"from ridge tops to the sea"

## Integrated Catchment Management Research: What have we learnt?

Integrated Catchment Management





TDC Tasman District Council

**Common Ground Ltd** 

Tiakina te Taiao Ltd

**Pansophy Ltd** 

nz landcare trust ngā matapopore whenua



SCION .



Takoro Naharang

# Talk outline

- A general ICM overview
- Fishery research
  - What's controlling the trout population?
  - Where are juveniles coming from?
  - Radiotracking of adults
  - Otolith microchemistry
  - The Rainy Study
  - Recent PIT tagging work

# Management Challenges

- Simple systems
- Complicated systems
- Complex systems

# Simple systems

 Call for generic solutions (or recipes) that work every time and don't require new skills or infrastructure



# **Complicated systems**

 Require a high level of skills and coordination, formulae are necessary, and there is a high degree of certainty in the outcome



## Complex systems

 Every situation is unique, uncertainty of outcome remains, expertise can help but isn't sufficient, quality of relationships are crucial





#### ICM connects land, water, coast and people



#### ICM.... is a process



#### Motueka catchment topics



# Motueka Stakeholder Survey: The Top 10 Issues

- **1.** River *Water* and Groundwater Availability
- 2. Groundwater Pumping Effects on Stream and River Flows
- 3. Methods to Resolve Competing Demands on Resources, e.g. *Water*
- 4. *River Gravel* Supply and Extraction Effects
- 5. Environmental Effects of Increased Water Takes

## Top 10 Issues ctd

- 6. Economic Impact on Irrigators of *Water* Restrictions
- 7. Environmental Impacts of Changes in Land Use
- 8. Off-Site Environmental Impacts of Major Catchment Land Uses
- 9. Best Methods to Improve Understanding and Acceptance of Research Results and *Resource Management Plans*

10.Protection and Management of *Riparian* Vegetation

#### **Cows crossing streams**



- 400% increase in *E.Coli* during cow crossings
- Cows 50x more likely to defecate in water



THE NELSON MAIL Tuesday, May 7, 2002 - 15

#### Bridge cuts stock pollution

Parties usually at oggerheads over rivr water quality gathred to celebrate the pening of a remote bridge . airts. last nek

The official ribon-cutting ceremoy for Frank and Lisa Vhite's \$50,000 stock eidge over the Shery River saw about 40 rople; including armers, Fish and same and Tasman District Council repesentatives, gather in the banks to celemate. Council

policy dunner Martin Worksan said stock ridges were good or the dairy industry, he environment and he public. "Our goal is to

ave the river clean nough to swim in." The river was the ocus of the first naional investigation tto the effects of tock regularly cross ig waterways.

major source of wa-

er pollution in New Zealand.

A study on the effect of the Whites' 245ow herd crossing the river to and from the ulking shed by the council, the Cawthron Intitute and Landcare Research found there vas a correlation between the number of ows in the stream channel and water cloudiess and faecal bacterial counts.

The study found the cows deposited 37kg f faeces in the stream during two crossings. hey also polluted the water with contamiants washed off their legs and by disturbing w stream bed.

Mr Workman said the voluntary bridging of treams by farmers to lessen stock water polition was more effective than blanket rules. "But farming bodies are asking for that if se voluntary approach does not work." he

MAIL PHOTO / HELEN MURIDOCH 27260

RIVER BRIDGED: With help from Tasman District councillor Tim Stock access to King, right, Mrs Theima White opens her son and daughter-in-law's vaterways is seen as new Sherry River stock bridge.

Nelson Landcare Research coordinator Barbara Stuart congratulated Sherry River farmers for their courage in dealing with the issue.

"The clean, green return to farmers exporting overseas is what you will get out of it." She predicted that more crossings would be built as farmers realised their benefits.

Nelson-Marlborough Fish and Game manager Neil Deans said he was pleased to see the project completed.

What we want to see now is the benefits of the bridge in ongoing research."

Cr Tim King said there was a growing awareness in the rural industry of the impact of activities on waterways.

"It's in everyone's best interest and the ulately the culmination of cooperat OB. COD





#### Natural – Present – Intensive land use scenarios



# Intensive land use socio-economic outcomes



# Intensive land use environmental outcomes



#### Best management practice

![](_page_17_Figure_1.jpeg)

#### Best management practice

![](_page_18_Figure_1.jpeg)

![](_page_19_Picture_0.jpeg)

![](_page_20_Figure_0.jpeg)

![](_page_21_Picture_0.jpeg)

#### CTD and water quality survey – 30 Apr 2009

![](_page_22_Figure_1.jpeg)

#### Ruminant MST marker (*Bacteroides* sp.) detected in mussels

![](_page_22_Figure_3.jpeg)

#### Travelling River

#### ... a collaboration of artists, scientists and the people of the Motueka River catchment

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![](_page_24_Picture_0.jpeg)

#### **Travelling River Art-Science Collaboration**

Travalling River

#### Travelling River

#### TDG Tasman District Council

![](_page_25_Picture_3.jpeg)

#### Cultural Heritage Award

Winner

#### Travelling River Exhibition

The Travelling River Exhibition has been named the winner of the Tasman District Councils Custoral Pentage Environmental Award, in recognition of the enormous contribution the exhibition has made to promote the custoral heritage and environmental significance of the Moueka River Catchment.

The collection incorporated the work, vision and stories of artists, scientists and the people of the Motueka River Catchment in an innovative and accessible way. Bringing the exhibition together drew all areas of the community into a discussion of what the river meant to them.

The beauty of the Travelling River artiscience exhibition is that it crosses cultural and social boundaries; giving equal consideration to the thoughts and views of the many sectors of the Motueka community.

We applaud the vision of Landcare Research and the exhibition curators Andrew Fenemor, Maggie Askinson and Suzie Peacock in bringing alive life and science in the Motueka River catchment.

Therefore the Tasman District Council and Judges of this category would like to congratulate all of the exhibition coordinators, the many contributors to the project, including attists, scientists, live and the greater community for sharing what the Moueka River Catchment has meant to them and how this compares with modern use and management.

![](_page_25_Picture_12.jpeg)

![](_page_26_Picture_0.jpeg)

#### Iwi Role in ICM

#### **Examples:**

- Assessment of iwi environmental monitoring approaches
- Collaborative learning guidelines for communities including iwi groups
- Develop Iwi Information Systems for environmental management

# Factors influencing long-term changes in brown trout abundance in the Motueka River

Roger Young, John Hayes - Cawthron Institute Les Basher, Andrew Fenemor - Landcare Research Neil Deans, Lawson Davey – Fish & Game NZ Trevor James – Tasman District Council

![](_page_28_Picture_0.jpeg)

#### **Drift Dive Counts - Motueka River @ Woodstock**

![](_page_29_Figure_1.jpeg)

![](_page_30_Picture_0.jpeg)

![](_page_31_Figure_0.jpeg)

Data from NIWA NRWQN

![](_page_32_Figure_0.jpeg)

Data from NIWA NRWQN

## What is affecting fish numbers?

- Floods
- Droughts
- Warm temperatures
- Food supply
- Water clarity
- Sediment
- Pine trees
- Disease
- Water Augmentation
- Angling pressure
- Shags
- Lack of stocking
- Didymo

![](_page_33_Picture_14.jpeg)

![](_page_34_Picture_0.jpeg)

![](_page_35_Figure_0.jpeg)

Duration of floods >FRE3 during **RELEVANT** Oct/Nov (hours)

![](_page_36_Figure_0.jpeg)

#### Multiple Regression – Best models

• Log(Large) = -Log(FloodDuration) - Log(MaxFlood) + FoodAbund-  $R^2 = 0.71$ , F = 8.9, P < 0.003

![](_page_37_Picture_2.jpeg)

• Log(Medium) = -Log(FloodDuration) - Days>25°C

$$- R^2 = 0.41, F = 5.1, P = 0.02$$

![](_page_37_Picture_5.jpeg)

#### Density dependence?

- Jim Ring Super Angler
- Detailed catch records since 1979
- Average 238 trout/season from Motueka

![](_page_38_Figure_4.jpeg)

#### Summary

- Long-term records a key to understanding fish population dynamics
- Floods during juvenile emergence have a strong effect on recruitment and cohort strength
- Food supply, temperature, and maximum flood size are also influential
- 'Natural' effects predominate?
- Predict effects of climate change

#### Where do most juveniles come from?

![](_page_40_Figure_1.jpeg)

# Radiotracking Study CAWTHRON 48 adult trout tagged 0 1 2 4 6 8 Kilometers

Movements of up to 41 km Most fish moved <1 km No differences between males and females

![](_page_42_Figure_1.jpeg)

More flow, more movement

![](_page_43_Figure_1.jpeg)

50-year flood killed 60-70% of radiotagged trout

![](_page_43_Picture_3.jpeg)

#### Otolith Microchemistry – Ricky Olley, Otago University

Collected juveniles from 8 sites Determined otolith 'fingerprints' Consistent over time Compared fingerprints with adult trout 11 of 23 linked back to 8 tributaries

- 3 Dart
- 2 Baton
- 2 Rainy
- 2 Motupiko
- 1 Graham
- 1 Upper Wangapeka

![](_page_44_Picture_8.jpeg)

![](_page_45_Figure_0.jpeg)

# PIT tagging – Rainy River

- 1000 juveniles tagged
- 2 permanent aerials
- Mobile aerials

![](_page_46_Picture_4.jpeg)

![](_page_46_Picture_5.jpeg)

# PIT tagging – Rainy River

- 91 migrated past upstream aerial
- 19 past downstream logger
- 2 adults tagged in 2007 moved up past the aerials
- Most movement during floods

![](_page_47_Figure_5.jpeg)

#### Thanks Fish & Game!!

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