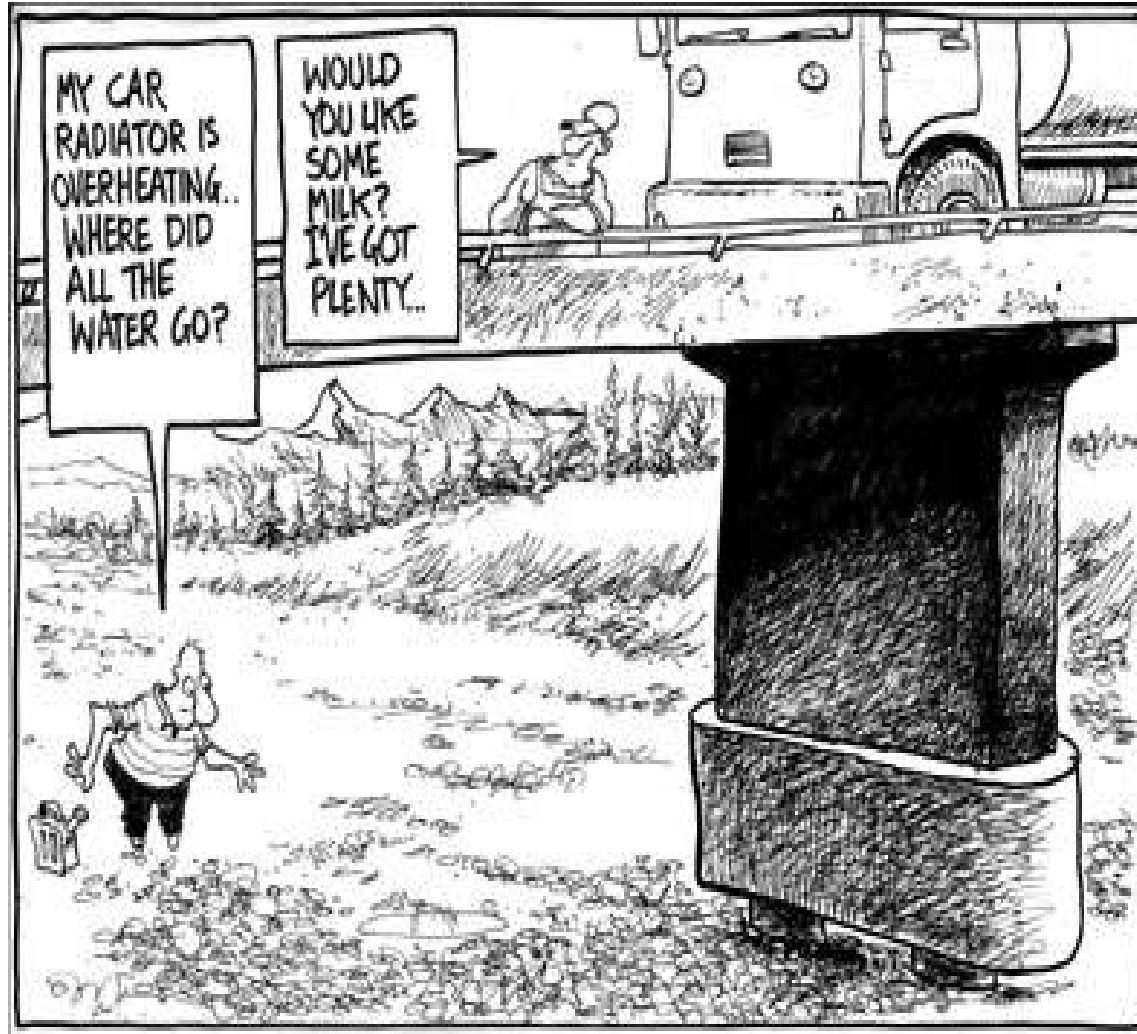




# Scientific Indicators of River Health

Roger Young  
Rowan Strickland  
Aaron Quarterman

# A healthy river?



# River Ecosystem Health



"A healthy river is an ecosystem that is sustainable and resilient, maintaining its ecological structure and function over time while continuing to meet societal needs and expectations."

So.... A healthy river supports:

- all the organisms that should be there
- all the ecological processes that should occur
- all the goods and services that people value

# Scientific indicators of river health



- o Water quantity
- o Water quality
- o What lives there?
  - Invertebrates
  - Fish
  - Algae
- o Functional indicators
- o Habitat
- o Fish passage

# Water Quantity

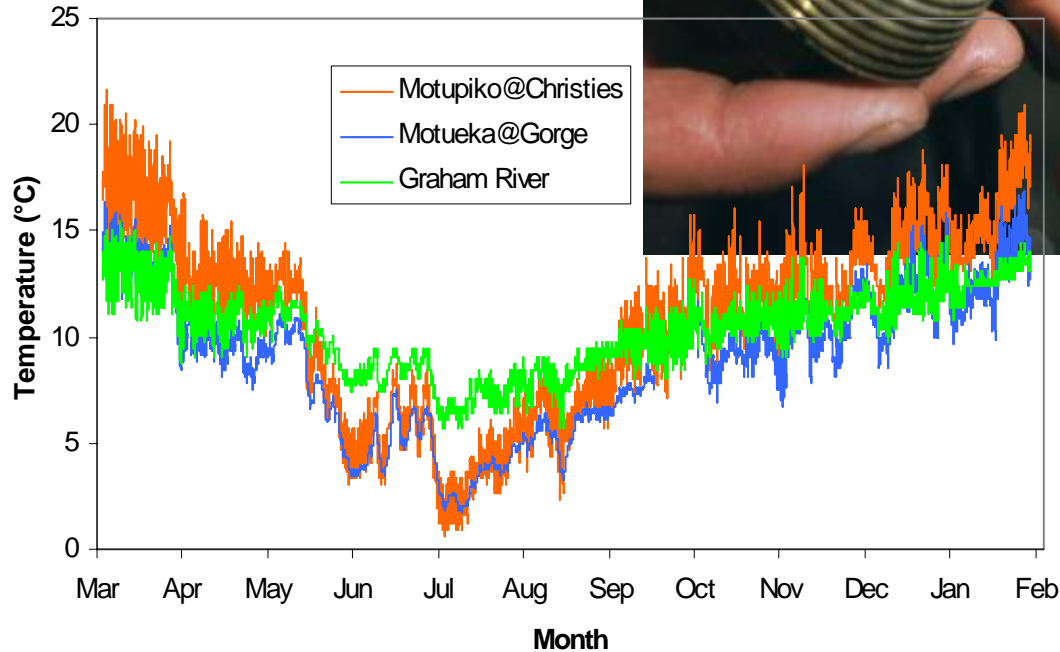


- o How much flow
- o Flow variability





## o Temperature

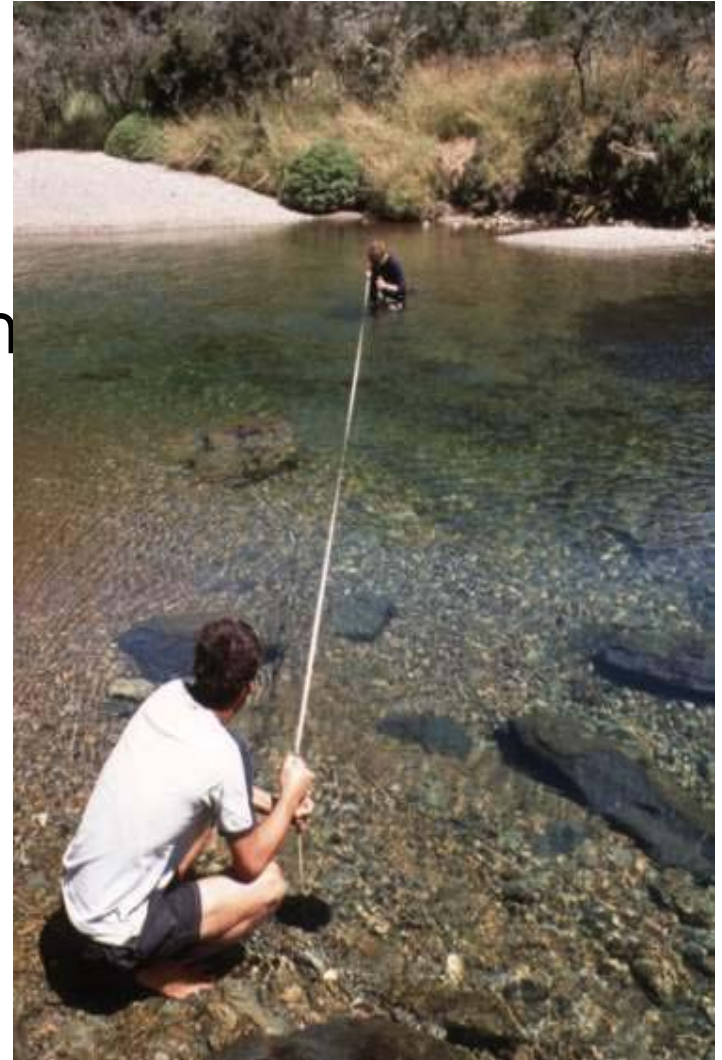




# Water Quality



- o Clarity
- o Turbidity
- o Suspended sediment



# Water Quality



- o Dissolved oxygen
- o pH





# Water Quality



- o Nutrients – nitrogen, phosphorus
- o Faecal bacteria



# What lives there?



## o Invertebrates



# What lives there?



- o Invertebrates
- o Sensitive species
- o Tolerant species
- o Indices – EPT, MCI





# What lives there?



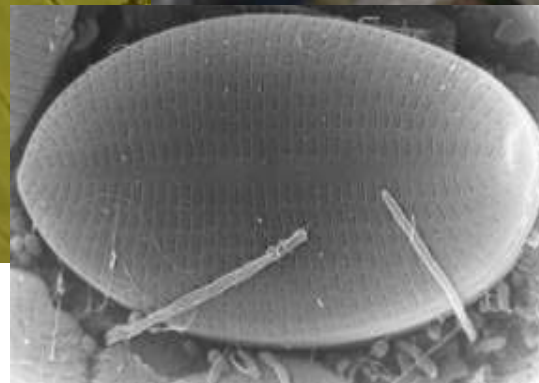
## o Fish



# What lives there?



## o Algae





# Functional Indicators



- o A new idea – still under development
- o **Rates** of ecosystem processes
- o The pasture analogy
  - How healthy is your pasture (or lawn)?



# Why use functional indicators?



- o More broad picture of ecosystem health
  - 3 options for response to stress
- o Integrated measure
  - over time and across habitats
  - influenced by a wide range of factors
- o Direct links with stress
- o Flexibility in habitats that can be sampled
- o Not affected by biogeography
- o Cost effective – no need for taxonomic expertise
- o Early warning

# Habitat



- o Channel type
- o Frequency of macrohabitats
- o Cover
- o River width
- o Water depth
- o Water velocity
- o Riverbed condition





# Fish passage



# Fish passage - culverts



Wrong



Right





# Fish passage - fords



# Fish passage - floodgates



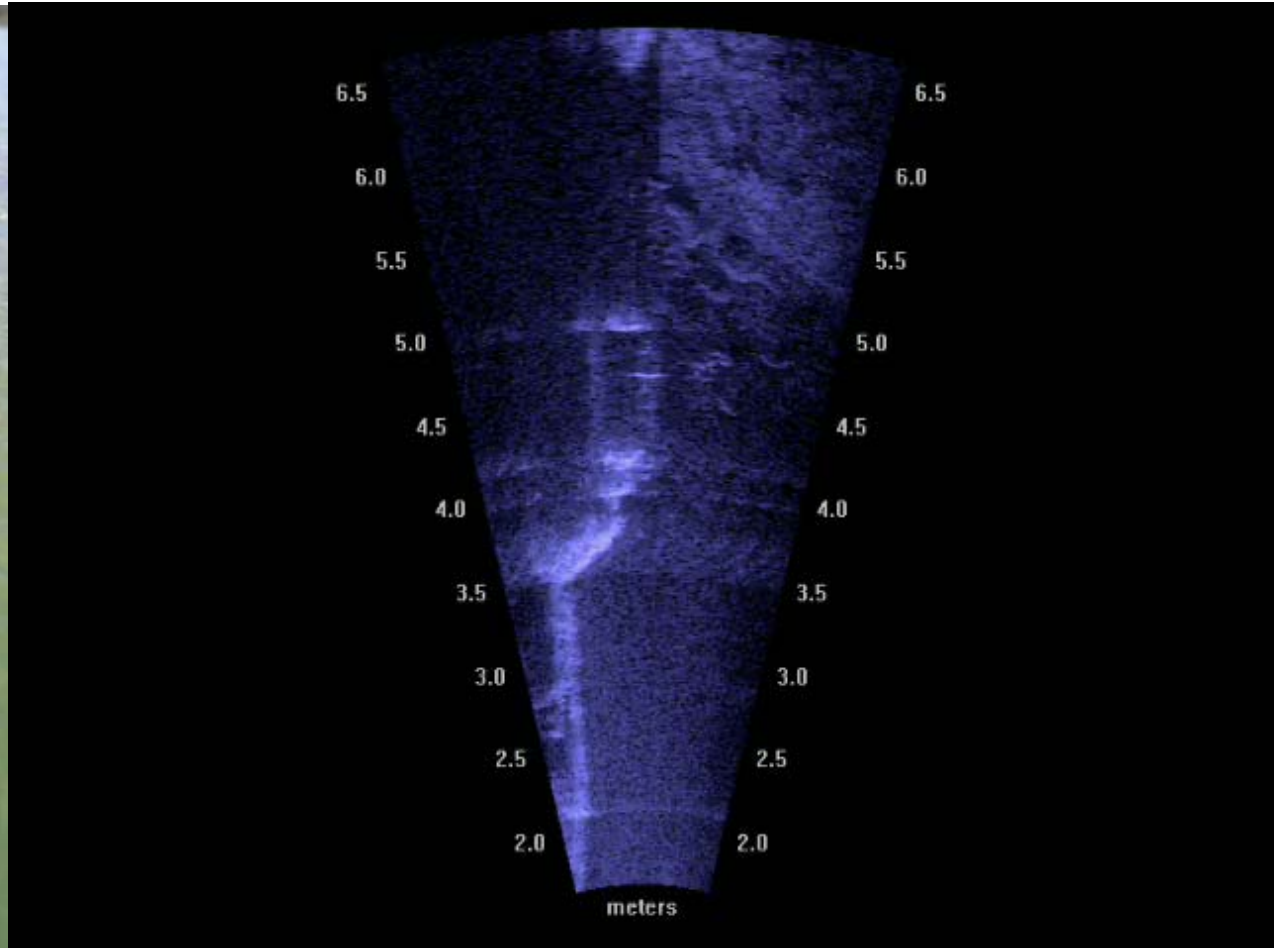
# Cawthron's acoustic camera



- Near video quality images through dirty water or in the dark
- Detection range from 1m to 30 m
- Can automatically count and measure fish
- Enables monitoring of fish behaviour and passage past floodgates



# Inanga and yelloweye mullet - Motueka





# Summary



- o Wide range of scientific methods used to indicate river health
- o Different tools for different purposes
- o Lets have a go with them.....