Awa restoration in Aotearoa

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Mountains to Sea Wānanga, Coromandel

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Department of Conservation
Te Papa Atawhai

New Zealand Government

Acknowledgements

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Presentation Structure

Why, is what we doing enough?

What, awa, rivers, streams, wetlands…..?

How, riparian planting re-snagging, protected areas….?

Who, ecologists, landowners, engineers…..?

Why?

1. High number of our larger rivers already dammed[1]
2. Rivers are poorly protected[2]
3. More damming & abstraction happening with provincial growth fund and in many cases fast tracking

[1] Jellyman & Harding 2012. The role of dams in altering freshwater fish communities in New Zealand. *NZJMFR 1-15*.

[2] New Zealand Conservation Authority. 2011. Protecting New Zealand's Rivers. Wellington, NZ.

Why? (cont'd)

4. Scale and pervasiveness of other alterations such as channelisation and stopbanking need addressing
5. Rivers operate at landscape scale so new and larger mahi needed to restore them.

[1] Jellyman & Harding 2012. The role of dams in altering freshwater fish communities in New Zealand. *NZJMFR 1-15*.

[2] New Zealand Conservation Authority. 2011. Protecting New Zealand's Rivers. Wellington, NZ.

What?

1. Awa, rivers…
    1. Awa, “(noun) river, stream, creek, canal, gully, gorge, groove, furrow”[1].
    2. River, “A river is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river” [2].
2. Both too broad, so working definition for this talk
    1. Flows from mountains to sea (i.e. not into another river)
    2. Is larger than a stream, so 5th order or larger

[1] https://maoridictionary.co.nz/search?&keywords=awa
[2] https://en.wikipedia.org/wiki/River .

How?

1. At scale to match the awa
2. Start upstream but balance with working with the willing at their place & pace
3. Objectively work out which are worst pressures-impacts and start with them
4. Take a long-term & holistic view, decades of impacts on awa so unlikely to fix in 1-3 year
    - Employees can be transient, mana whenua permanent and landowners usually long-term
    - Most important outcomes (& fixes) probably larger, more difficult, hard to measure and take longer

How? (cont'd)

1. At scale to match the awa
    1. For example our Ngā awa programme.
    2. 14 mountains to sea awa

Catchment order	Average Catchment area (Ha)	Number of Ngā awa sites (Awa name)
4th	28654	1 (Arahura)
5th	29246	8
6th	280757	3
7th	711866	1 (Whanganui)
8th	1190107*	1 (Waitaki)

* Nga awa site only covers ~12% of catchment below dams with other programmes such as Project River Recovery contributing to restoration of catchments upstream of dams.

3. Obj start with

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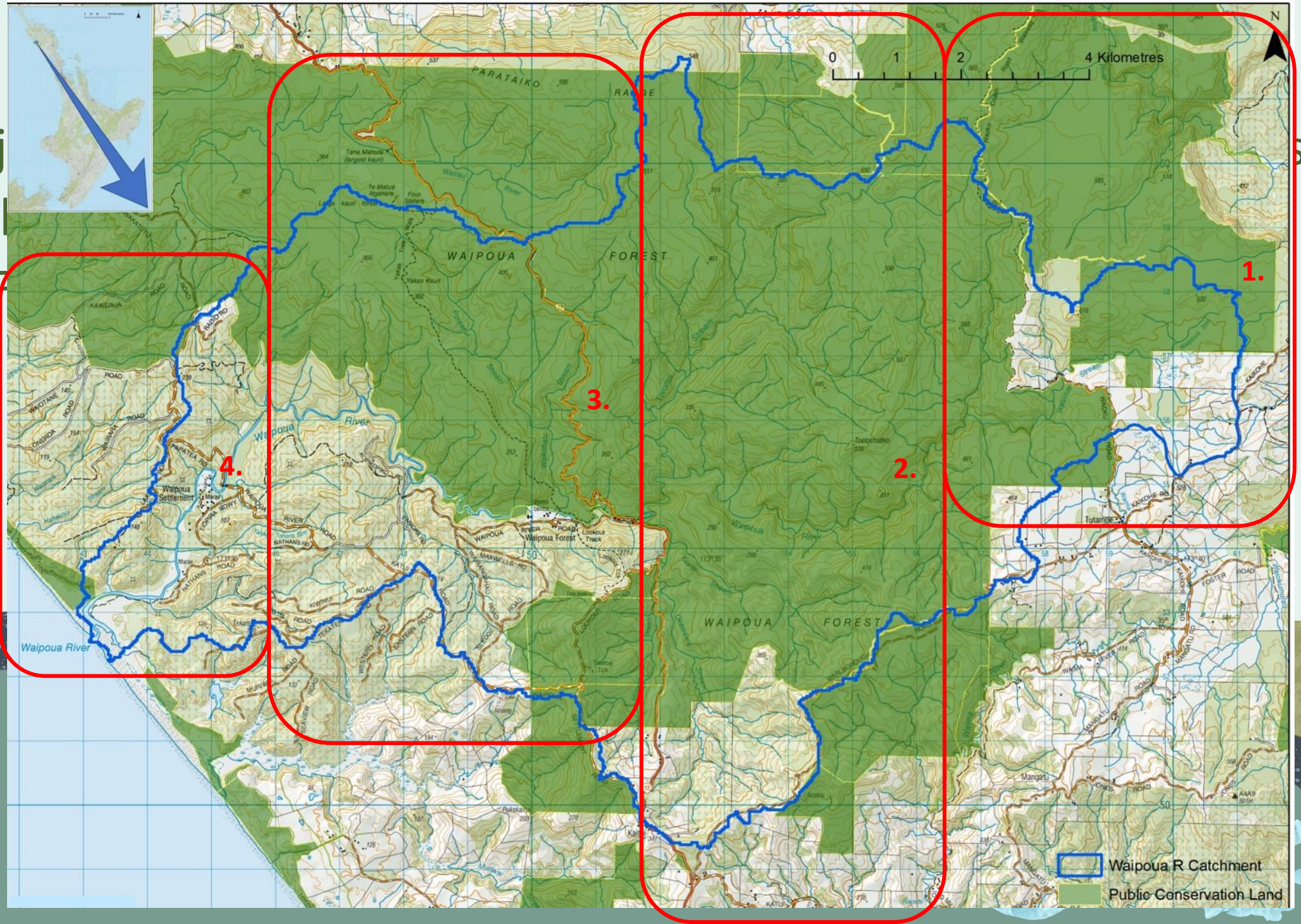

3. Ob art
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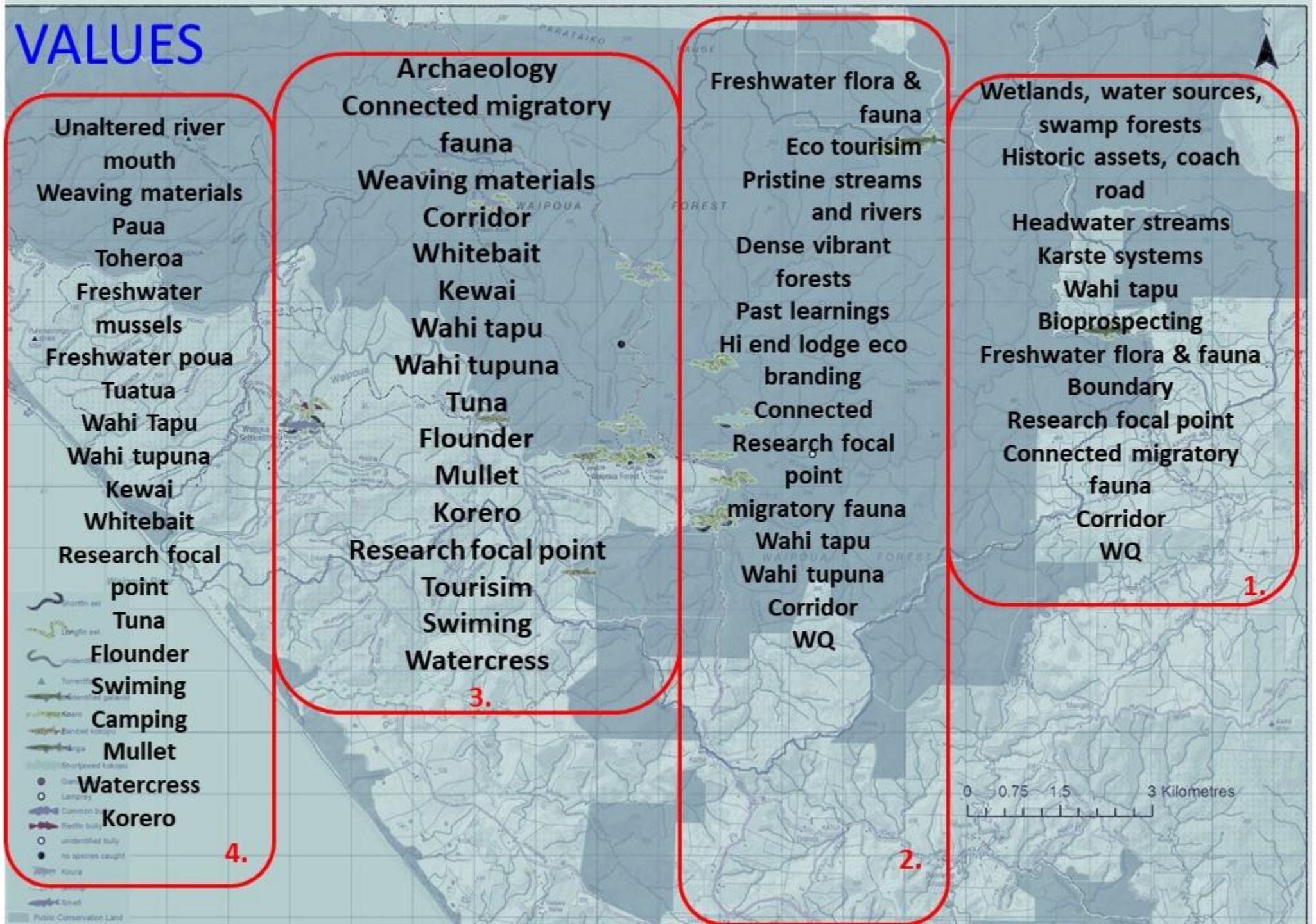
VALUES
Unaltered river mouth
Weaving materials
Paua
Toheroa
Freshwater mussels
Freshwater poua
Tuatua
Wahi Tapu
Wahi tupuna
Kewai
Whitebait
Research focal point
Tuna
Flounder
Swiming
Camping
Mullet
Watercress
Korero
4.
Archaeology
Connected migratory fauna
Weaving materials
Corridor
Whitebait
Kewai
Wahi tapu
Wahi tupuna
Tuna
Flounder
Mullet
Korero
Research focal point
Tourisim
Swiming
Watercress
3.
Freshwater flora & fauna
Eco tourisim
Pristine streams and rivers
Dense vibrant forests
Past learnings
Hi end lodge eco branding
Connected Research focal point
migratory fauna
Wahi tapu
Wahi tupuna
Corridor
WQ
2.
Wetlands, water sources, swamp forests
Historic assets, coach road
Headwater streams
Karste systems
Wahi tapu
Bioprospecting
Freshwater flora & fauna
Boundary
Research focal point
Connected migratory fauna
Corridor
WQ
1.
0 0.75 1.5 3 Kilometres

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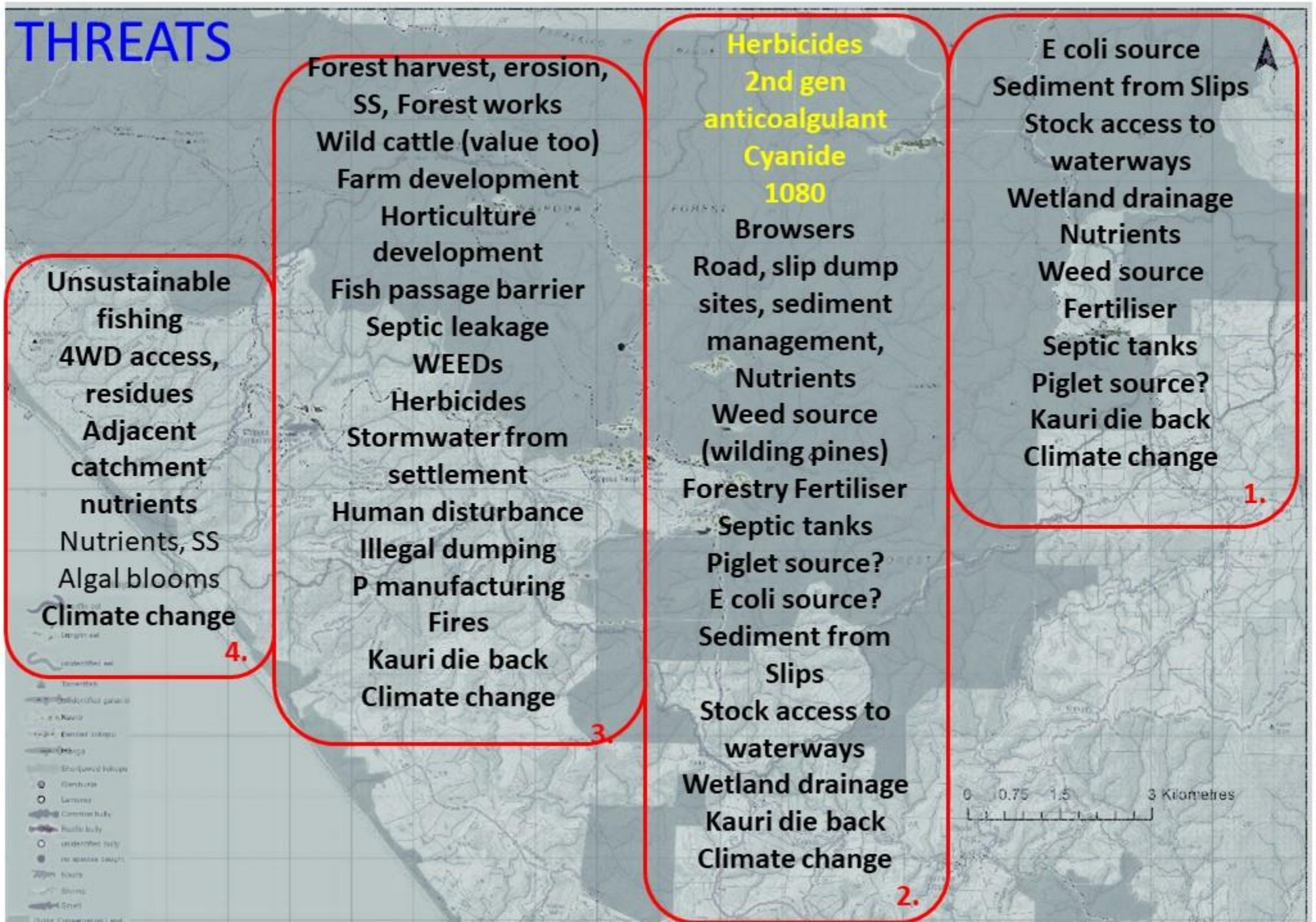
THREATS
Unsustainable fishing
4WD access, residues
Adjacent catchment nutrients
Nutrients, SS
Algal blooms
Climate change
4.
Forest harvest, erosion, SS, Forest works
Wild cattle (value too)
Farm development
Horticulture development
Fish passage barrier
Septic leakage
WEEDs
Herbicides
Stormwater from settlement
Human disturbance
Illegal dumping
P manufacturing
Fires
Kauri die back
Climate change
3.
Herbicides
2nd gen anticoalgulant
Cyanide
1080
Browsers
Road, slip dump sites, sediment management,
Nutrients
Weed source (wilding pines)
Forestry Fertiliser
Septic tanks
Piglet source?
E coli source?
Sediment from Slips
Stock access to waterways
Wetland drainage
Kauri die back
Climate change
2.
E coli source
Sediment from Slips
Stock access to waterways
Wetland drainage
Nutrients
Weed source
Fertiliser
Septic tanks
Piglet source?
Kauri die back
Climate change
1.
0 0.75 1.5 3 Kilometres

How? (cont'd)

3. Objectively work out which are worst pressures-impacts and start with them.
   - For example Waipoua conceptual model building

3. Ob … tart wi…

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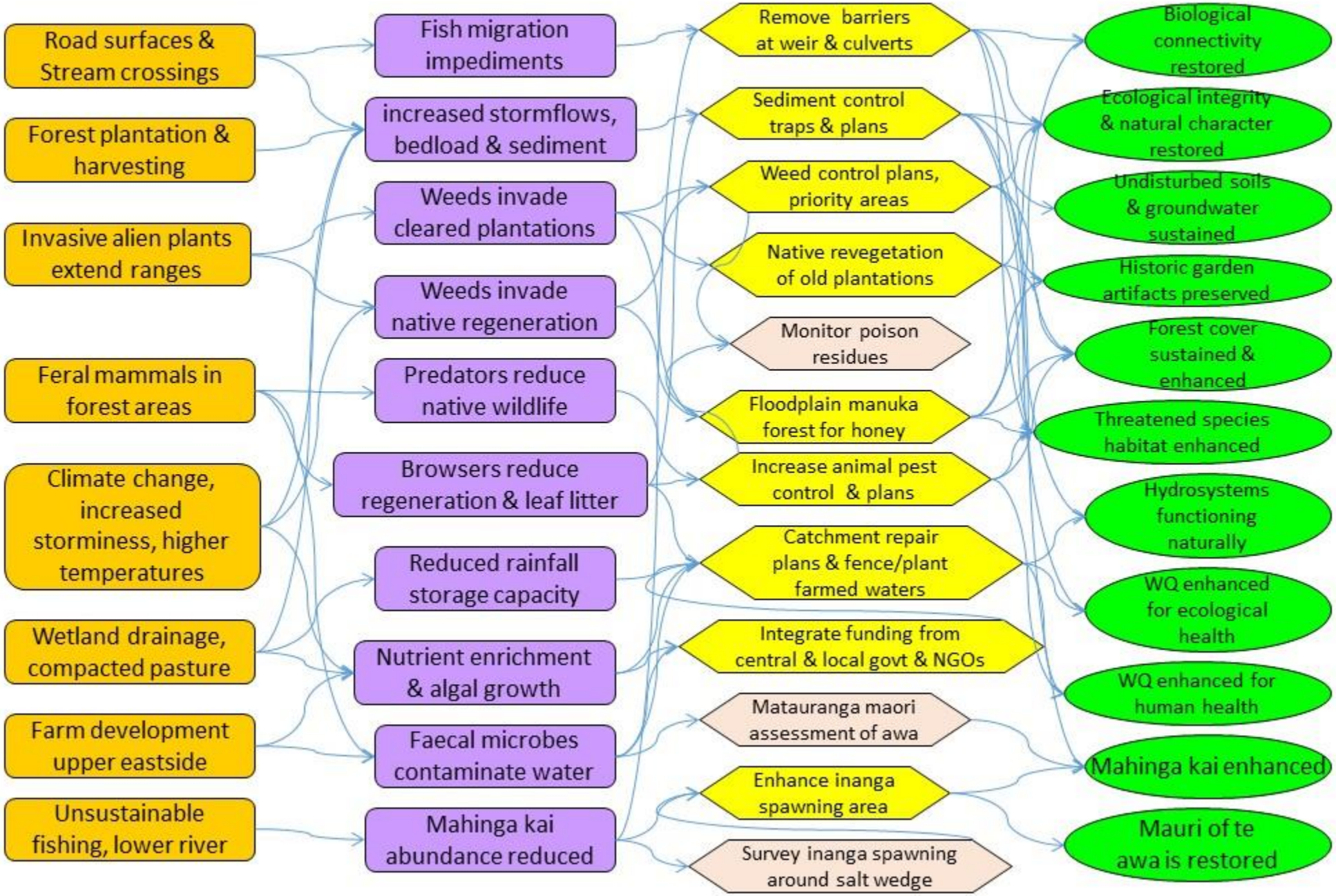
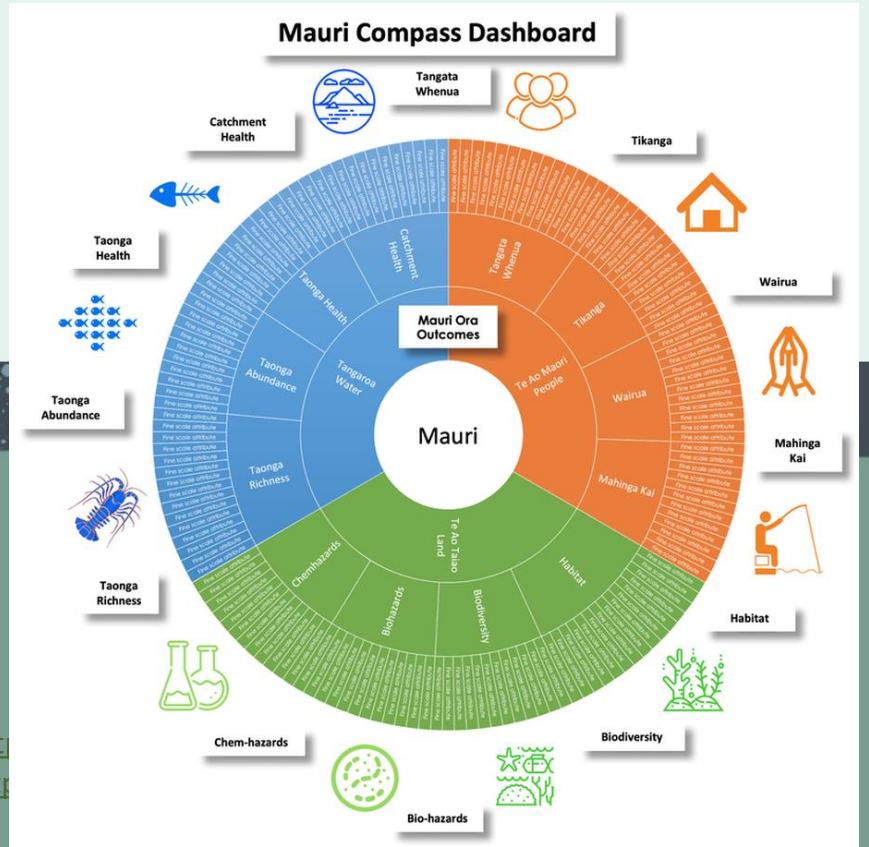
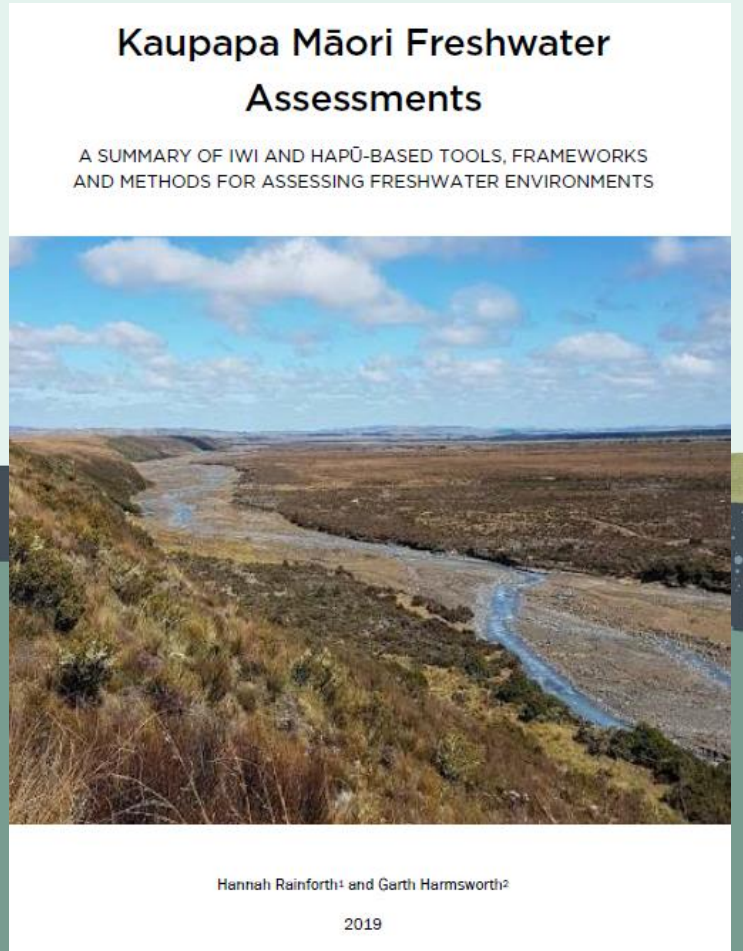
Conceptual Model of Waipoua watershed restoration



How? (cont'd)

4. Take a long-term & holistic view
    1. Mauri, "(noun) life principle, life force, vital essence, special nature, a material symbol of a life principle, source of emotions - the essential quality and vitality of a being or entity. ….." [1]





[1] http
[2] http

How? (cont'd)

4. Holistic view (cont'd) e.g. Western science holistic frameworks

Ecological integrity of NZ freshwaters (Schallenberg et al 2011)

GENERAL PROPERTY OF EI	INDICATOR
Nativeness	Native fish (% native, no. of introduced species, O/E)
	Presence of invasive macrophytes/algae
Pristineness	
Structural	Macroinvertebrate community composition (MCI, %EPT)
	Fish IBI
Functional	Ecosystem metabolism
	Wood decomposition rates
	BOD
	δ15N of primary consumers
Physico-chemical	Water clarity, turbidity
	Nutrient concentrations
	Water temperature, dissolved oxygen
Diversity	Macroinvertebrate taxonomic richness, diversity, O/E richness
	Abiotic structure (habitat template)
Resilience	Presence/absence of key indicator taxa
	Ecosystem function

DOC Outcome Monitoring Framework

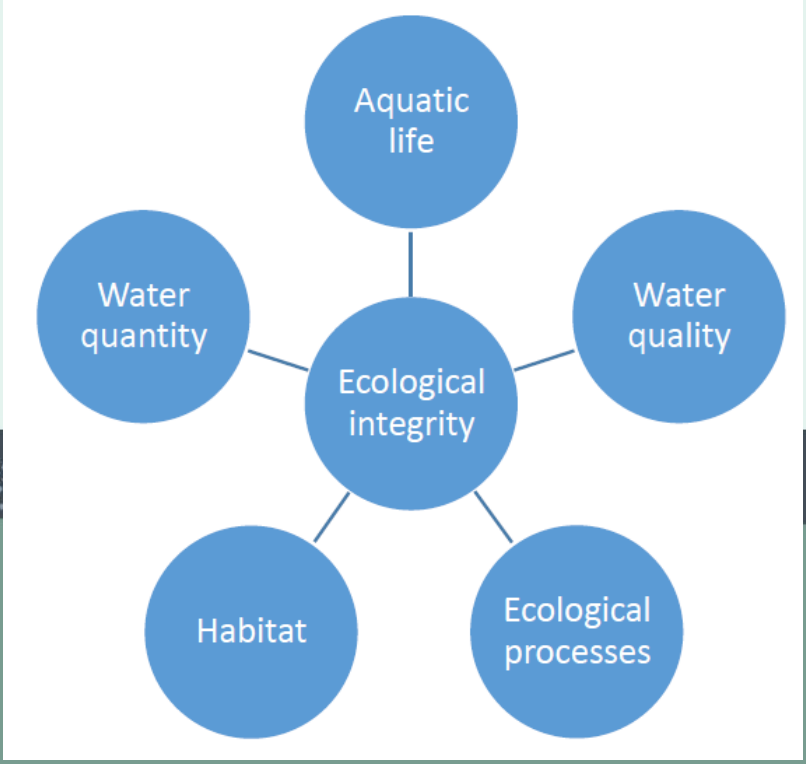
IO1: The diversity of our natural heritage is maintained and restored (McGlone et al 2020)

Outcome Objective	Indicator
Maintaining ecosystem processes	Substrate quality
	Ecosystem function
	Water quality and quantity
	Ecosystem structure
	Disturbance
	Land cover
Limiting environmental contaminants	Non-nutrient contaminants
Reducing spread and dominance of exotic species	Exotic species occurrence
	Invasive species dominance
Preventing declines and extinctions	Conservation status of indigenous taxa
	Security of threatened and at risk taxa
	Loss of genetic diversity
Maintaining ecosystem composition	Species composition and diversity
	Species occupancy of natural range
Ensuring ecosystem representation	Ecosystem representation and protection status
Adapting to climate change	Basic climate series
	Biological responses to climate change
Human use and interaction with natural heritage	Hunting and harvesting of indigenous resources
	Hunting and harvesting of non-native species and resources
	Human health and well-being and natural ecosystems
	Exploration, appreciation and investigation of natural ecosystems

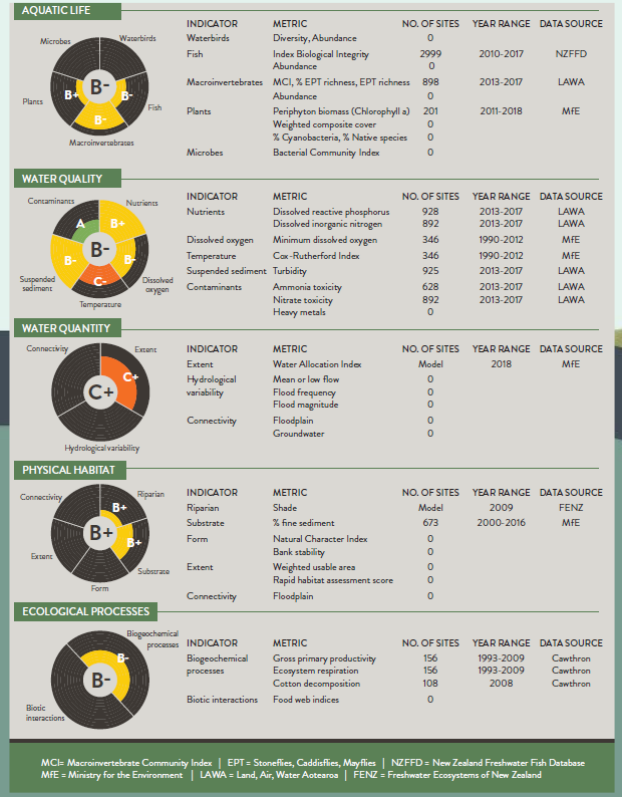
How? (cont'd)

4. Holistic view (cont'd) e.g. Western science holistic frameworks

MfE's Freshwater biophysical ecosystem health framework (Clapcott et al 2018)



River Prototype (Clapcott et al 2019)



AQUATIC LIFE

INDICATOR	METRIC	NO. OF SITES	YEAR RANGE	DATA SOURCE
Waterbirds	Diversity, Abundance	0		
Fish	Index Biological Integrity	2999	2010-2017	NZFFD
	Abundance	0		
Macroinvertebrates	MCI, % EPT richness, EPT richness	898	2013-2017	LAWA
	Abundance	0		
Plants	Periphyton biomass (Chlorophyll a)	201	2011-2018	MfE
	Weighted composite cover	0		
	% Cyanobacteria, % Native species	0		
Microbes	Bacterial Community Index	0		

WATER QUALITY

INDICATOR	METRIC	NO. OF SITES	YEAR RANGE	DATA SOURCE
Nutrients	Dissolved reactive phosphorus	928	2013-2017	LAWA
	Dissolved inorganic nitrogen	892	2013-2017	LAWA
Dissolved oxygen	Minimum dissolved oxygen	346	1990-2012	MfE
Temperature	Cox-Rutherford Index	346	1990-2012	MfE
Suspended sediment	Turbidity	925	2013-2017	LAWA
Contaminants	Ammonia toxicity	628	2013-2017	LAWA
	Nitrate toxicity	892	2013-2017	LAWA
	Heavy metals	0		

WATER QUANTITY

INDICATOR	METRIC	NO. OF SITES	YEAR RANGE	DATA SOURCE
Extent	Water Allocation Index	Model	2018	MfE
Hydrological variability	Mean or low flow	0		
	Flood frequency	0		
	Flood magnitude	0		
Connectivity	Floodplain	0		
	Groundwater	0		

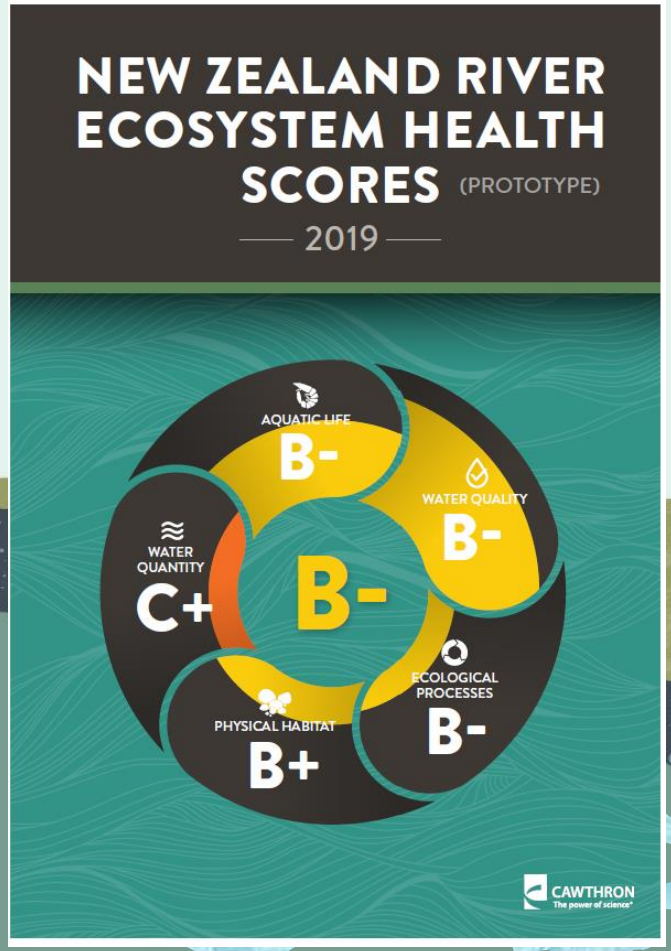
PHYSICAL HABITAT

INDICATOR	METRIC	NO. OF SITES	YEAR RANGE	DATA SOURCE
Riparian	Shade	Model	2009	FENZ
Substrate	% fine sediment	673	2000-2016	MfE
Form	Natural Character Index	0		
	Bank stability	0		
Extent	Weighted usable area	0		
	Rapid habitat assessment score	0		
Connectivity	Floodplain	0		

ECOLOGICAL PROCESSES

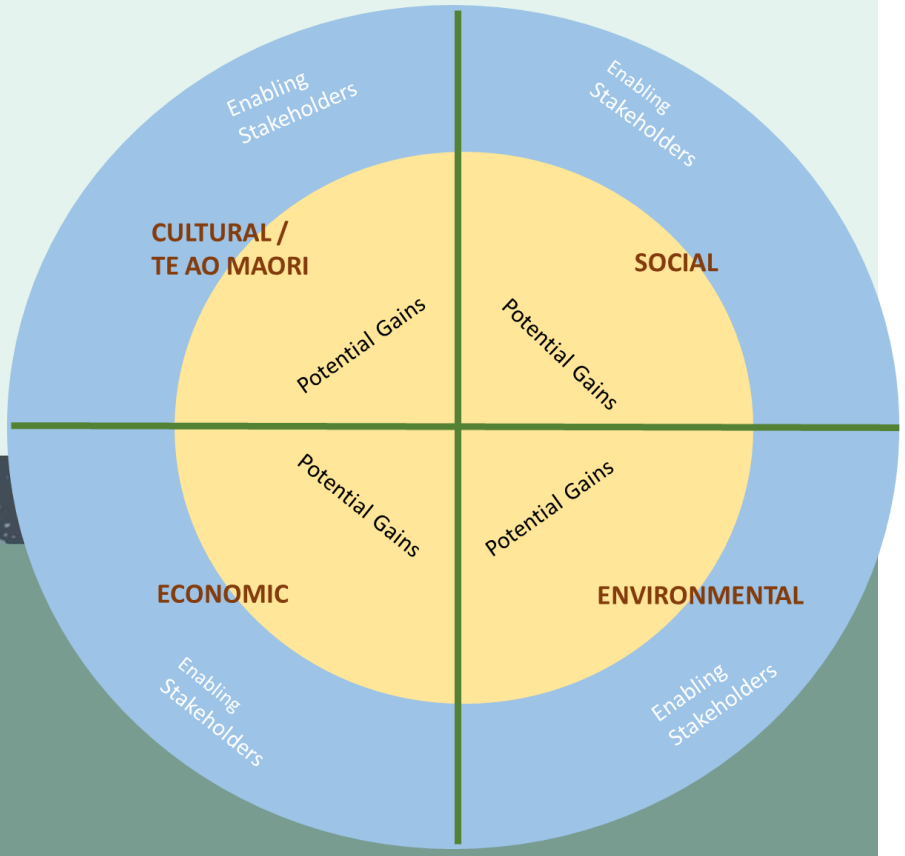
INDICATOR	METRIC	NO. OF SITES	YEAR RANGE	DATA SOURCE
Biogeochemical processes	Gross primary productivity	156	1993-2009	Cawthron
	Ecosystem respiration	156	1993-2009	Cawthron
	Cotton decomposition	108	2008	Cawthron
Biotic interactions	Food web indices	0		

MCI= Macroinvertebrate Community Index | EPT = Stoneflies, Caddisflies, Mayflies | NZFFD = New Zealand Freshwater Fish Database
MfE = Ministry for the Environment | LAWA = Land, Air, Water Aotearoa | FENZ = Freshwater Ecosystems of New Zealand



Who?

1. Key partners- engagement e.g. Ngā Awa



The Four Pillars of Trust

Inspired by Steven Covey "Leading with Trust"

'Bang the Table' Resource Library www.bangthetable.com

Who?

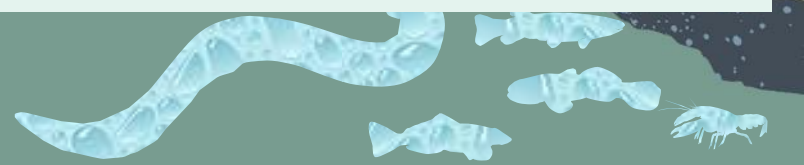
1. Key partners- engagement e.g. Ngā Awa cont'd

INDICATOR	Poor (0)	Fair (1)	Good (2)	Excellent (3)	Comments
Stakeholder Mapping and Engagement Planning	No mapping or engagement planning process in place. Stakeholder engagement is reactive.	Use of participation spectrum and 4 quadrant analysis as basis for proactive approach to enabling stakeholders	Full mapping and engagement planning process integrated into project planning	Proactive live engagement plan ensures diverse strong collaboration and participation	To ensure we take the time to involve partners and communities affected from the start.
Maori (esp. mana whenua)	Lack of Maori Connection Reactive responses to Maori	Initial 'consultation' with Maori	Proactively engaged with Maori, exploring how to work on this project together. Gaining an understanding of each others' values and priorities.	Shared vision with Maori, alignment of values. Actively working in co-design and shared kaitiakitanga.	Aiming towards shared design, shared leadership, shared caretaking for the future.

Who?

1. Key partners- engagement e.g. Ngā Awa cont'd

- Ngā Awa sites have different communities and positions on partnership, knowledge and restoration pathways
- Care needed that important partners are brought in as early as possible e.g. if problems with district and regional council flood-drainage management then council engineers will be valuable sources of information and potentially partners if approached right
- Even "pristine" awa headwaters can have unmapped impacts-discharges



Key messages

1. Define your scope-scale, all tributaries flowing into a harbour or the largest or worst awa.
2. Know your awa, first few years may be sampling and getting to know the community rather than fixing
3. Balance 2. with starting something, no awa restoration template so safe to fail fixes good start
4. Set some objectives you can achieve and document early
5. Go fishing, everybody loves fishing