

Resilient Riverscapes

Opportunities for Enhancing Floodplain Connectivity along the Waikato River



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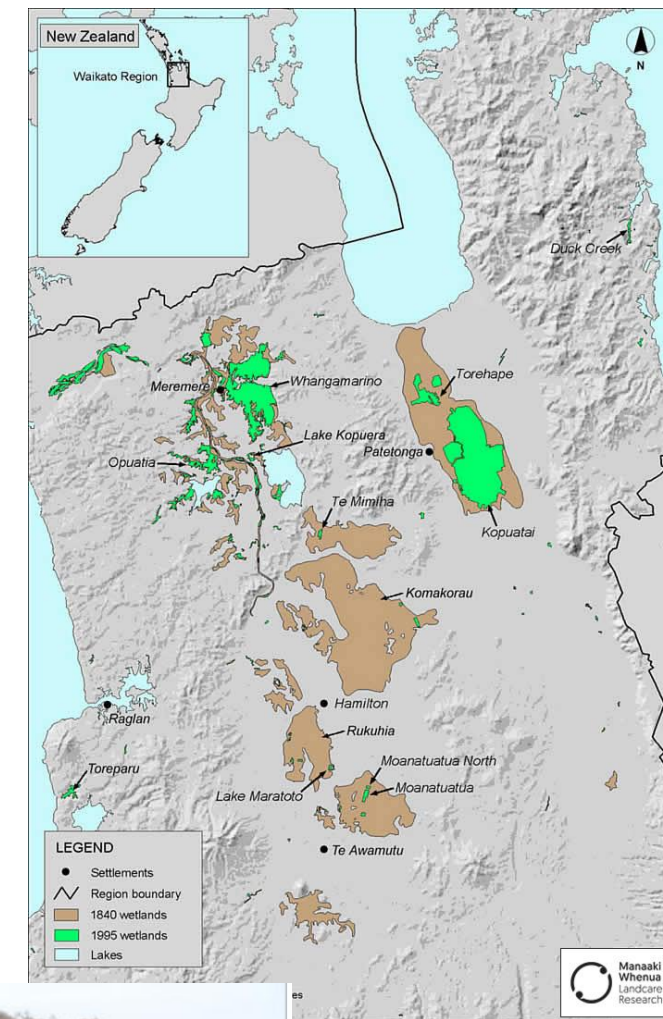
Overview

- The Waikato floodplain waterbodies
- Current challenges
- Rebuilding resilience for native biodiversity
- Opportunities



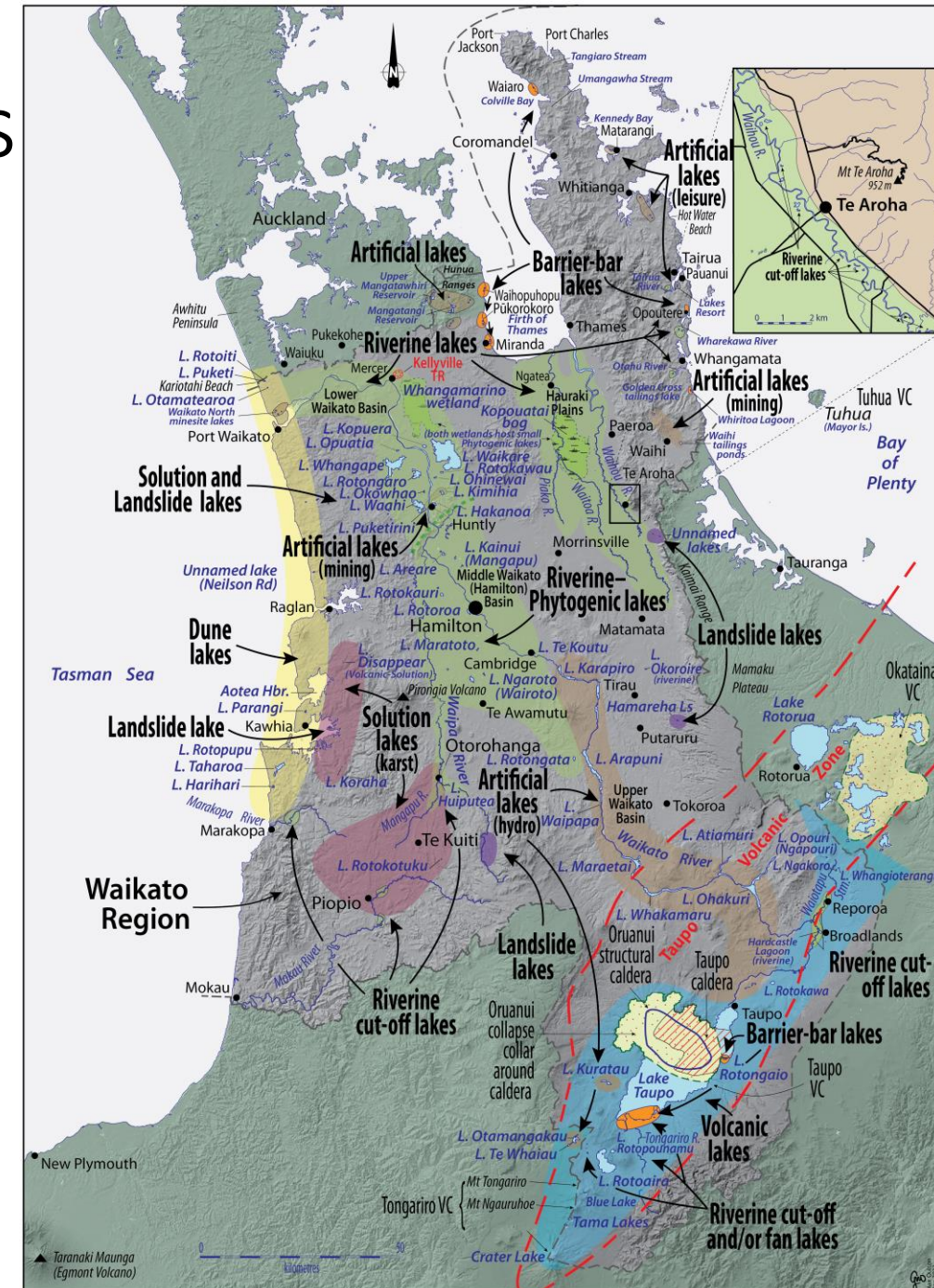
The Waikato floodplain waterbodies

- Area of wetlands in the Waikato region has declined by around 75 per cent
- Many Waikato wetlands have been drained and converted to pasture



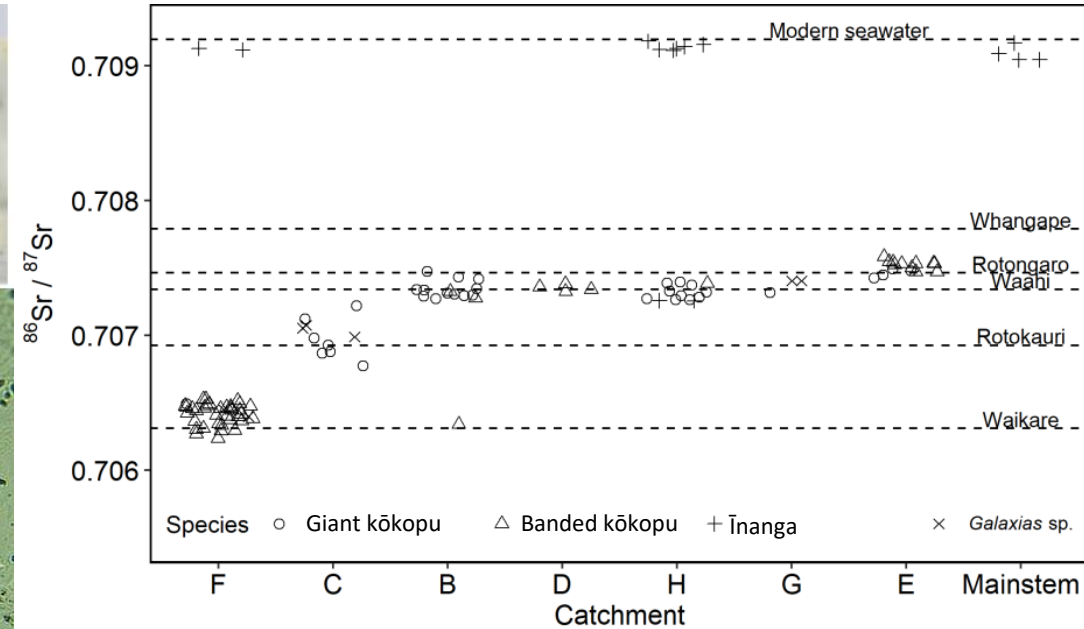
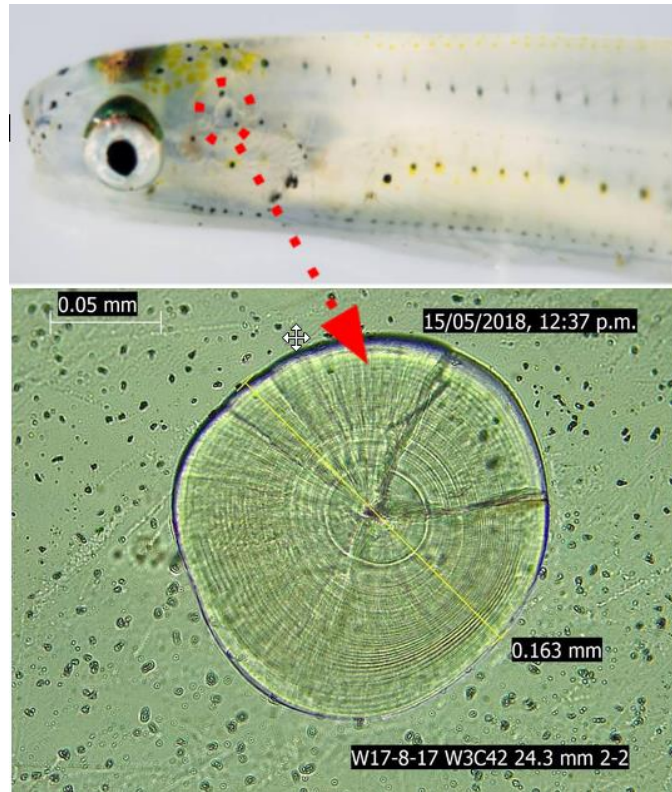
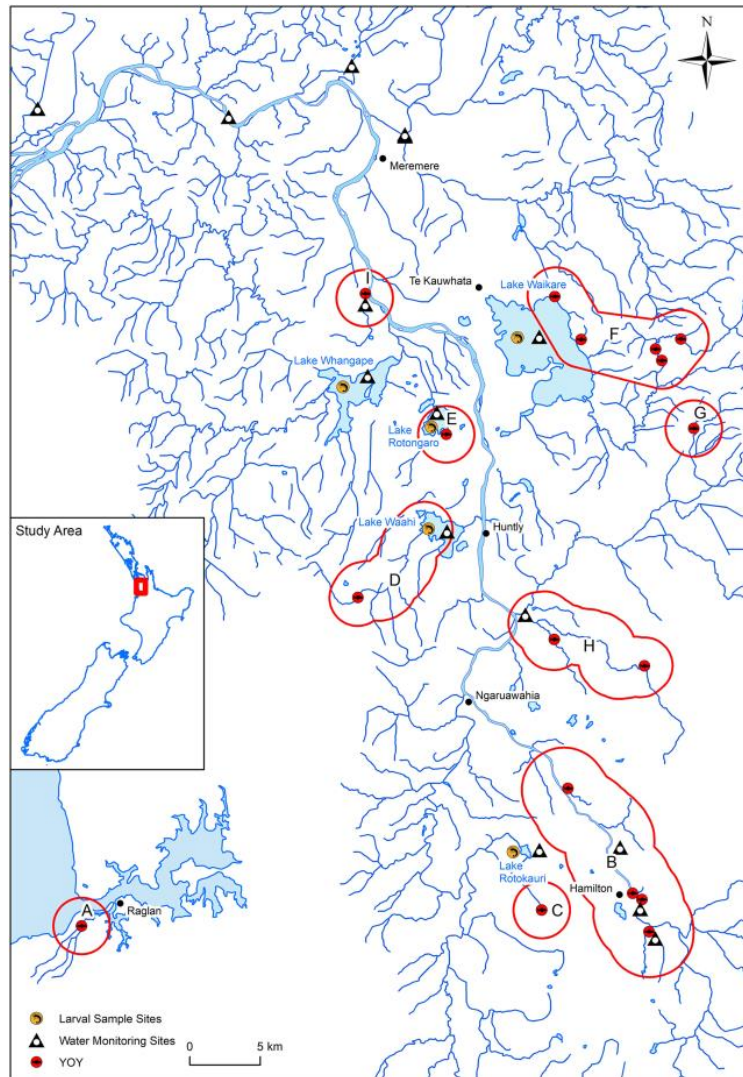
The Waikato floodplain waterbodies

- Indigenous fauna and flora;
- Wildlife & game
- Commercial & traditional fisheries;
- Culturally & recreationally significant;
- Ecosystem processes (incl. nutrient cycling)
- Economic benefits (e.g. water supply & flood control)
- Intrinsic values



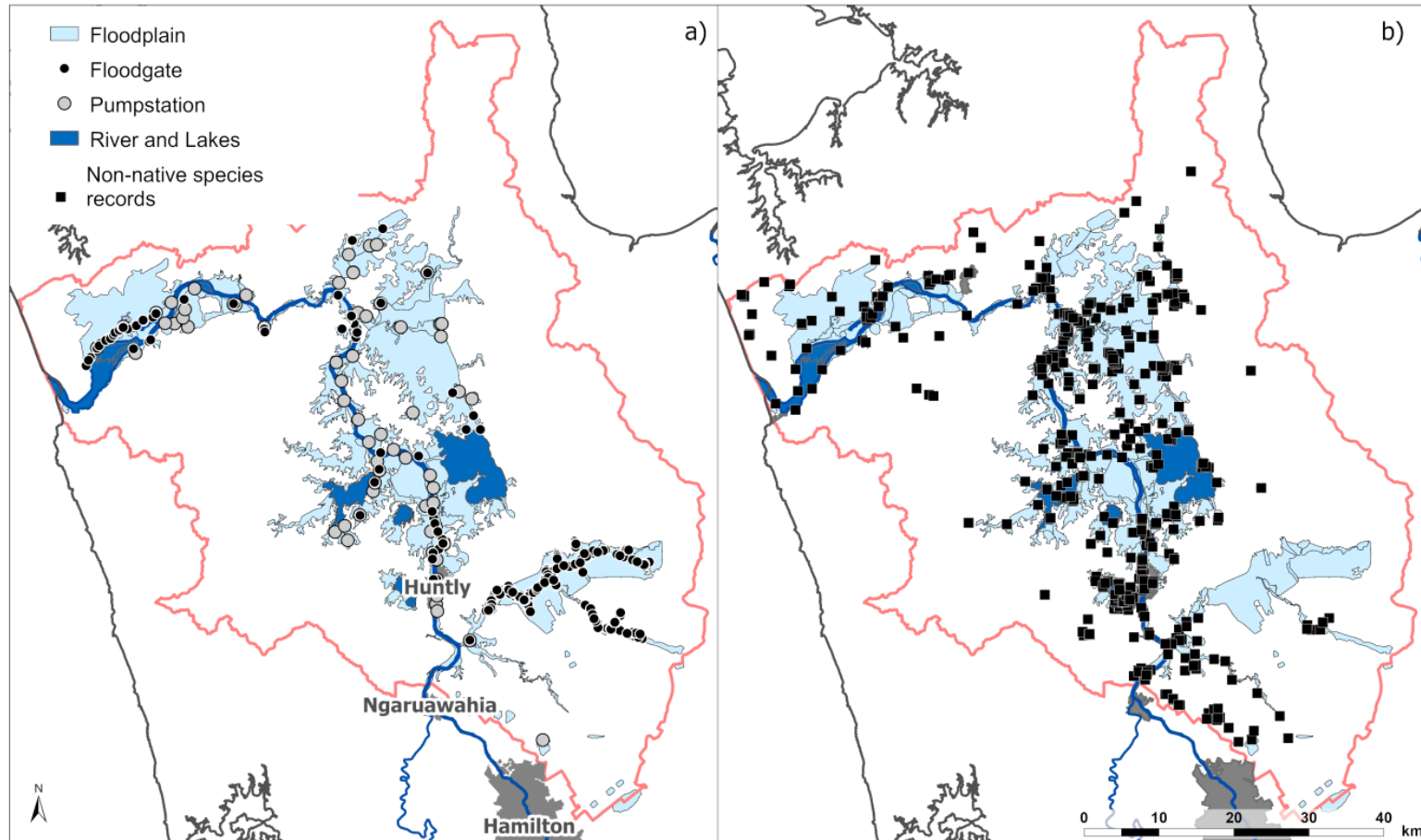
Low and Green 2023. Origins and ages of Waikato lakes; *in press*

Connectivity and Fish movement in the river system



Identifying water bodies that disproportionately support native fish diversity in the wider riverscape

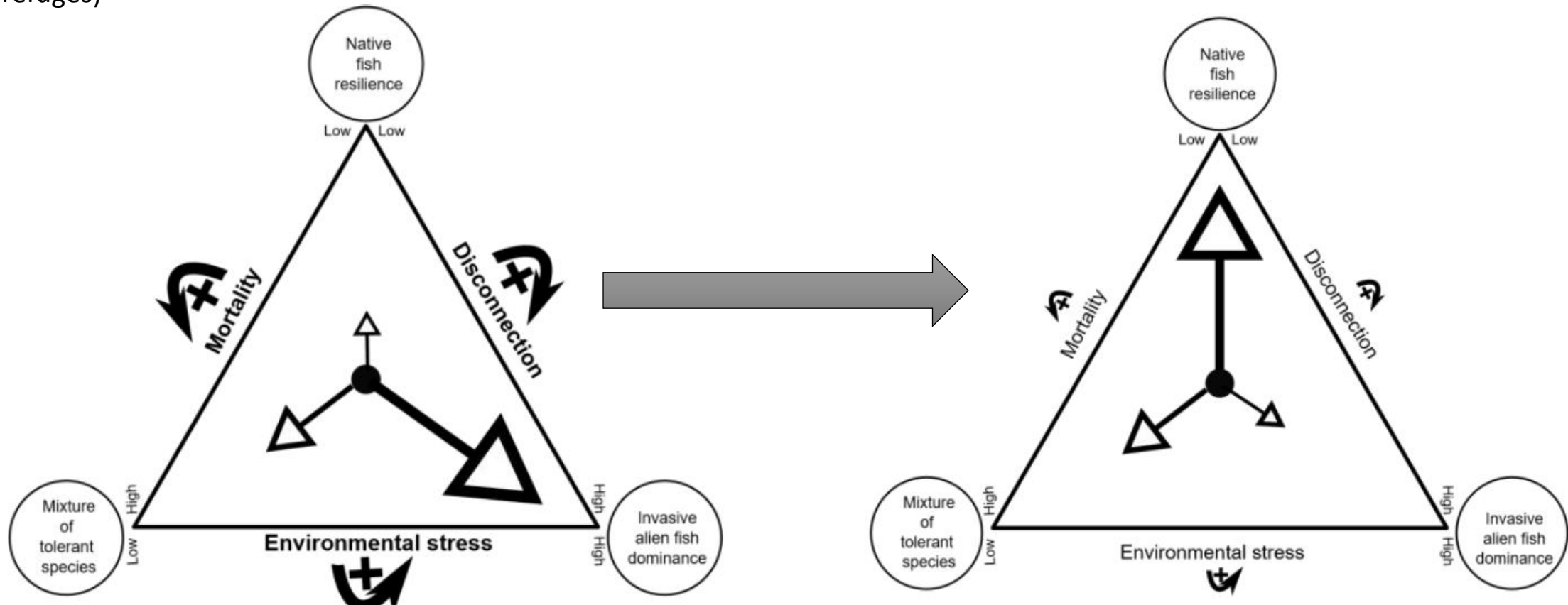
Regaining native fish resilience following fish invasions



Regaining native fish resilience following fish invasions

Integrated floodplain management:

- Reducing native fish mortality and controlling invasive alien fish
- Floodplain management (e.g. creation of inanga spawning habitat)
- Legal instruments (e.g. environmental limits, protection of native fish habitat and refuges)



Synthesis and critical evaluation of issues and restoration methods

- What are the main threats to the ecological values of large floodplain rivers?
- What methods are available to restore large floodplain rivers?
- What is the potential for restoration methods to enhance large floodplain river ecosystems?
- What are key research priorities?

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Background and scope

- 27 large river systems in NZ (stream order 7 or greater, +6 order rivers)
- Current restoration efforts largely focused on small rivers/streams
- Challenges in measuring success in larger rivers
- Aspirational goals will likely require larger scale restoration efforts



Evaluation of restoration methods relevant to large floodplain rivers in NZ

Restoration goal	Method/technique	Evaluation			
		Effectiveness	Achievability	Sustainability	Confidence
Aesthetics/education	↓ litter	Low	High	Low	High
Aesthetics/education	Education	High	High	High	High
Bank stabilisation	Hard engineering	High	Low	Low	High
Bank stabilisation	Bioengineering	High	High	High	High
Enhance fish passage	↑ fish passage	High	High	Low	High
Enhance fish passage	Fish pumps	High	High	Low	High
Environmental planning	Parks	High	Low	High	High
Fisheries management	Fish stocking	None	None	None	High
Fisheries management	Quotas	High	Low	High	High
Floodplain reconnection	Dike works	High	High	High	High
Enhance flow regime	↓ abstraction	High	High	High	High
Enhance flow regime	Res. release	High	High	High	High
Enhance flow regime	SUDS	High	High	High	High
Enhance flow regime	↑ soil C	High	Low	High	None
Instream habitat improvement	↑ gravel	None	None	None	High
Instream habitat improvement	↑ structure	None	None	None	High
Instream habitat creation	Channel realign.	High	High	High	High
Instream habitat creation	Side arms	High	High	High	High
Invasive species control	↓ riparian invasives	None	High	High	High
Invasive species control	↓ aquatic invasives	High	High	High	High
Invasive species control	↓ pest fish	High	High	High	High
Restore free-flowing river	Dam removal	High	Low	High	High
Riparian/floodplain habitat improvement	Wetlands	High	High	High	High
Riparian/floodplain habitat improvement	Planting	High	High	High	High
Riparian/floodplain habitat improvement	Fencing	High	High	High	High
Riparian/floodplain habitat improvement	Water level mgmt.	High	High	High	High
Water quality management	WWTPs	High	High	High	High
Water quality management	↓ agricultural loads	High	High	High	High
Water quality management	Stormwater	High	High	High	High
Thermal management	Res. thermal mgmt.	High	High	High	None

Feasibility criteria

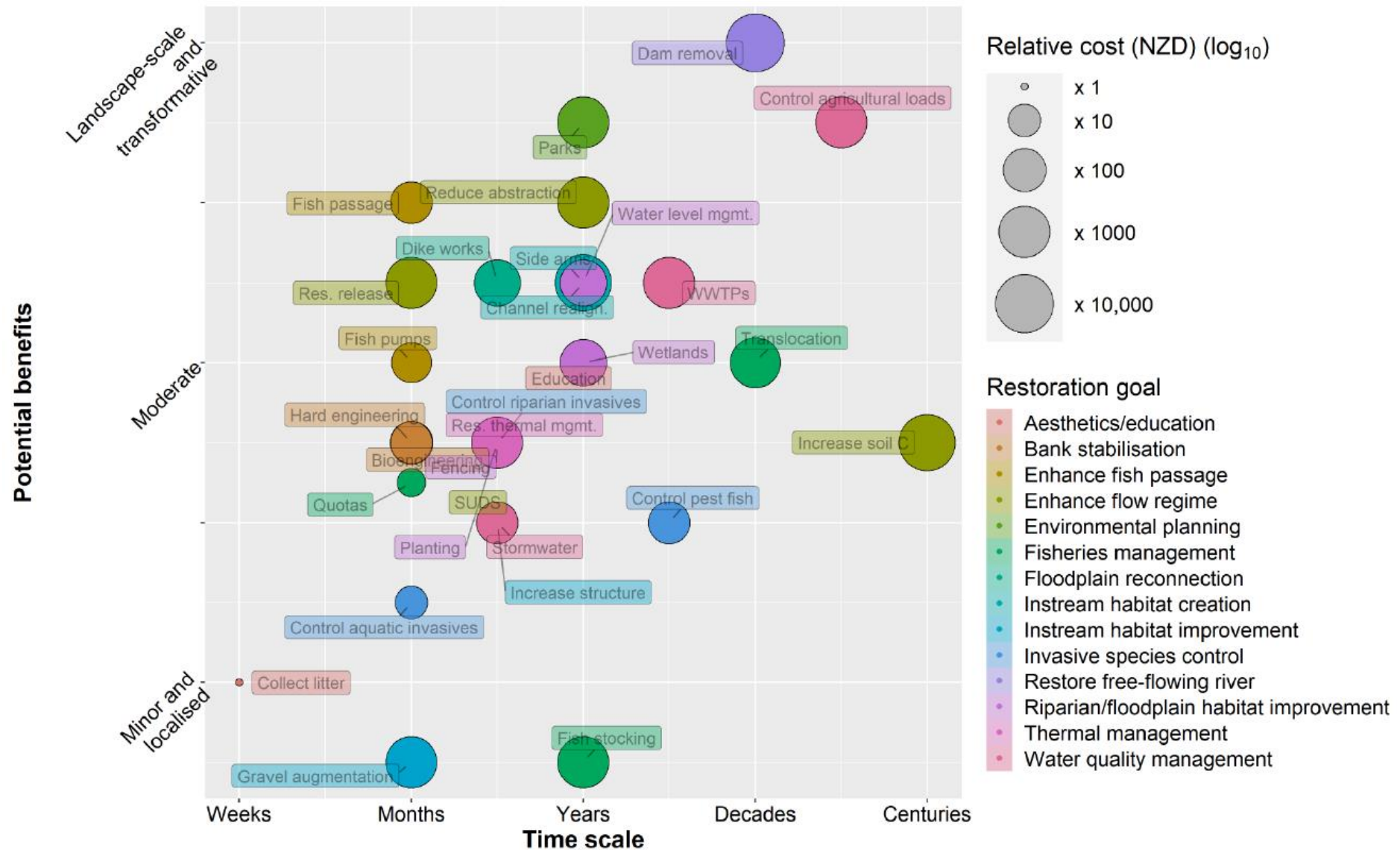


Danube delta (WWF restoration project)



Fish spawning grounds when marshes are reconnected with the river (Belen Island in Bulgaria; WWF restoration project)

Restoration goals, time scale, relative costs, and ecological benefits



Conclusions

- Collective efforts in floodplain and river restoration are commendable.
- How can we systematically scale up restoration efforts to address the escalating demands for ecological rehabilitation at the catchment scale?
- Tackling the difficult aspects of floodplain restoration demands a strategic approach.
- Knowledge and demands have changed since the implementation of the flood protection scheme – Knowing what we know today, would we design it in the same way?



Kia ora

