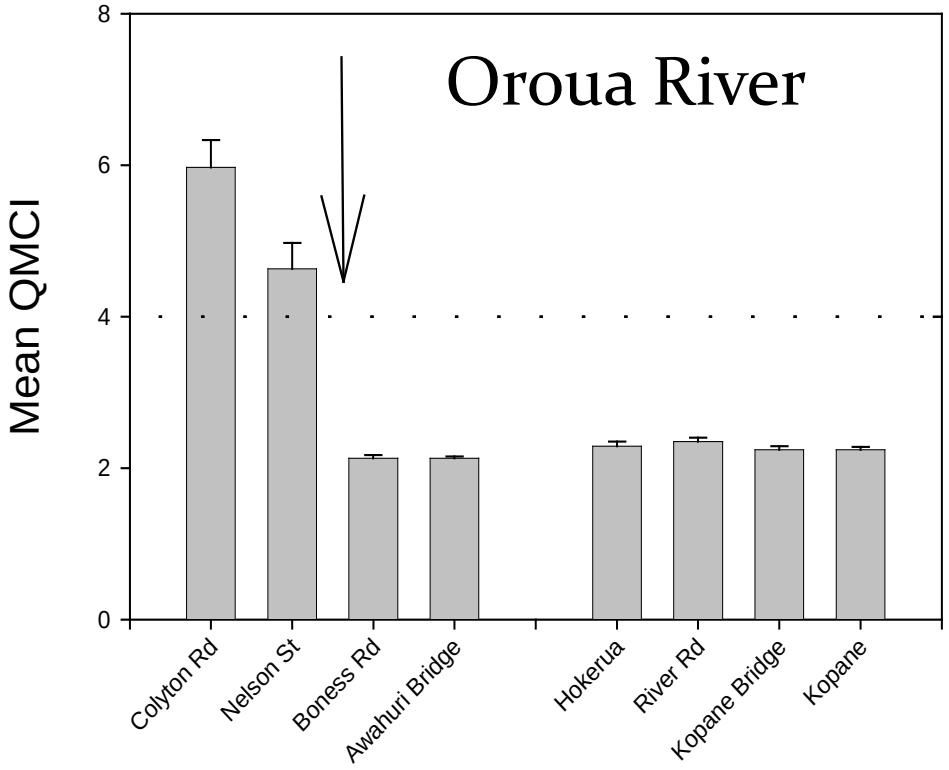
Sediment (EIA Pg 17)

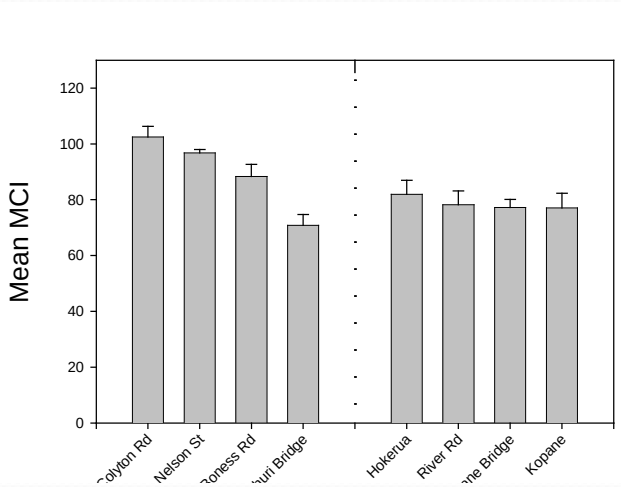
- Smothers animals
- Lowers quality of food.
- Destroys their homes

Sediment water quality relationship



Lowered water quality in the region is a result of both non-point and point sources (EIC 42-43)





Water quantity (EIC P 19)

- Do not support the use of IFIM (Instream Flow Incremental Method) as it relies on habitat quantity being the limiting factor for riverine animal populations.
- BUT will support 90% of MALF as a minimum flow. (45-48)
- Lower flows set with IFIM would not be supported

Flow pattern is as important as the amount of water

- With respect to flows the most important ecological condition is the maintenance of flow variability. (49)
- Floods are a characteristic of almost all New Zealand rivers and the ecological communities require them to maintain their integrity.
- "It is now widely accepted that a naturally variable regime of flow, rather than just a minimum low flow, is required to sustain freshwater ecosystems, and this understanding has contributed to the implementation of environmental flow management on thousands of river kilometres worldwide" (Poff et al. 2009)

How do we maintain flow pattern?

- Flow variability is made reference to but I believe there needs to be specific standards and protocols associated. (52)
- Mr Hay in his supplementary evidence and changes to Policy 6-16 seemed to agree with my concerns.
- Mr Hay seems to support the use of ELOHA (Environmental Limits of Hydrological Alteration) and RVA (Range of Variability Approach) as a mechanism to address the above issues but was a bit guarded about their use in New Zealand.

River and Lake Beds (EIC P 21)

- Suitable habitat is critical for a healthy biological community (54).
- This includes both the wet bit and the riparian margins. Many insects spend part of their life on land, fish lay their eggs on land and fish eat terrestrial insects and mice (55, 56).
- Living both by a stream and a river I fully understand the need for flood control however making rivers into drains, while this may seem best for floods, it is the worst for habitat (57).

- Maintaining habitat variability is why NZ organisms can survive floods in our rivers (59).
- Again there is mention of its importance but no standards or definitions e.g., natural character (60,61).
- Natural character needs to be quantified and maintained as it appears to be in decline across the region.
- Deposited sediment standards should be included here (62 63).
- EIC 64, 65, and 66 have been resolved with caucusing.

Conclusion (EIC 66-80)

- Only new point is I would like to see some specific targets against which to judge the POP.
- I believe a 20% improvement in ecological condition in 20% of the regions streams in 20 years is an achievable realistic goal against which to judge how well the POP works (70)

A plea for the rivers

- The waterways of our region are an extremely valuable resource not just for the economy but for the community and future generations.
- It is important that we do not allow the complacency of a seemingly unlimited renewable resource to allow us to slide along the path others have been such as the Aral Sea or Murray-Darling River.
- A death by a thousand cuts.

- Thank you for your time.