

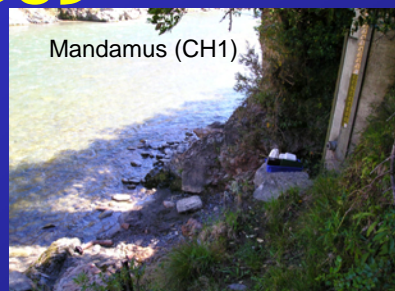
21 years of Hurunui mainstem environmental monitoring: what does it tell us?

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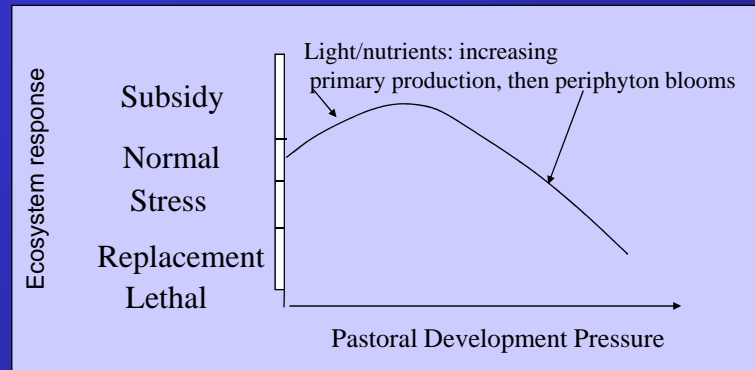


Hurunui monitoring: since 1989

- **Sites**
 - Mandamus: 1% dev. pasture
 - SH1: 26% dev pasture
 - Irrign since 1980 (Waiau) and 1985 (Balmoral)
 - Irrigated S&B → dairy
 - Borders → spray
- **Monitoring**
 - Continuous flow
 - Monthly water quality
 - Monthly potential nuisance algae cover in wadeable area
 - filamentous & mats
 - Annual invertebrates
 - Ecosystem health
 - Food for fish & birds



Expectations: Subsidy-stress response?



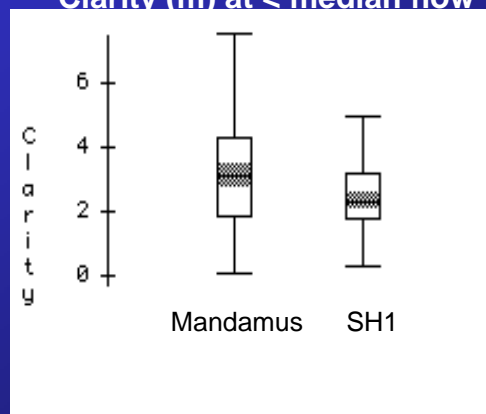
After Quinn, J.M. (2000). Effects of pastoral development. *In*: Collier, K.J.; Winterbourn, M.J. (eds). New Zealand stream invertebrates: ecology and implications for management, pp. 208-229. Caxton Press, Christchurch.



Water Clarity

- **Clarity lower at SH1**
 - Stable flow means 3.2 & 2.6 m
 - Both meet MfE guideline at stable flow
- **No trends since 1989 at either site**

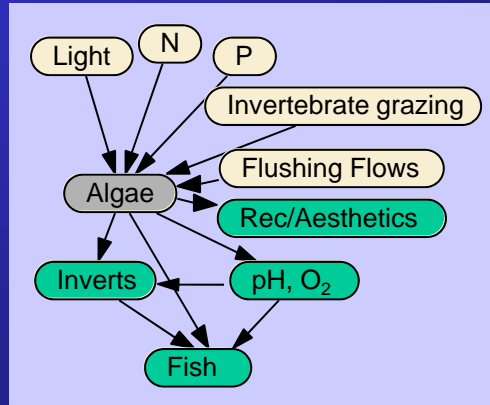
Clarity (m) at < median flow



Riverbed algae: controls, effects and trends at Mandamus and SH1

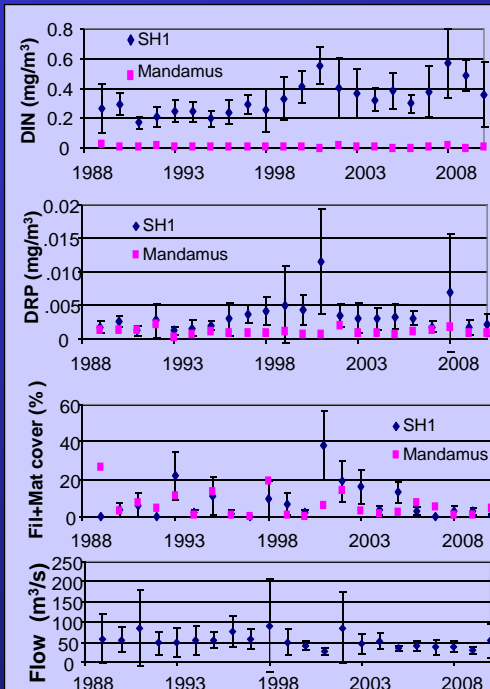
- **Slightly more algae at SH1 than Mandamus**

- 3% c.f. 2% obs > 15% filamentous cover
- Av Ann Max % cover
 - 10% (SH1) vs 9% filamentous
 - 27% (SH1) vs 26% mats



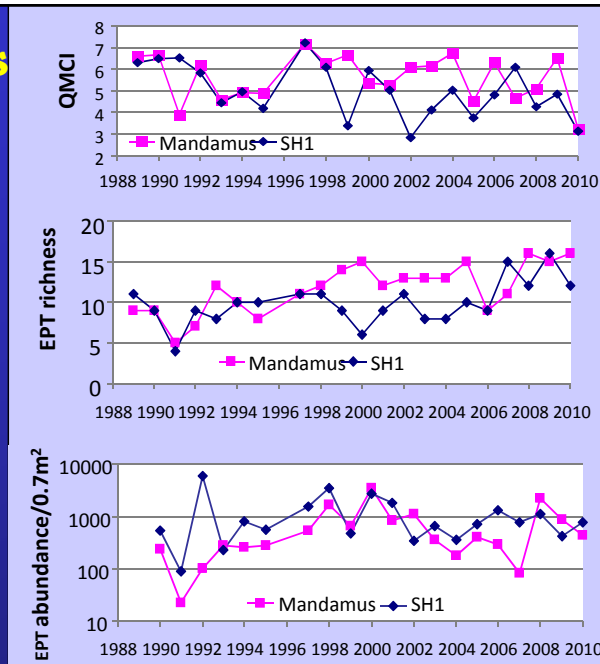
Summer mean trends

- **N up 15x at SH1 and increasing over time**
- **DRP up then down**
 - Peak in 2001 drought
 - Drop since 2000 (stat sig)
 - 0.0016 ppm (35%) over 10yr
- **Algae cover**
 - Peak in 2001 drought
 - Minimal since 2005
 - pH and O₂ corroborate less algae since 2005
- **Flow & flow variability important**
 - Scour algae
 - Dilutes runoff
 - High algae in 2001, 2005



Invertebrates

- **1999-2005:**
 - Relative abund & richness of sensitive species lower at SH1
- **Total abundance of sensitive EPT typically higher at SH1**



Conclusions on Hurunui mainstem

- **Enrichment downstream, esp. N**
- **Algae**
 - higher at SH1 in 2001-2005
 - recent drop in P & algal cover at SH1
- **Current nutrient effects more *subsidy* than *stress* on invertebrates**
- **Evidence of recent improvement**
 - Response to mitigations in Pahau?



Acknowledgements

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 - Hamilton biology lab

