



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/m<sup>3</sup>)



# 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
  - Bioreseraches found P decreased down river
- **Algae** – no proliferation (*Bioreseraches*)
  - 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?



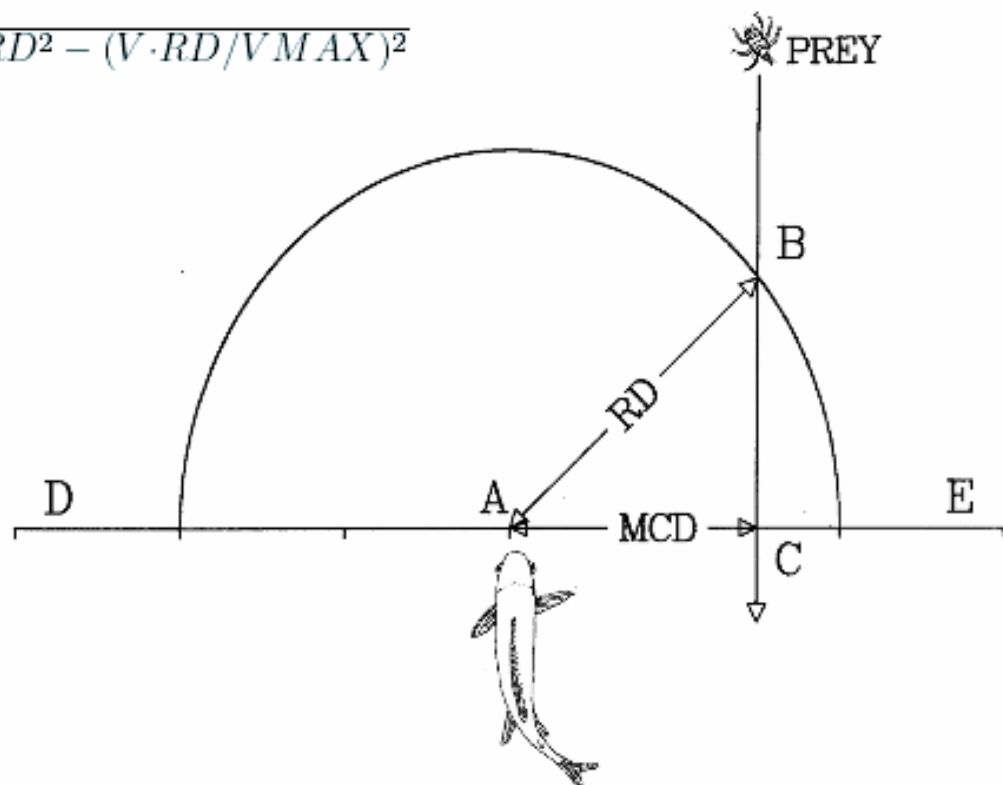
# Recommendations cont'd

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

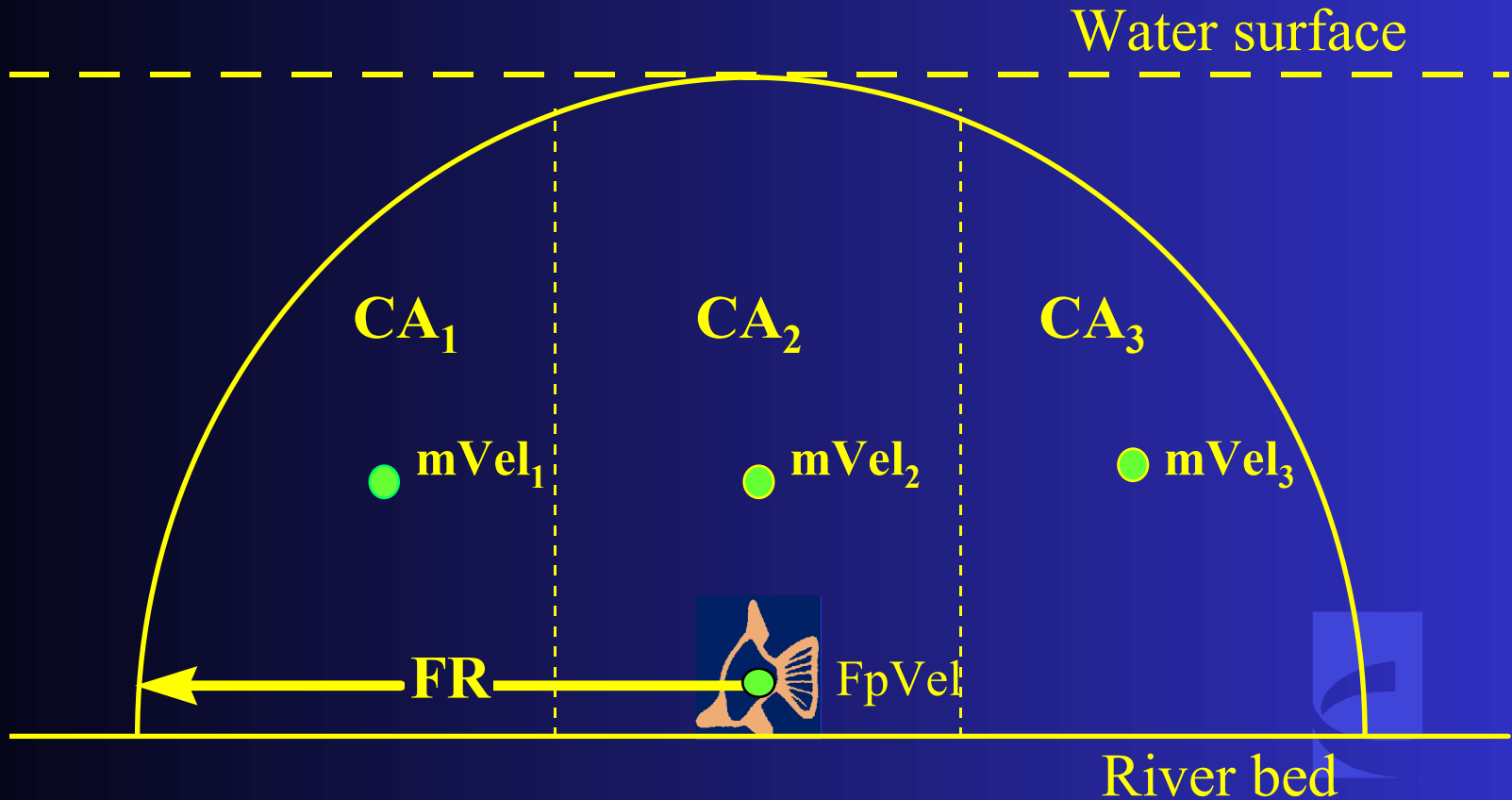


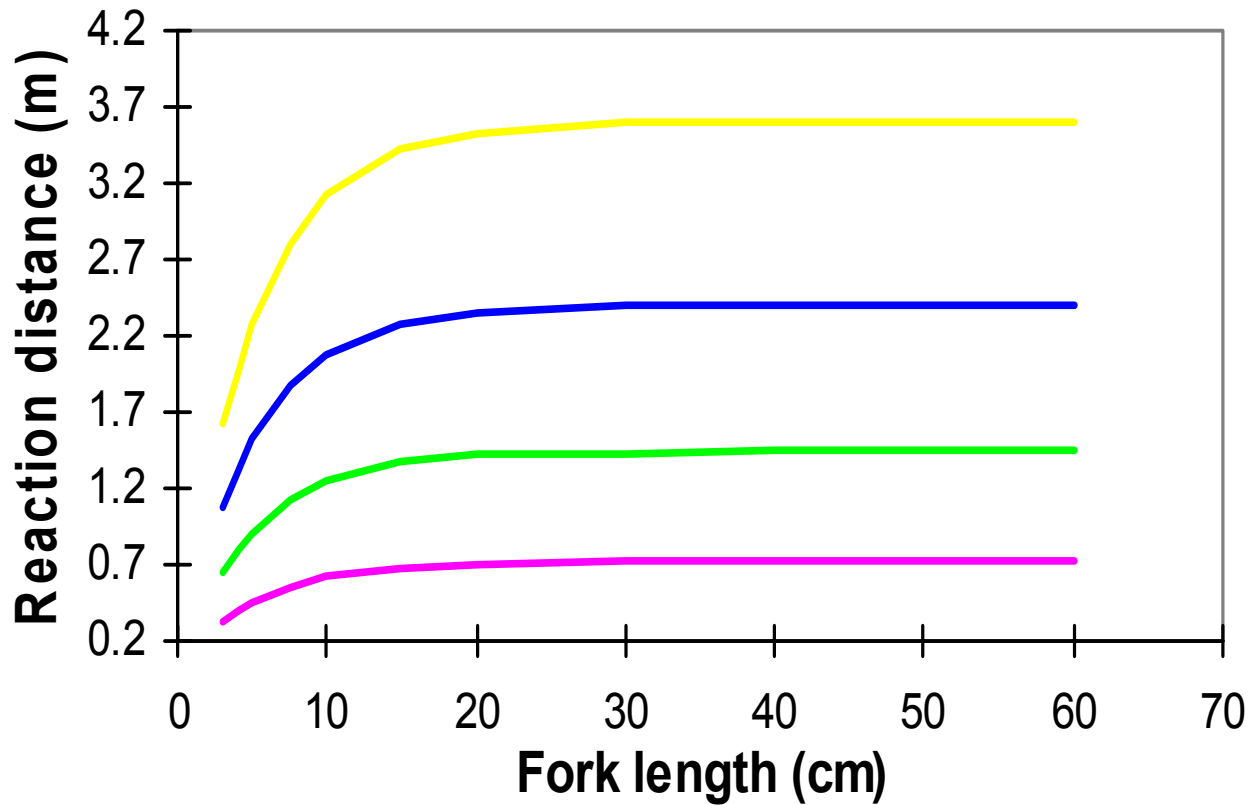
# Foraging geometry

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

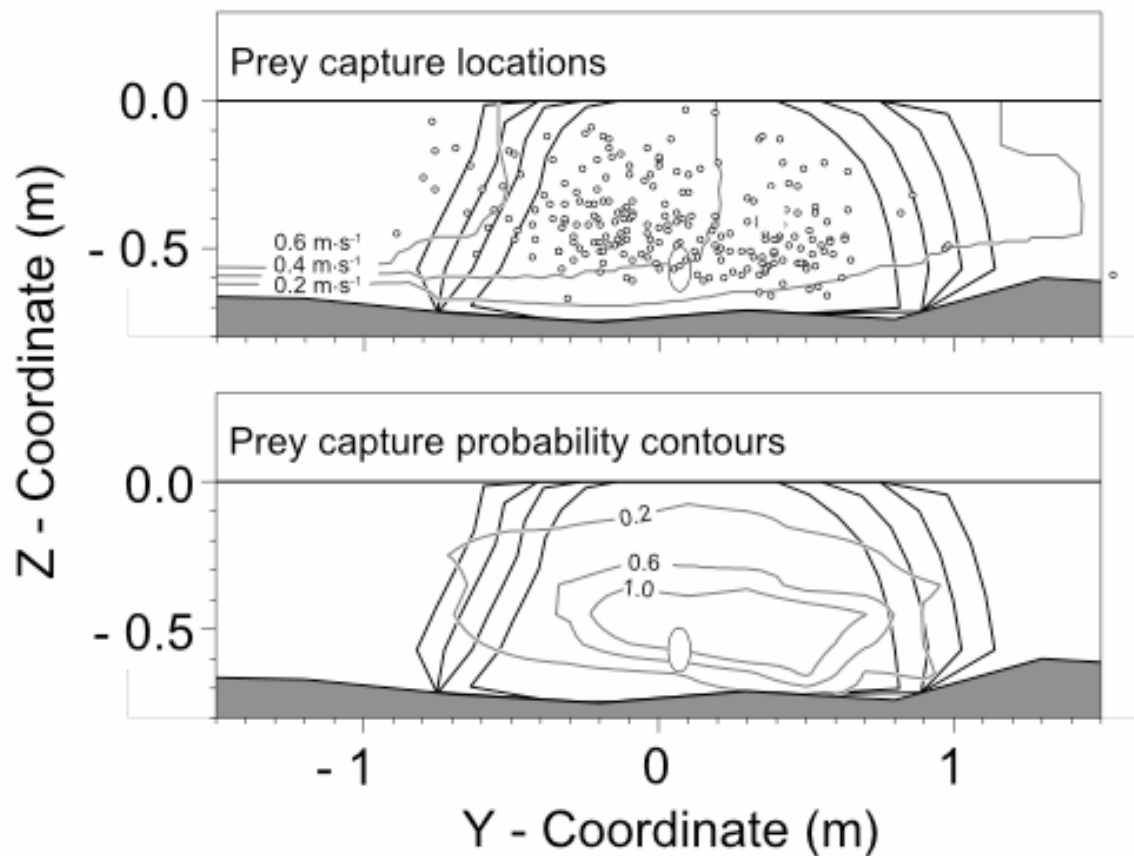


# Conceptual model of drift-feeding trout foraging area

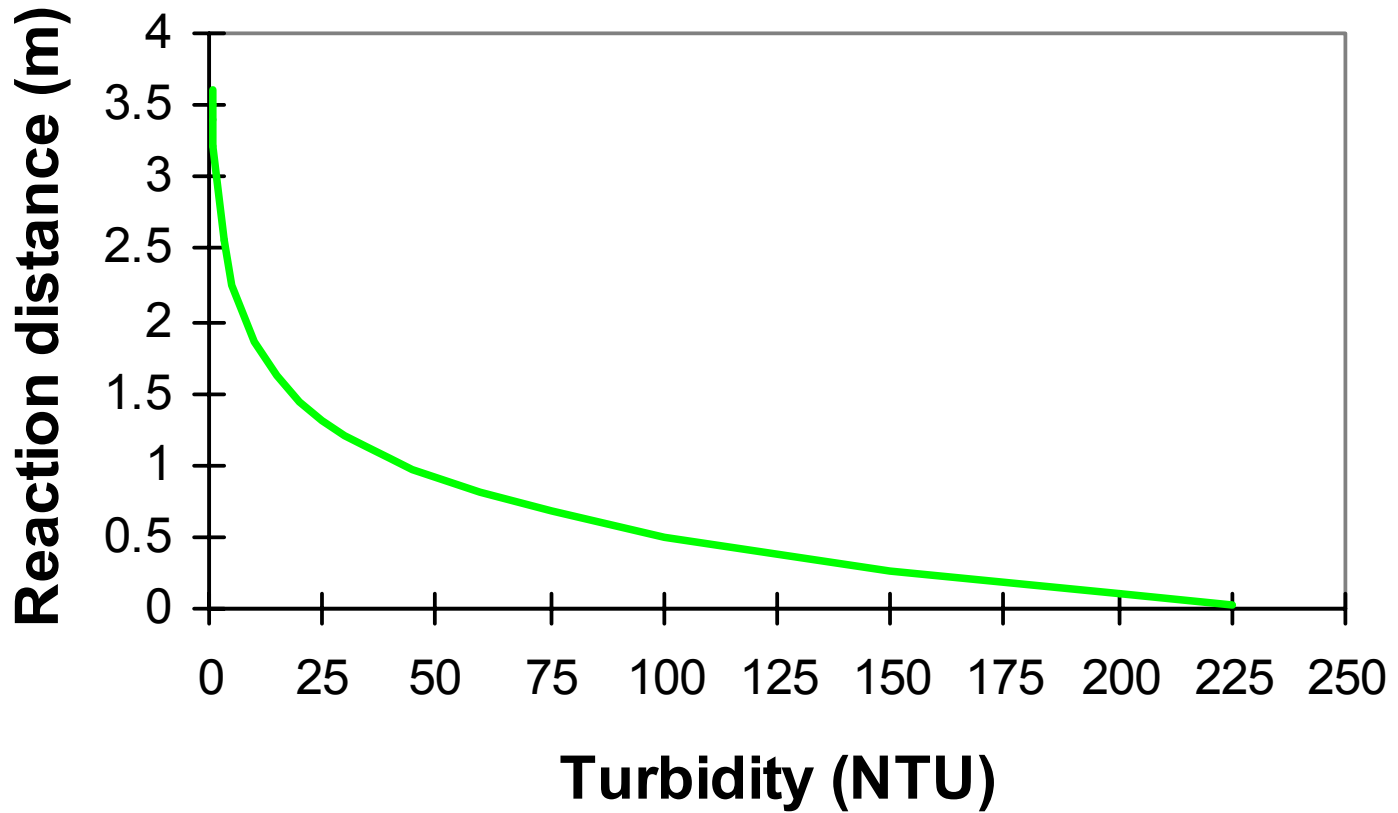




# Prey capture probability



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?