



AWTHRON

Review of Water Quality & Ecological Monitoring of the Taharua River

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Purpose of report:

- Review HBRC's draft report
 - *'Taharua River Water Quality and Instream Ecology November 01 to December 05'*
- Recommend how to tailor monitoring to address potential impacts on trout arising from dairy development
- Also reviewed Bioreserches monitoring done for Poronui Stn. – since Dec 1999.

Key results from monitoring

- **Water clarity** declined over time & down Taharua
 - but not often below HBRC's guideline of 1.6 m (black disc)
 - usually within ANZECC (2000) guidelines for turbidity (4.1 NTU)
 - SS usually within ANZECC (2000) guidelines (6 g/m³)



Key results from monitoring cont'd

- **N** increasing trend to high levels
 - but decreased down river (*dilution?*)
- **DRP** exceeds HBRC's guideline (0.015 mg/l)
 - HBRC found no trend down river
 - Bioresarches found P decreased down river
- **Algae** – no proliferation (*Bioresarches*)
 - despite high N & P



Key results from monitoring cont'd

- DO spot records > 80% saturation – indicate no concern (*Bioresearches*)
 - but 24h DO monitoring on one occasion found DO dropped to 74% (*HBRC & Cawthron*)
- Faecal coliforms usually below guideline (<50/100ml)
 - but occasionally high (e.g. following rain or when cattle grazing near river – *Bioresearches*)



Key results from monitoring cont'd

- **MCI** – indicates good ecosystem health



Recommendations

- Plan monitoring within framework of Limiting Factor Analysis
- Limiting factors:
 - spawning / egg incubation habitat
 - fry / juvenile rearing habitat
 - adult habitat



Spawning / egg incubation habitat

- Key potential impacts:
 - **Sedimentation**
 - smothering of eggs in redds
 - Nitrate?
 - may be lethal to trout eggs at conc. > 1.1 mg/l
 - DO?



Fry / juvenile rearing habitat

- Key potential impacts:
 - **Sedimentation**
 - embedding of substrate (no gaps to hide under rocks)
 - smothering invertebrate food
 - Riparian vegetation
 - loss of cover (e.g. by stock trampling/grazing)
 - DO?



Adult habitat

- Key potential impacts:
 - **Sedimentation**
 - smothering invertebrate food
 - **Water clarity**
 - reduced drift foraging area (= reduced food intake & growth)
 - Riparian vegetation
 - loss of cover (e.g. by stock trampling/grazing)
 - DO?



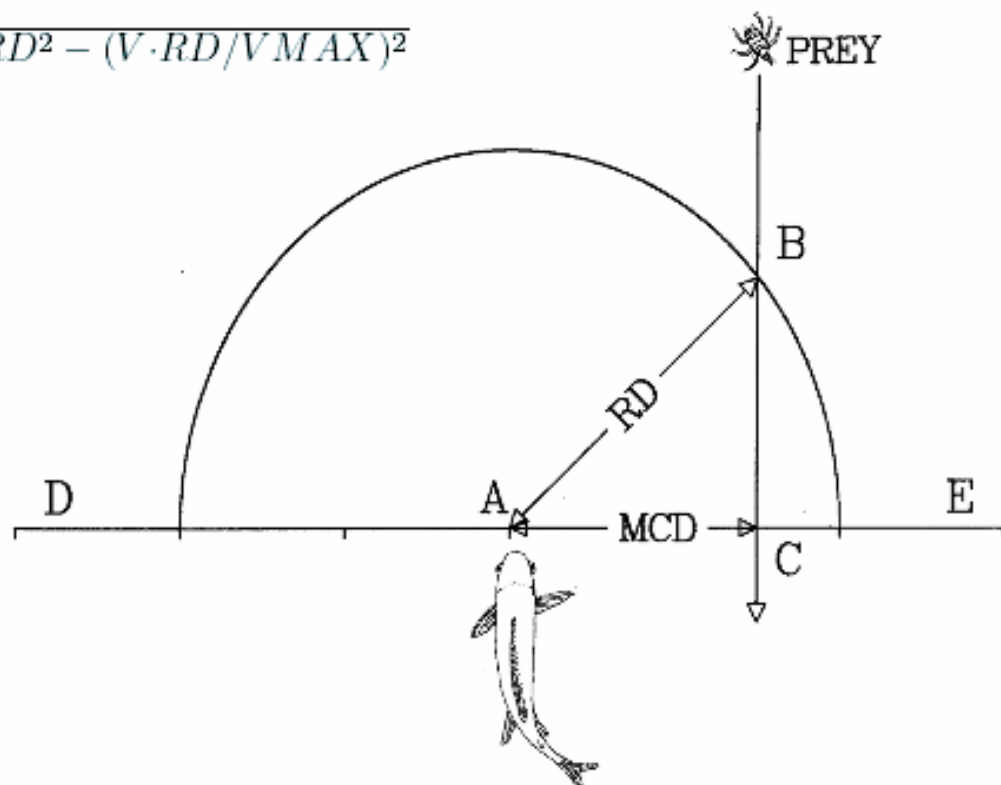
Recommendations cont'd

- Revise **water clarity** guideline
 - 1.6 m BD is inadequate for drift feeding trout
 - ≥ 5 m BD or BD naturally exceeded 90% of time is more appropriate
- Continuous turbidity monitoring

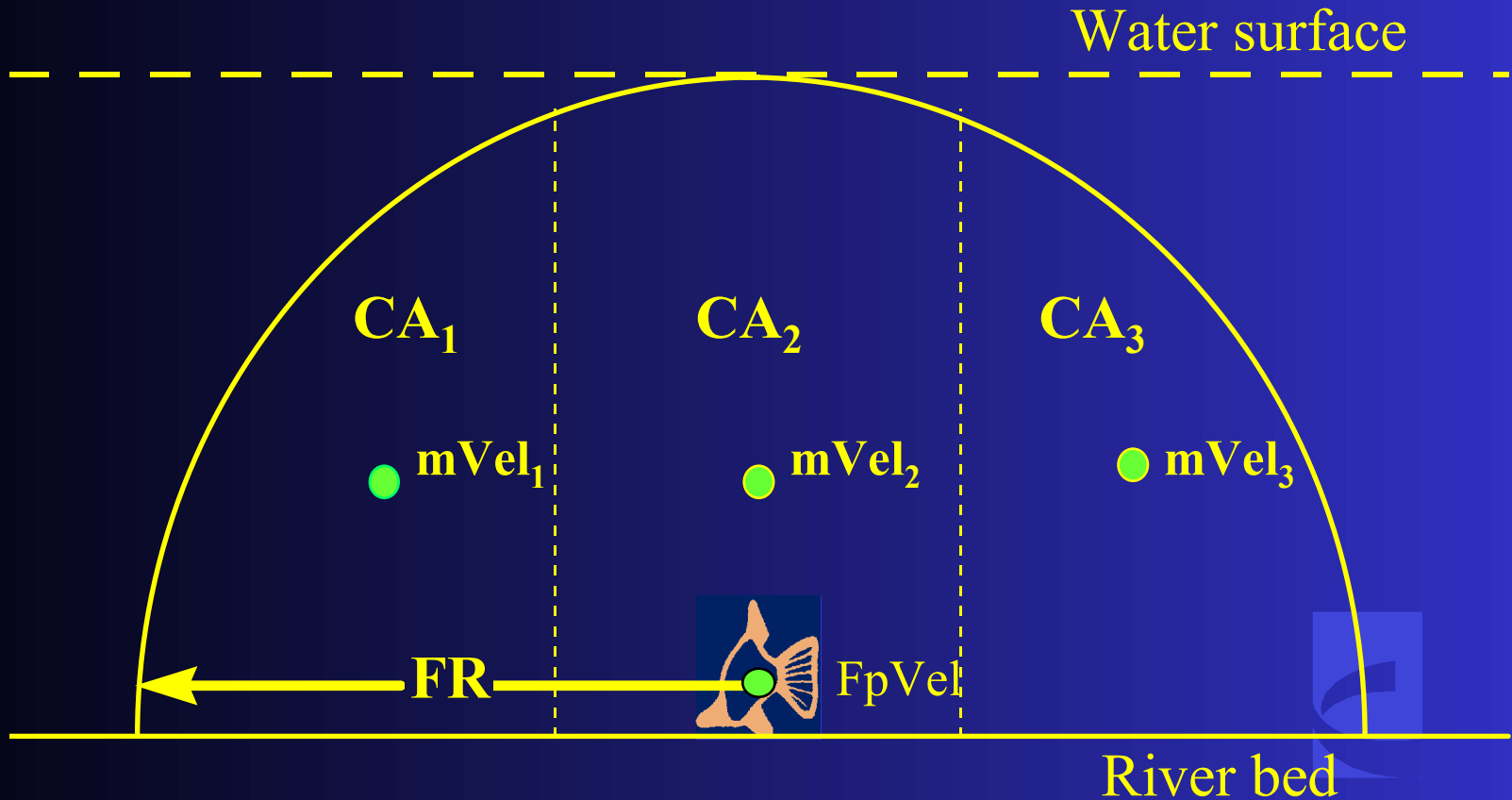


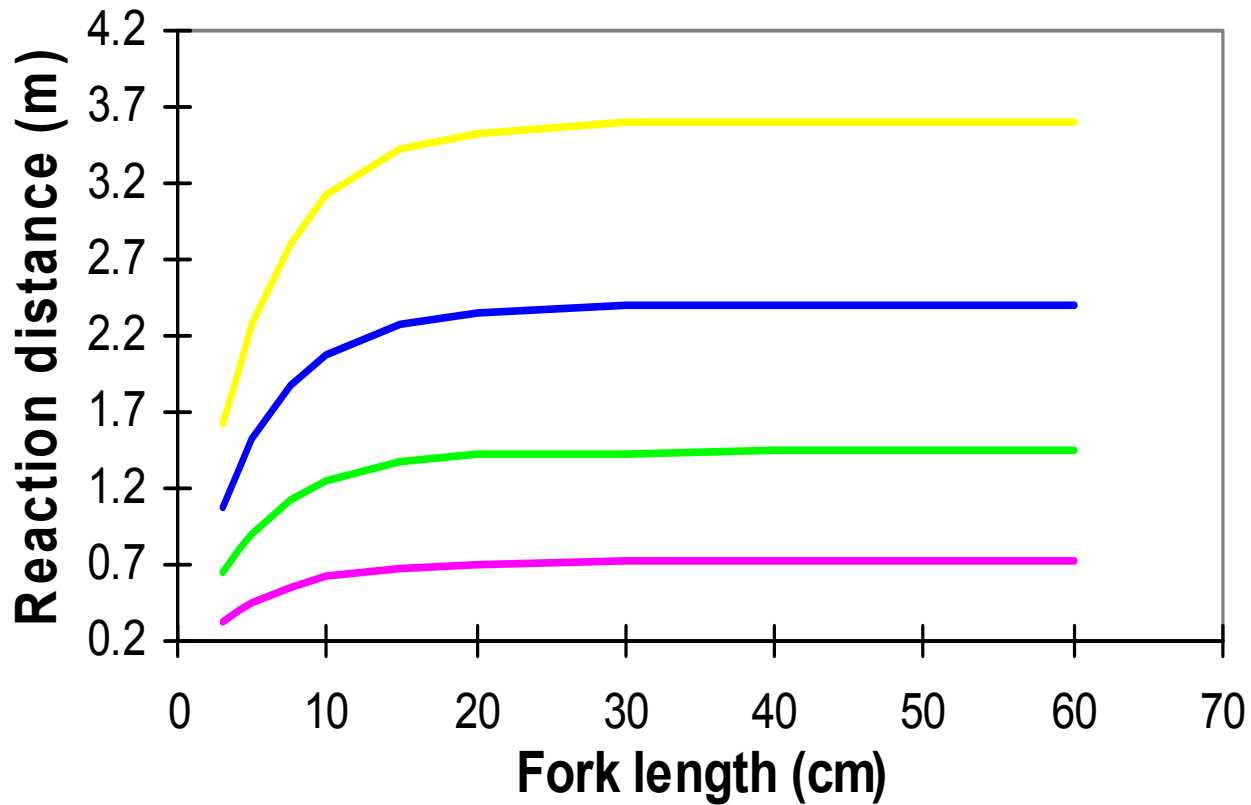
Foraging geometry

$$MCD = \sqrt{RD^2 - (V \cdot RD / VMAX)^2}$$

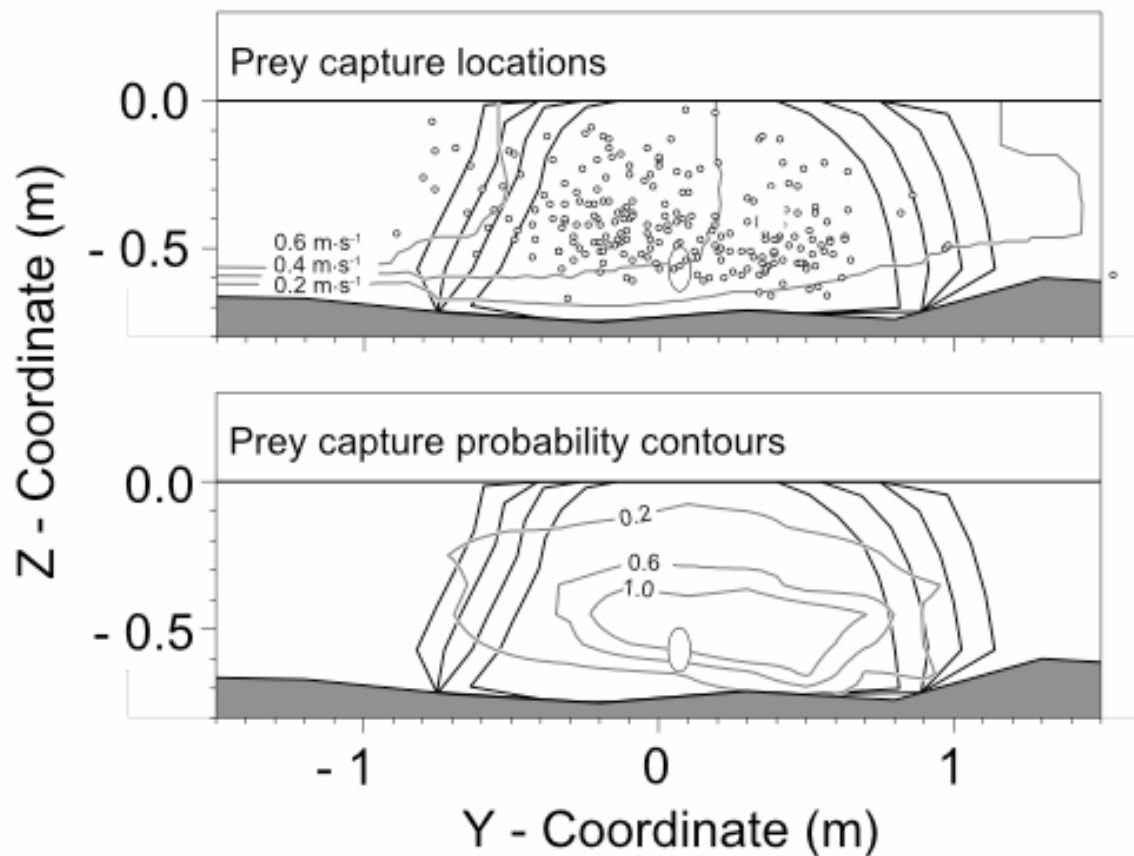


Conceptual model of drift-feeding trout foraging area

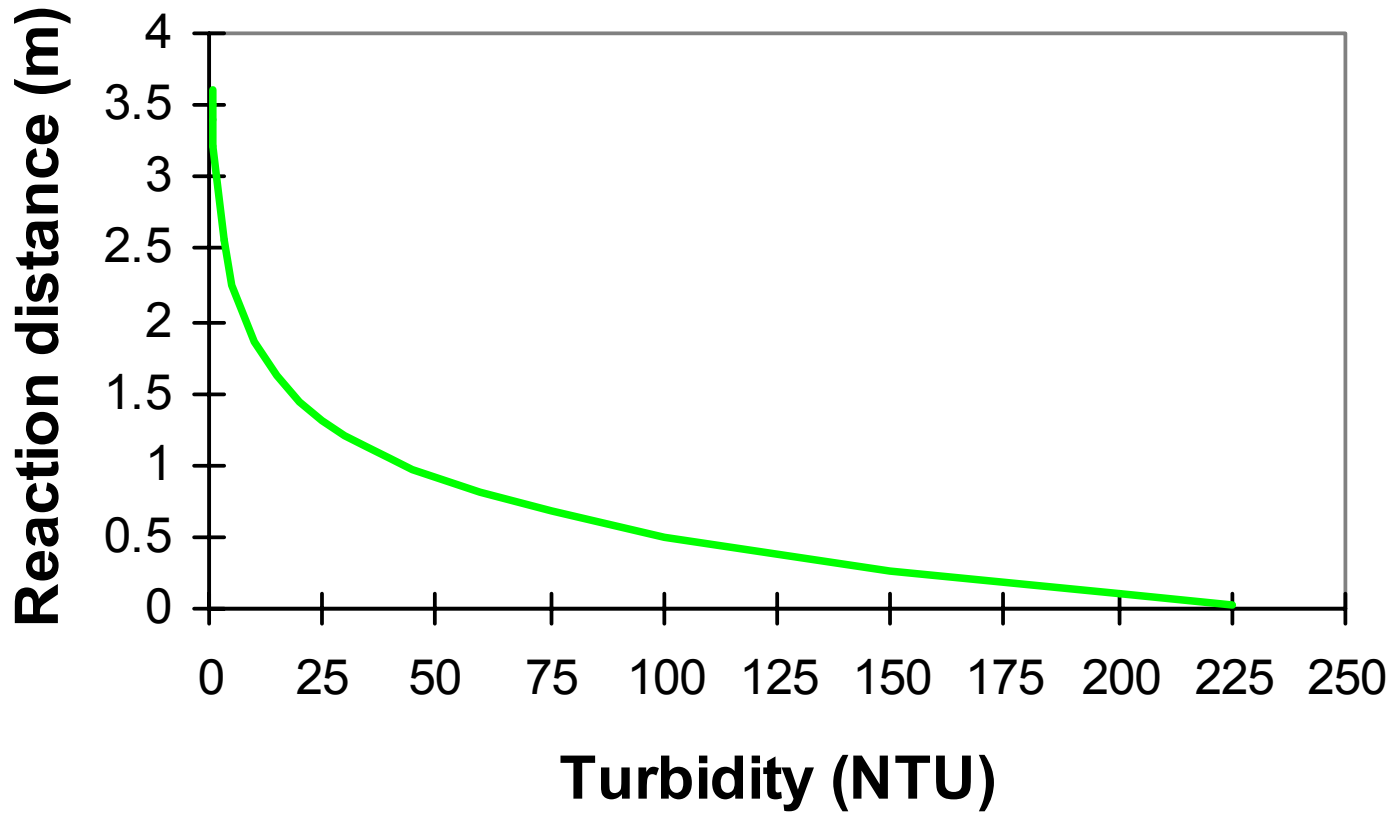




Prey capture probability



Data source: Hughes, N.F., J.W. Hayes, K.A. Shearer and R.G. Young. Testing a model of drift-feeding using 3-D videography of wild brown trout in a New Zealand river. *Canadian Journal of Fisheries and Aquatic Sciences*. (Accepted pending satisfactory revisions).



0.5 NTU ~ 5m BD

Recommendations cont'd

- **DO** – 24h monitoring
 - regularly
 - & in concert with **N** interpret in context of river metabolism analysis



Recommendations cont'd

- **N, P, Algae**
 - extend monitoring into Mohaka River below Taharua confluence



Recommendations cont'd

- Spawning habitat & sedimentation
 - conduct spawning survey
 - check for sedimentation
 - NIWA's quorer 'Irish Rubbish Tin' practical monitoring tool
 - if sedimentation present could study:
 - spawning gravel quality
 - egg survival



Recommendations cont'd

- Riparian habitat condition survey
 - could base on existing protocols
 - Bain et al (1999)
 - MfE (2000)
 - Quinn et al. (2001)
 - or could simply inventory obvious damage from stock & land use change



Recommendations cont'd

- Benthic invertebrates
 - consider including runs in monitoring
 - looking for progressive sedimentation effects which begin in pools → runs → riffles



Recommendations cont'd

- Monitor trout population parameters:
 - abundance & catch rate
 - growth
 - condition
- F&G – drift diving?
- Poronui Stn. – angling records
 - trout size (length & weight)
 - catch rate
 - otoliths & scales for growth analysis?
 - tag & recapture for growth analysis
 - bank counts trout & rising trout by date?