Incorporating food web research into a braided river adaptive management project

The next five years on the upper Waiau Toa / Clarence River

C. Ellery Mayence (and Frances Schmechel, ECan)
Principal Science Advisor, Threatened Ecosystems
BRaid Symposium, Lincoln University
14 July 2021

Department of Conservation
Te Papa Atawhai

Environment Canterbury
Regional Council
Kaunihera Taiao ki Waitaha

New Zealand Government

Presentation objectives

- **ECan's Braided River Regional Initiative**
  - Partnership with DOC (21/22 is Year 3 of 6)
  - Objectives
  - Projects
- **Research / adaptive management activities on the upper Waiau Toa / Clarence River**
  - Phase I
  - Phase II

Source: WMIL

ECan's Braided River Regional Initiatives Fund

Partnership with DOC

- **Research / adaptive management projects addressing:**
  - Areas of high indigenous biodiversity value
  - Rūnanga priorities / support / mahinga kai values
  - BR research & management questions of local / regional / national significance
  - Ecosystem health
  - Canterbury Water Management Strategy (CWMS) goals
  - Important Bird Areas (IBAs)

Projects

Nearing completion

Ongoing

New

- **Predator control** to ↑ river bird productivity / population size (Rangitata, Rakaia, Hurunui, Waiau Uwha, and Waiau Toa / Clarence)
- **Vital rates and movements of SIPO** (Rangitata)
- **Invertebrate diversity and abundance** (Ashley & Cass [and Aparima of Southland])
- **Weed seed banks / BBG response to human disturbance** (Ashley)
- **Habitat type and condition** → influence **food web dynamics** across multiple tropic levels (upper Waiau Toa / Clarence)
  - Phase I (2015-19)
  - Phase II (2021-26)

Projects

Nearing completion

Ongoing

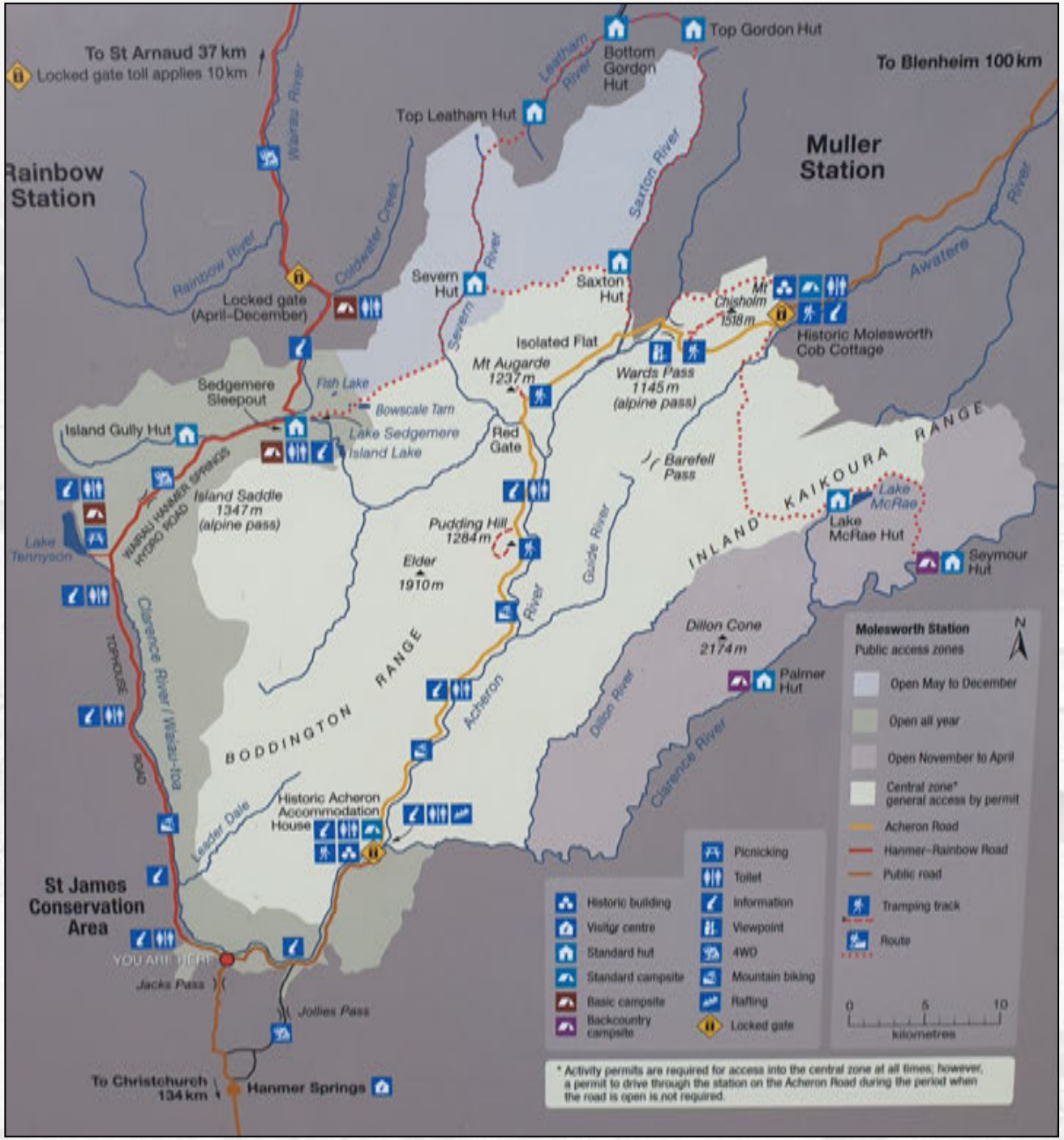
New

- **Predator control** to ↑ river bird productivity / population size (Rangitata, Rakaia, Hurunui, Waiau Uwha, and Waiau Toa / Clarence)
- **Vital rates and movements of SIPO** (Rangitata)
- **Invertebrate diversity and abundance** (Ashley & Cass [and Aparima of Southland])
- **Weed seed banks / BBG response to human disturbance** (Ashley)
- **Habitat type and condition** → influence **food web dynamics** across multiple tropic levels (upper Waiau Toa / Clarence)
  - Phase I (2015-19)
  - Phase II (2021-26)

Project area

Upper WTC

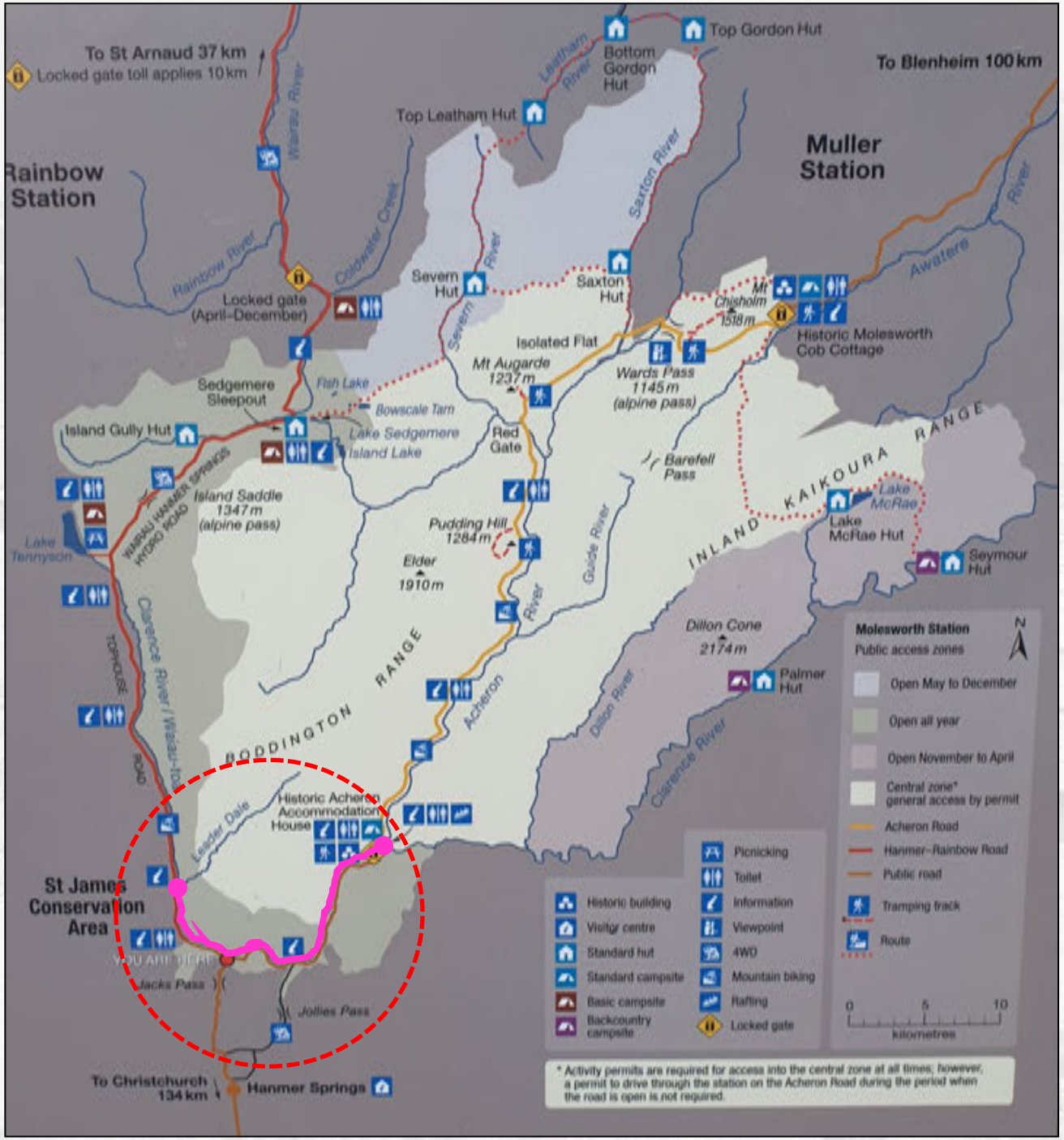
St James to the Acheron



Project area

Upper WTC

St James to the Acheron



Phase I

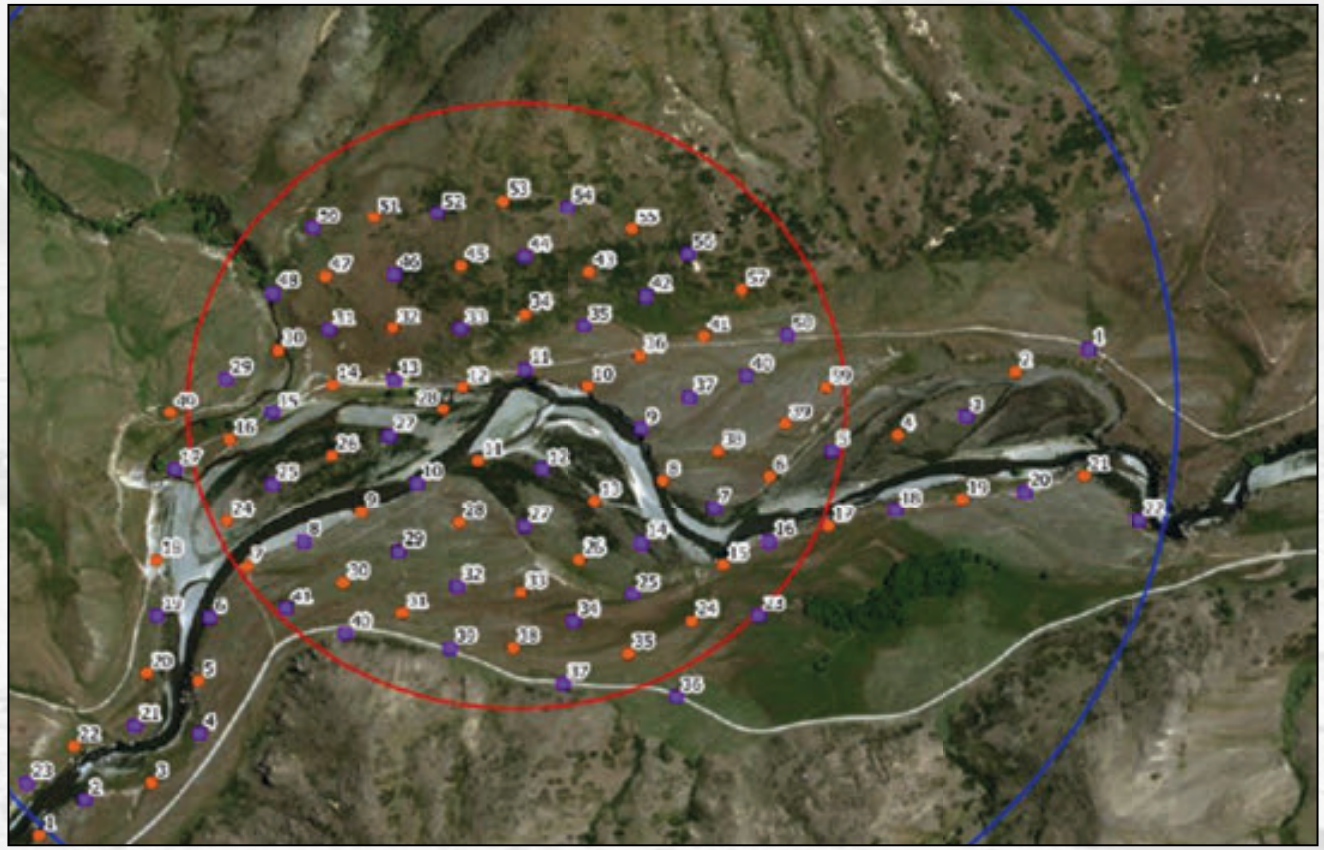
Objectives

- **Increase the upper WTC black-fronted tern (BFT) population:**
- **Test:**
  - Localised predator control
  - Habitat improvement
    - Island enhancement → 3 islands
    - Weed control

Source: Issie Barrett

Phase I

Predator trapping



Source: WMIL

- Trap rings of 500 m (tails of 100 m up and downstream)
- No traps between islands = gaps

Phase I

Results

- **# of nests in non-enhanced & un-trapped areas 3-14x greater**
- **Hatching success (% of total nests) greater in enhanced & trapped areas**
- **Productivity:**
  - Non-enhanced & un-trapped = 0.14
  - Enhanced & trapped = 0.5
- **Causes of nest failure:**
  - Flooding (51%)
  - Kahū (11%)
  - Cats (9%)
  - Ferrets (5%)
  - SBBG (5%)

Phase I

Recommendations

- ↑ enhanced islands (40 cumec flood)
- Chick shelters
- Shift to lateral trapping (both sides of river); no gaps
- Kahū control
- SBBG control (Acheron only)
- Better understand ecological processes

Phase II
Objectives

- **Increase the WTC BFT population**
- **Test:**
  - Expanded pest control (26 km) = no gaps b/ islands
  - Habitat improvement
    - Island enhancement (↑ to 6 islands)
    - Weed control
  - Chick shelters
  - SBBG control (Acheron only)
  - Kahū predation, density & movements
- **Food webs – ecological processes**
  - Habitat type and condition
  - Terrestrial & aquatic linkages

Phase II

Objectives

- **Increase the WTC BFT population**
- **Test:**
  - Expanded pest control (26 km) = no gaps b/ islands
  - Habitat improvement
    - Island enhancement (↑ to 6 islands)
    - Weed control
  - Chick shelters
  - SBBG control (Acheron only)
  - Kahū predation, density & movements
- **Food webs – ecological processes**
  - Habitat type and condition
  - Terrestrial & aquatic linkages

Phase II

Team

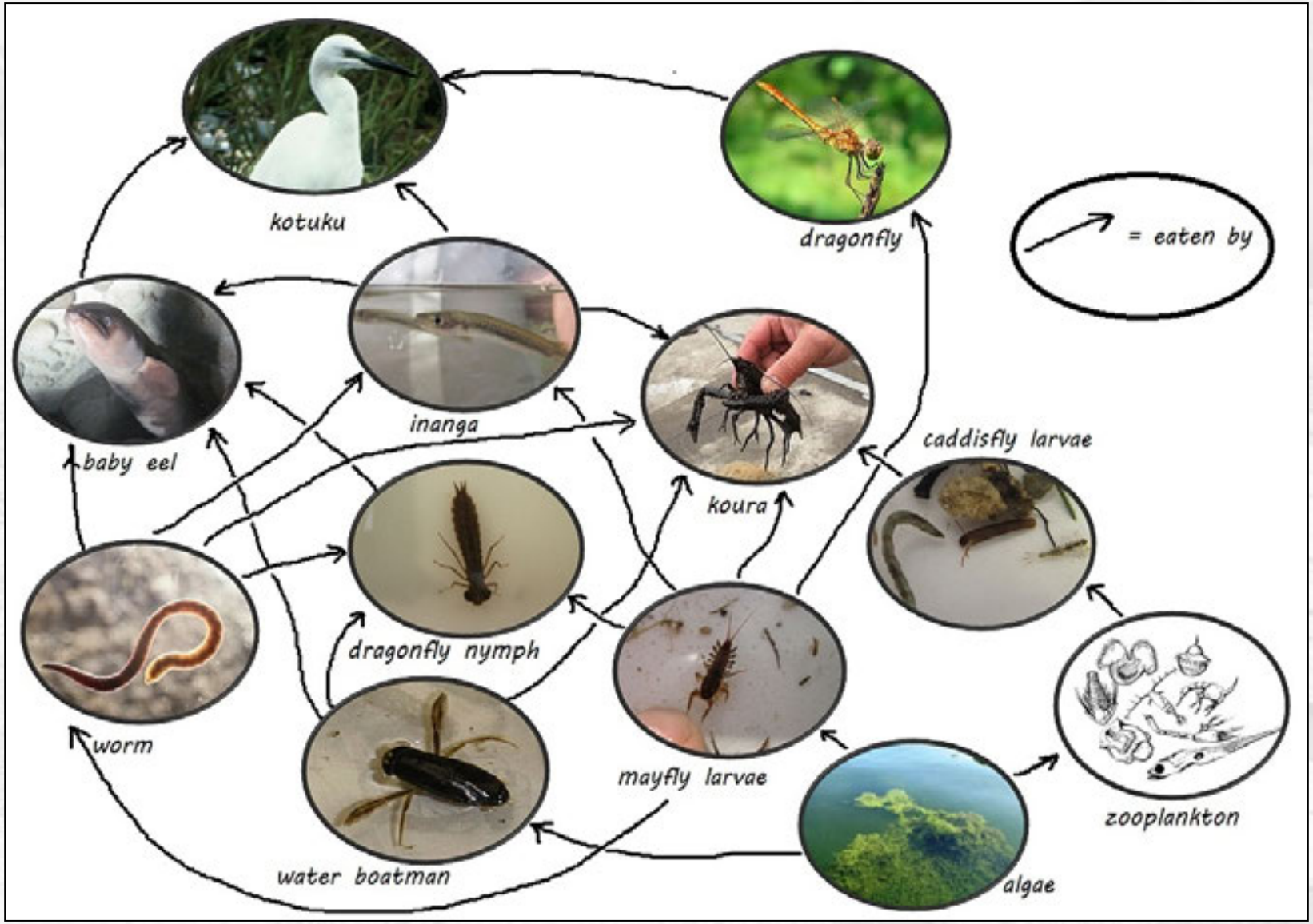
- DOC Terrestrial Science & Operations
- ECan
- Te Rūnanga O Kaikōura
- LINZ
- University of Canterbury
- Wildlife Management International
- Boffa Miskell
- Others TBC

Source: WMIL

Food webs

Habitat type & condition

Terrestrial & aquatic



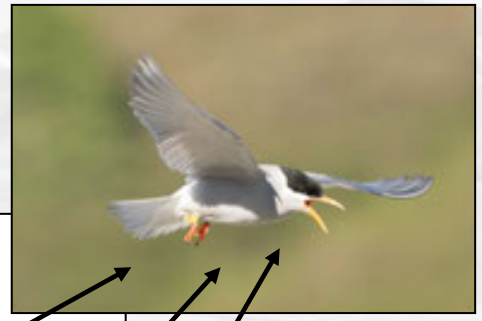
Source: Learnz

Food webs

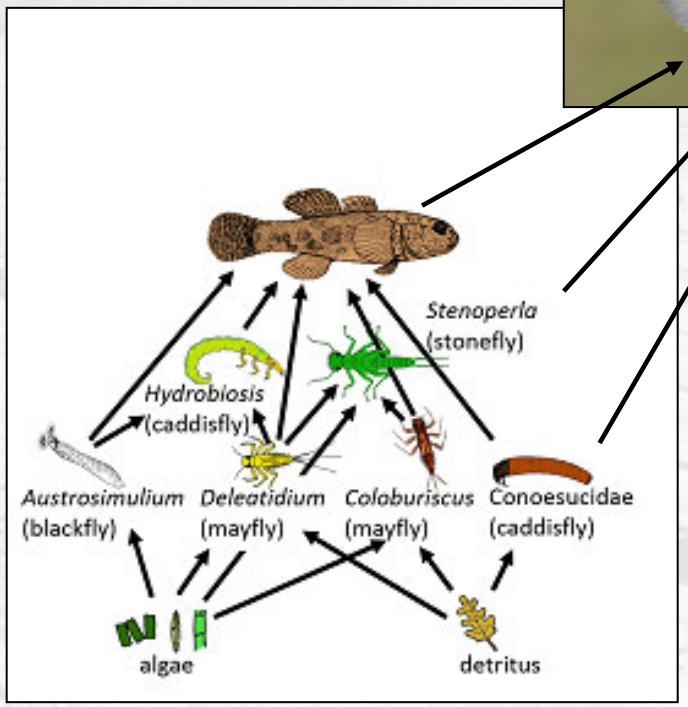
Habitat type & condition

Terrestrial & aquatic

Interactions



Source: WMIL



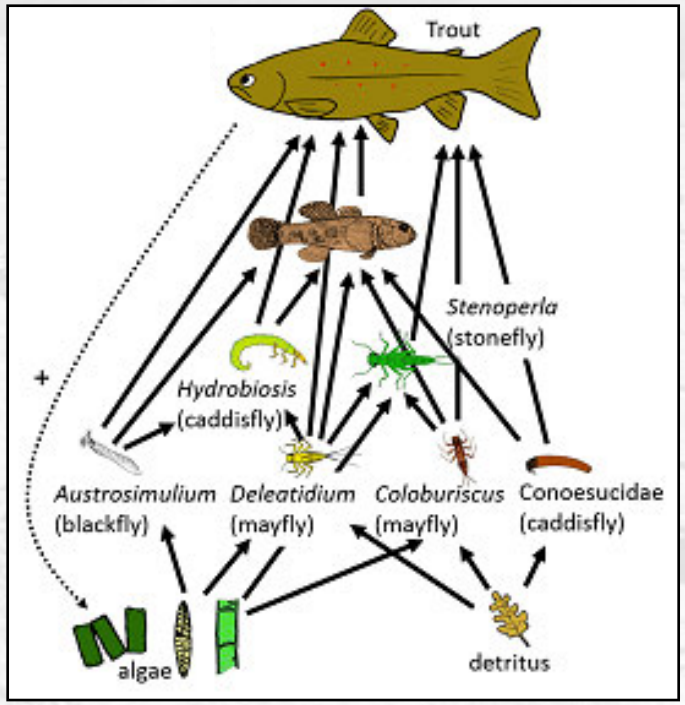
Source: Learnz

Food webs

Habitat type & condition

Terrestrial & aquatic

Interactions



Source: Learnz

Food webs

Habitat type & condition

Terrestrial & aquatic

Interactions

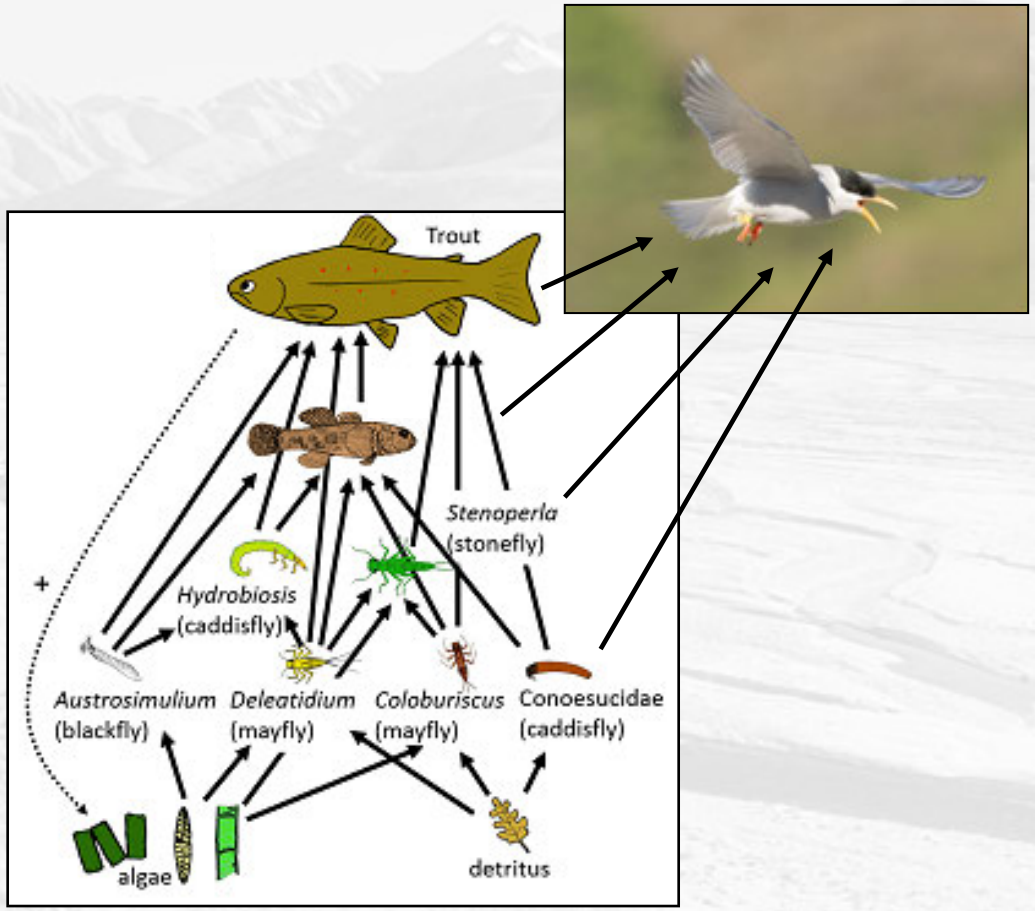


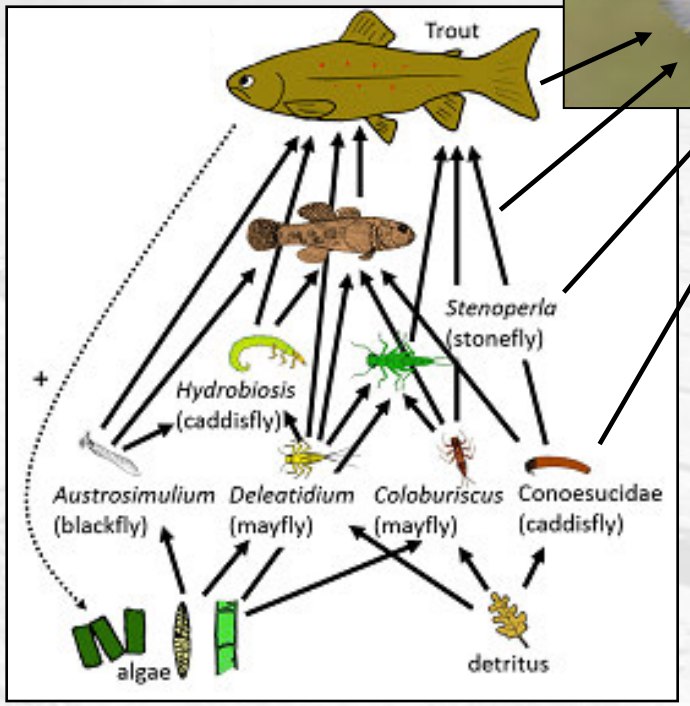
Image: Learnz

Food webs

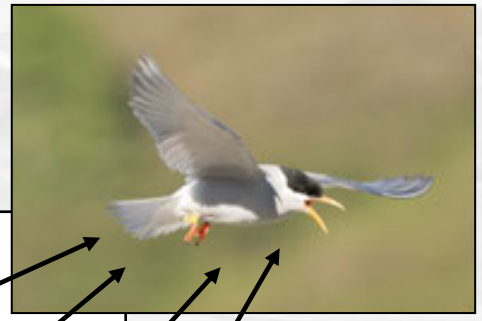
Habitat type & condition

Terrestrial & aquatic

Interactions



Source: Learnz



Source: WMIL

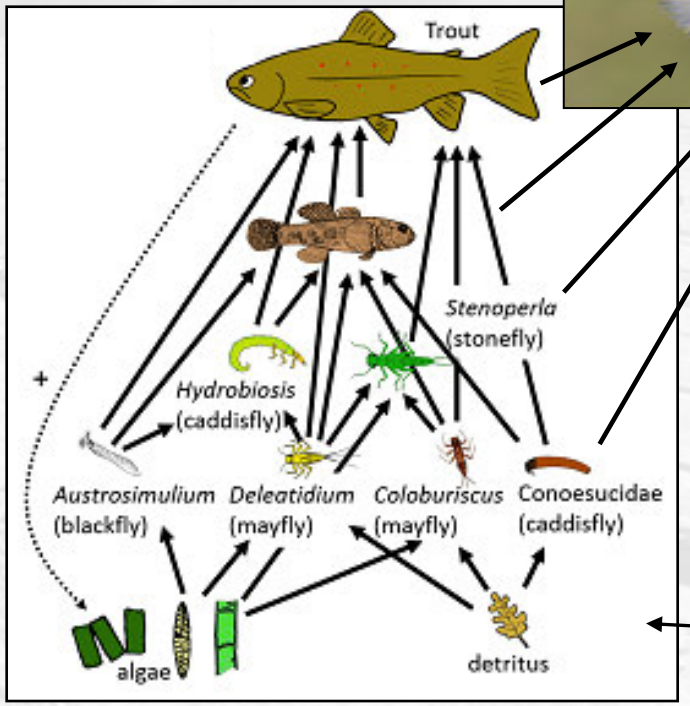
Source: WMIL

Food webs

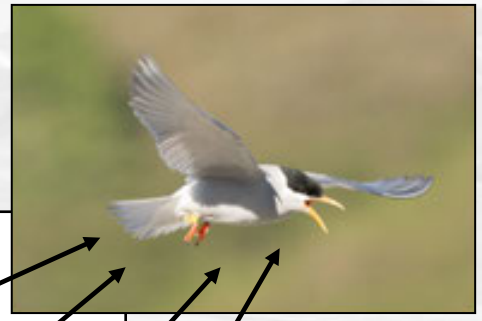
Habitat type & condition

Terrestrial & aquatic

Interactions

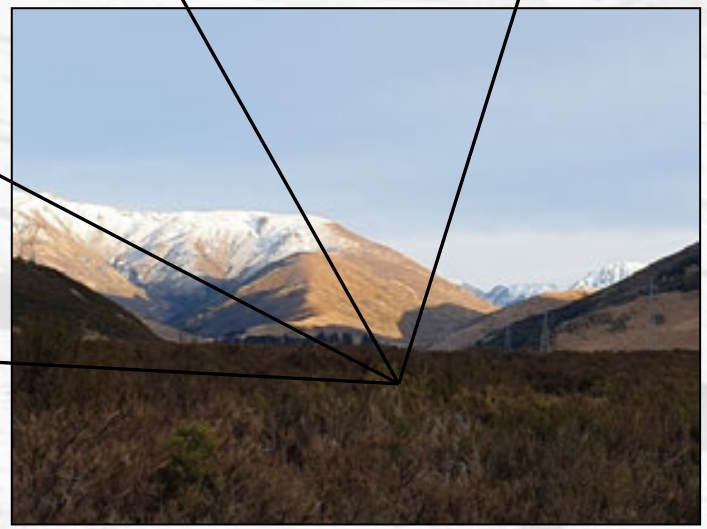


Source: Learnz



Source: WMIL

Source: WMIL

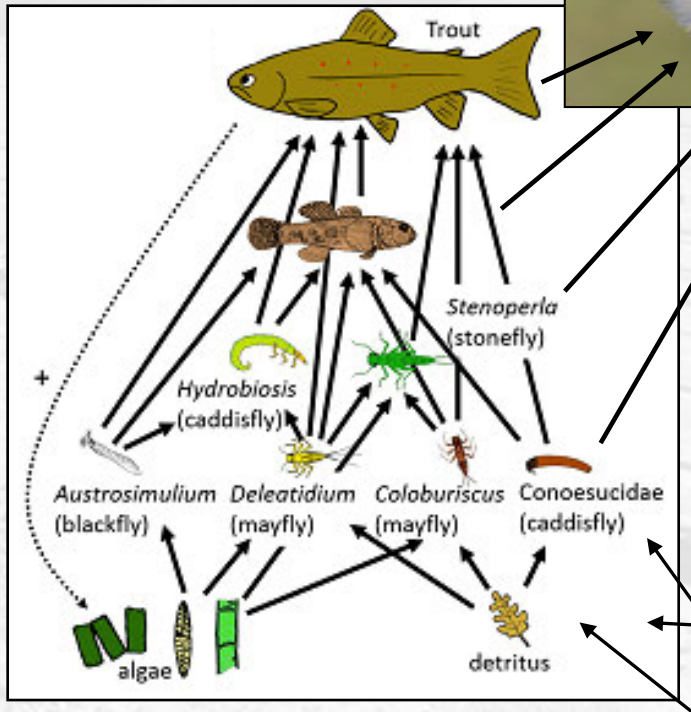


Food webs

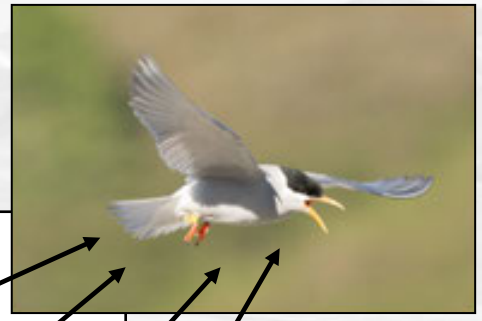
Habitat type & condition

Terrestrial & aquatic

Interactions



Source: Learnz



Source: WMIL

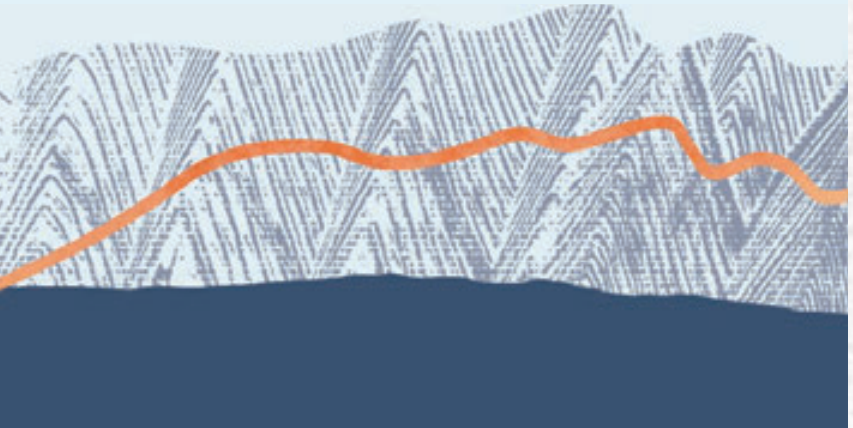
Source: WMIL

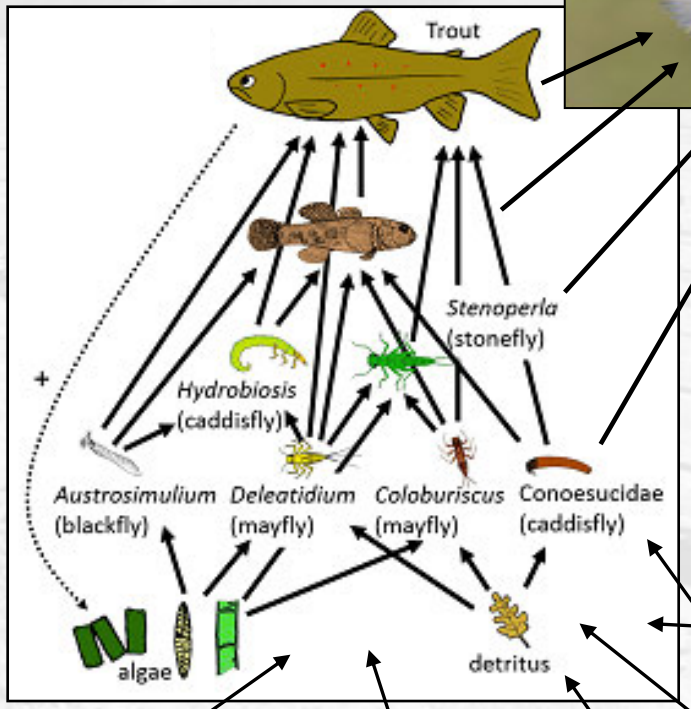
Food webs

Habitat type & condition

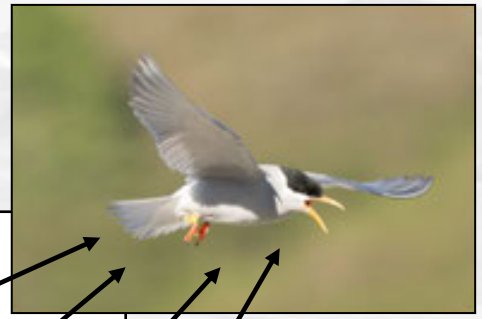
Terrestrial & aquatic

Interactions



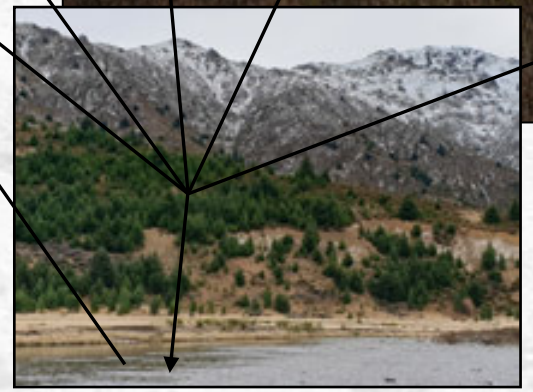


Source Learnz



Source: WMIL

Source: WMIL



Source: A. McIntosh

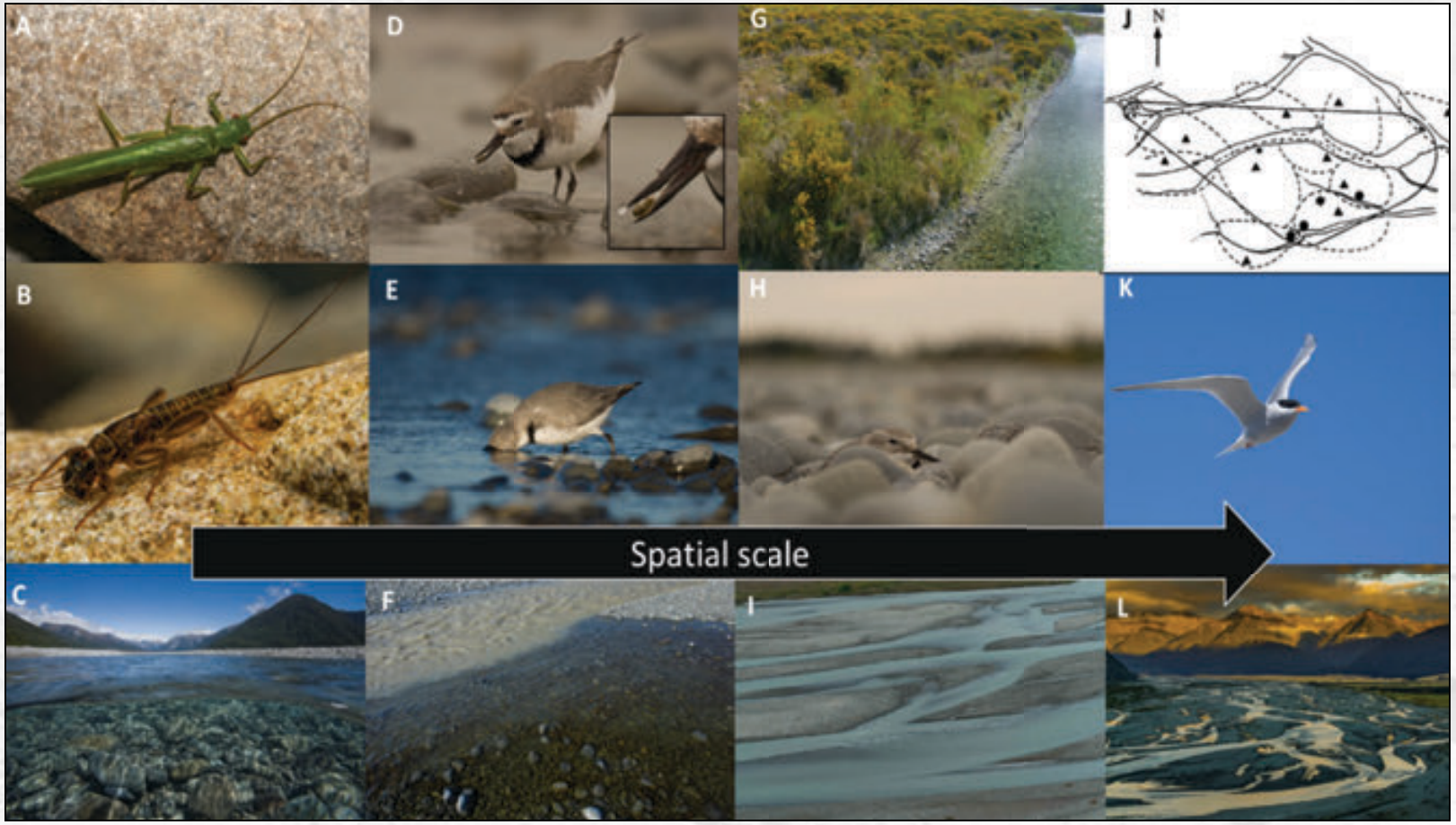
Food webs

Habitat type & condition

Terrestrial & aquatic

Interactions

Scale



Source: A. McIntosh

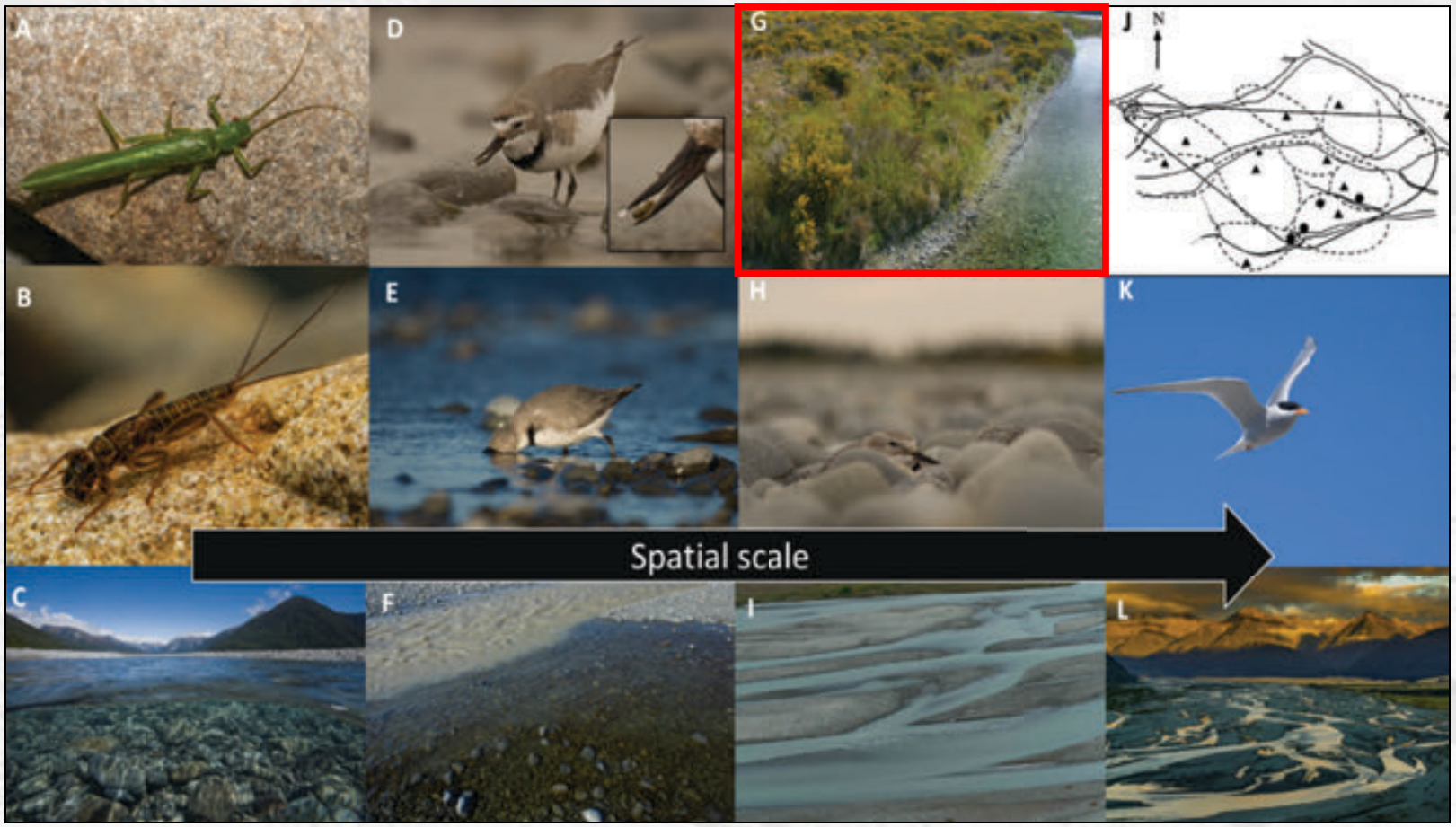
Food webs

Habitat type & condition

Terrestrial & aquatic

Interactions

Scale



Source: A. McIntosh

Food webs

Habitat type & condition

Terrestrial & aquatic

Interactions

Scale

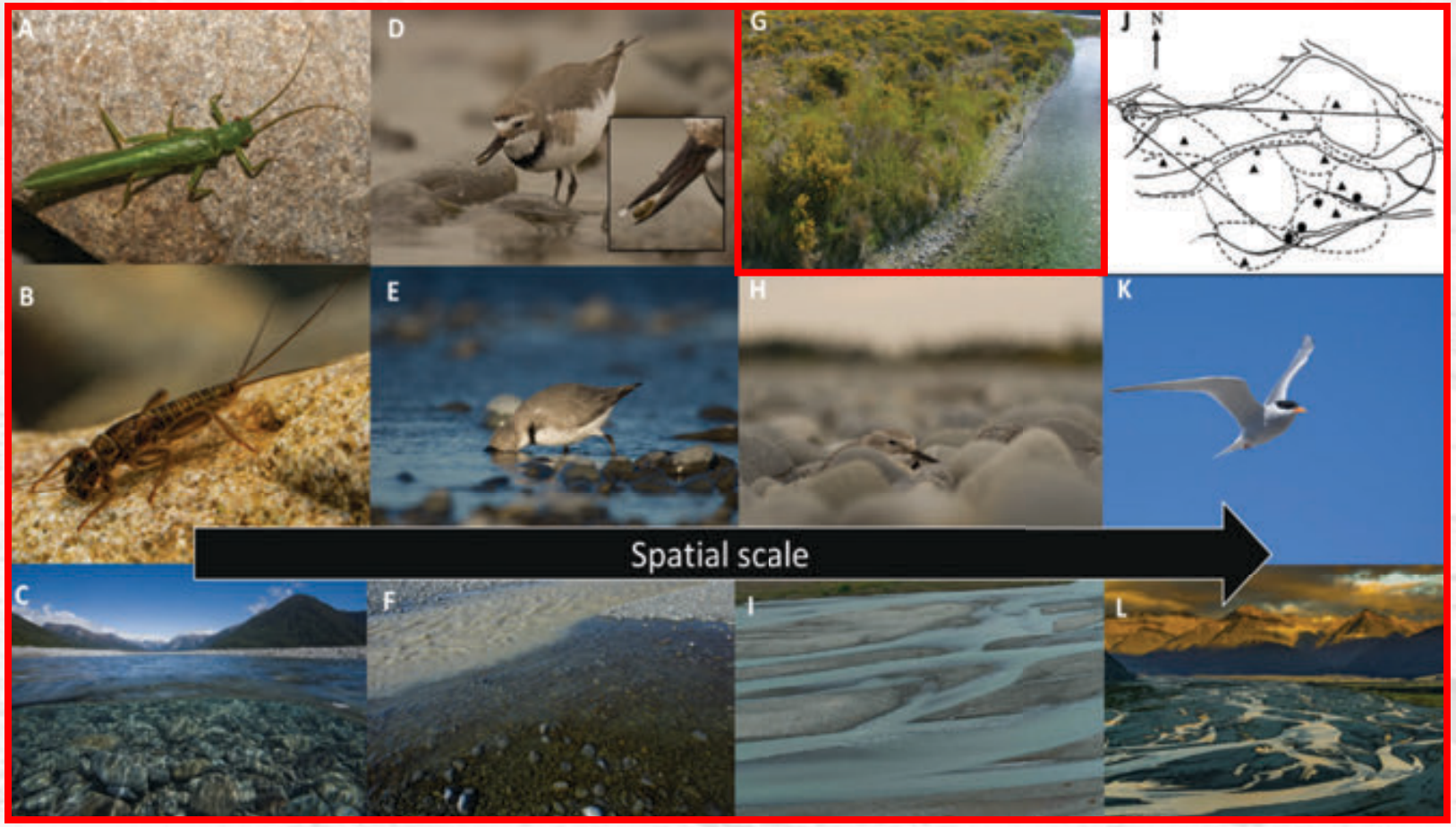
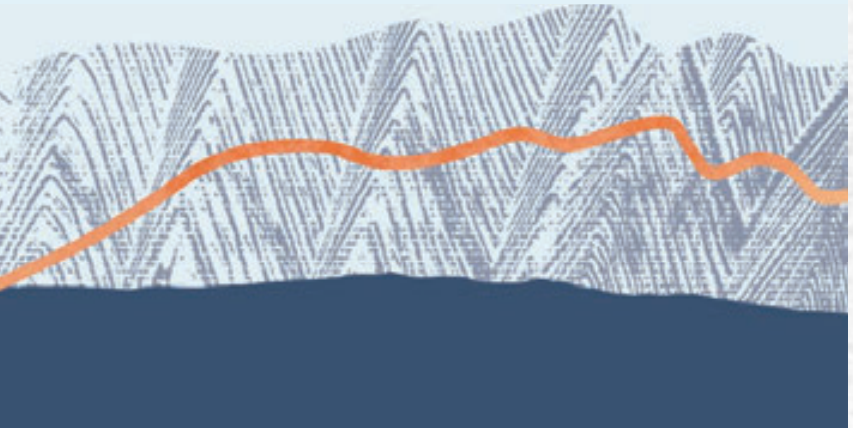


Image: A. McIntosh

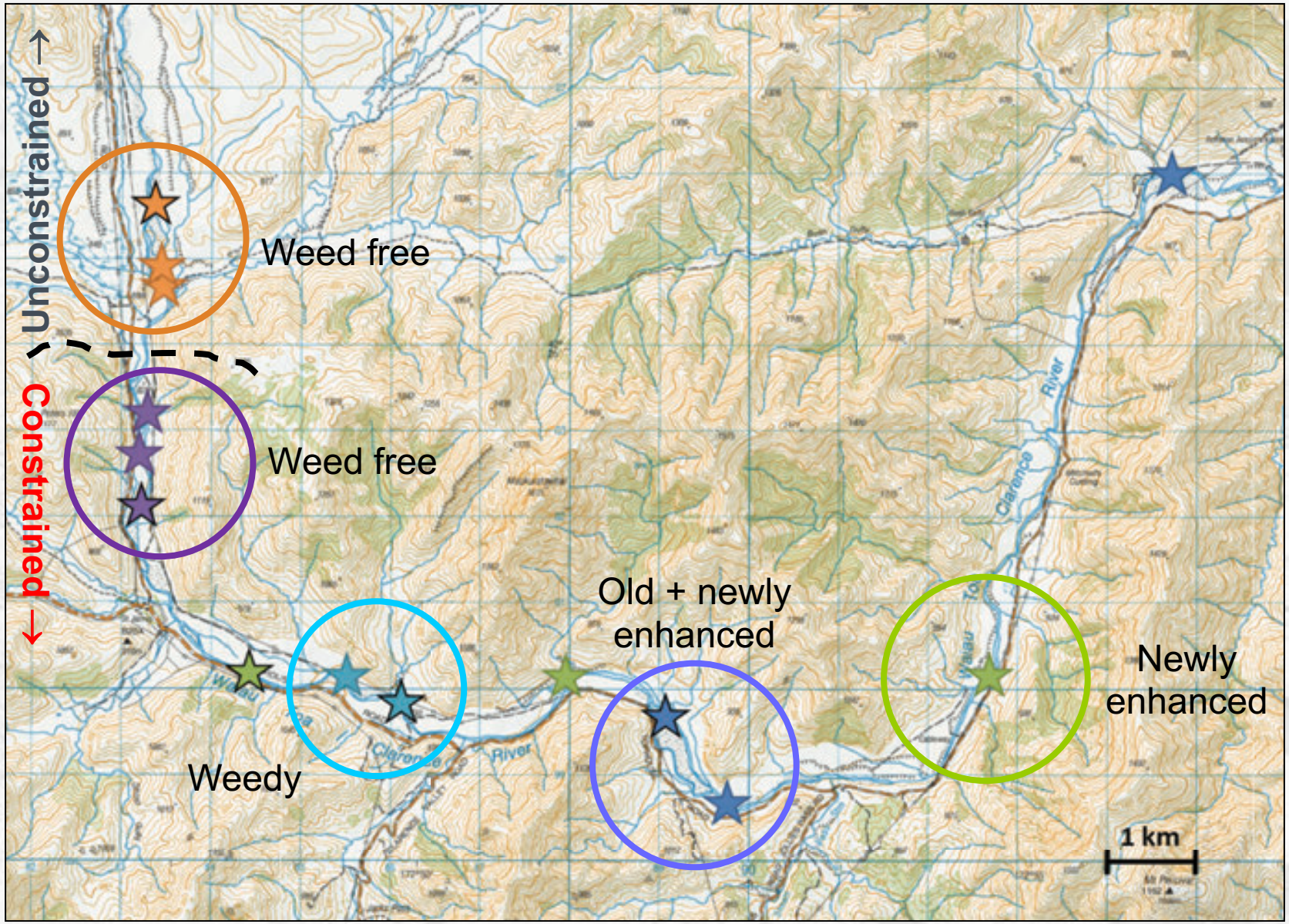
Food webs

Habitat type & condition

Terrestrial & aquatic



Aquatic sampling locations

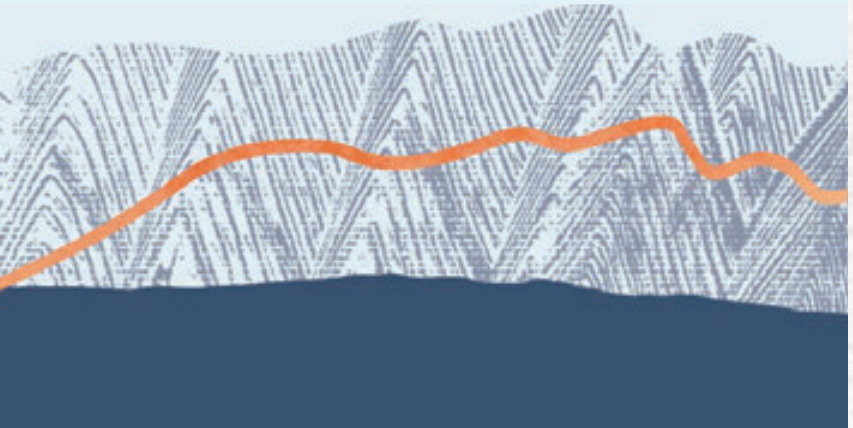


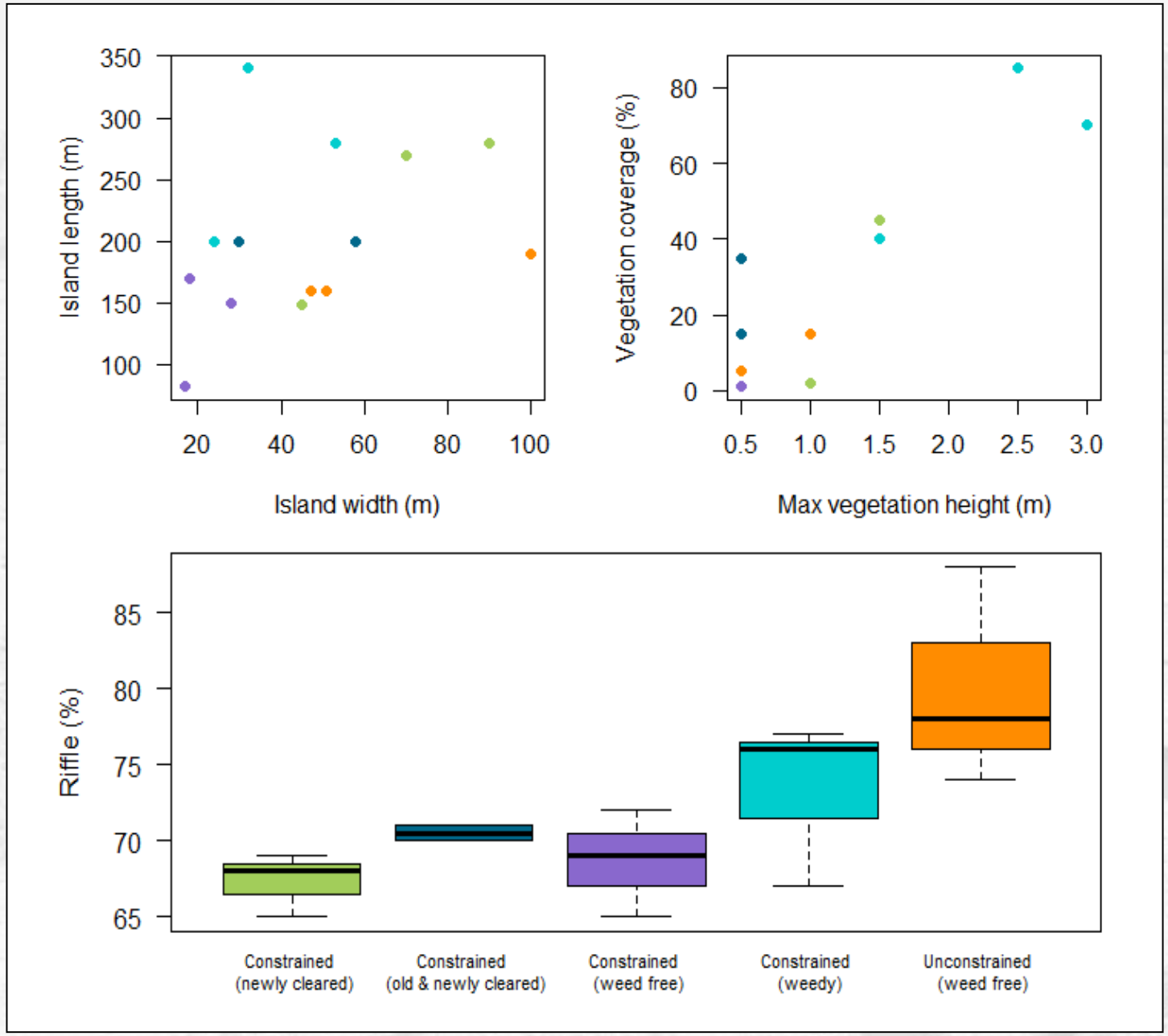
Source: A. McIntosh

Habitat type & condition

Are there differences?

How do they influence ecological processes?





Source: A. McIntosh

Habitat type & condition

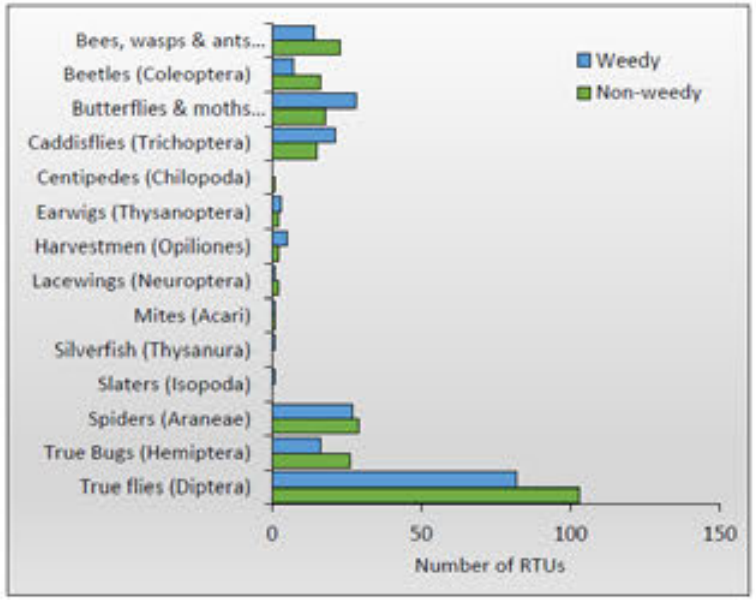
Weedy / non-weedy

Time since weeding

Mechanical weeding – Ashley River

December:

- 4,510 specimens
- 207 RTUs at the weedy site
- 238 RTUs at the non-weedy site
- Diptera most diverse
  - weedy = 82 RTUs
  - non-weedy = 103 RTUs



Source: T. Murray

Greater invertebrate diversity & abundance in non-weedy compared to weedy

Differences in non-weedy and weedy decrease with time post weeding

Transformed vegetation communities

Changes to dimensions and configuration of terrestrial and aquatic habitats

- **Cross-ecosystem interactions**
- **Possible effects:**
  - Varying amounts of productive habitat for aquatic inverts (riffles)
  - Alterations in refuges for aquatic inverts (springs & side channels)
  - Differences in the combination/configuration of bird foraging habitat

Source: A. McIntosh

Transformed vegetation communities

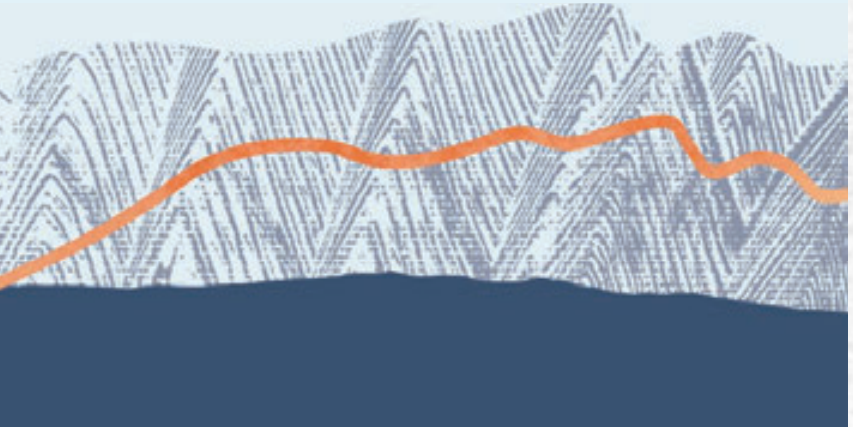
Changes to dimensions and configuration of terrestrial and aquatic habitats

- **Cross-ecosystem interactions**
- **Possible effects:**
  - Aquatic → terrestrial energy transfer curtailed: aquatic resource less spread
  - Terrestrial → aquatic transfer increases but is less accessible
  - Reduced connectivity between riverscape elements: ↓ system resilience

Source: A. McIntosh

Transformed vegetation communities

Changes to dimensions and configuration of terrestrial and aquatic habitats



- **Cross-ecosystem interactions**
- **Possible effects:**
  - Loss of endemic / mobile terrestrial inverts → replaced by cosmopolitan species
  - Change in aquatic inverts proportional to microhabitat composition changes
  - Aquatic resource subsidy usurped by ↓ valued terrestrial invertebrate predators
  - Terrestrial subsidy to aquatic system is usurped by trout




Source: A. McIntosh

Kia ora!