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Pathogens and Indicators in Freshwater

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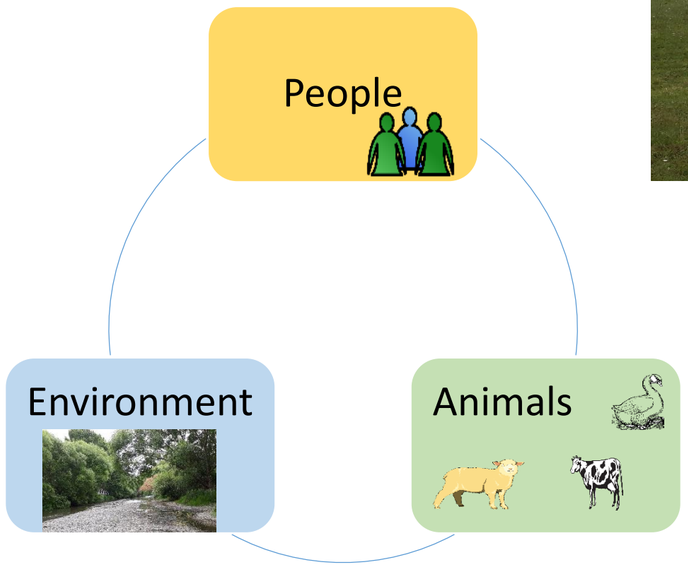
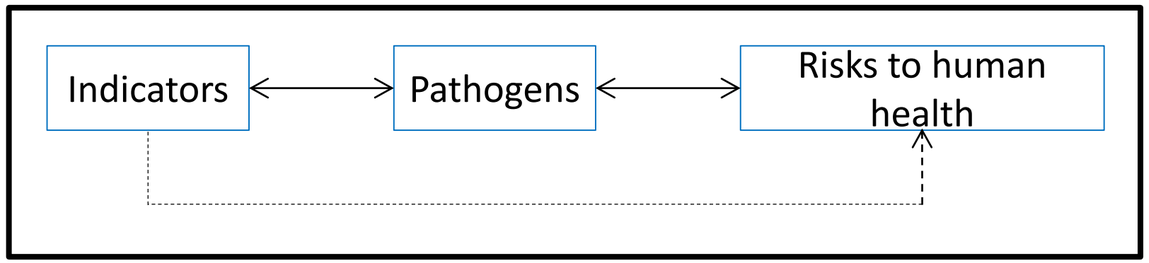
Recreational water use

How do we know it's safe?



Microbiological Guidelines for Freshwater Recreation 2003 based on 1998-2000 study



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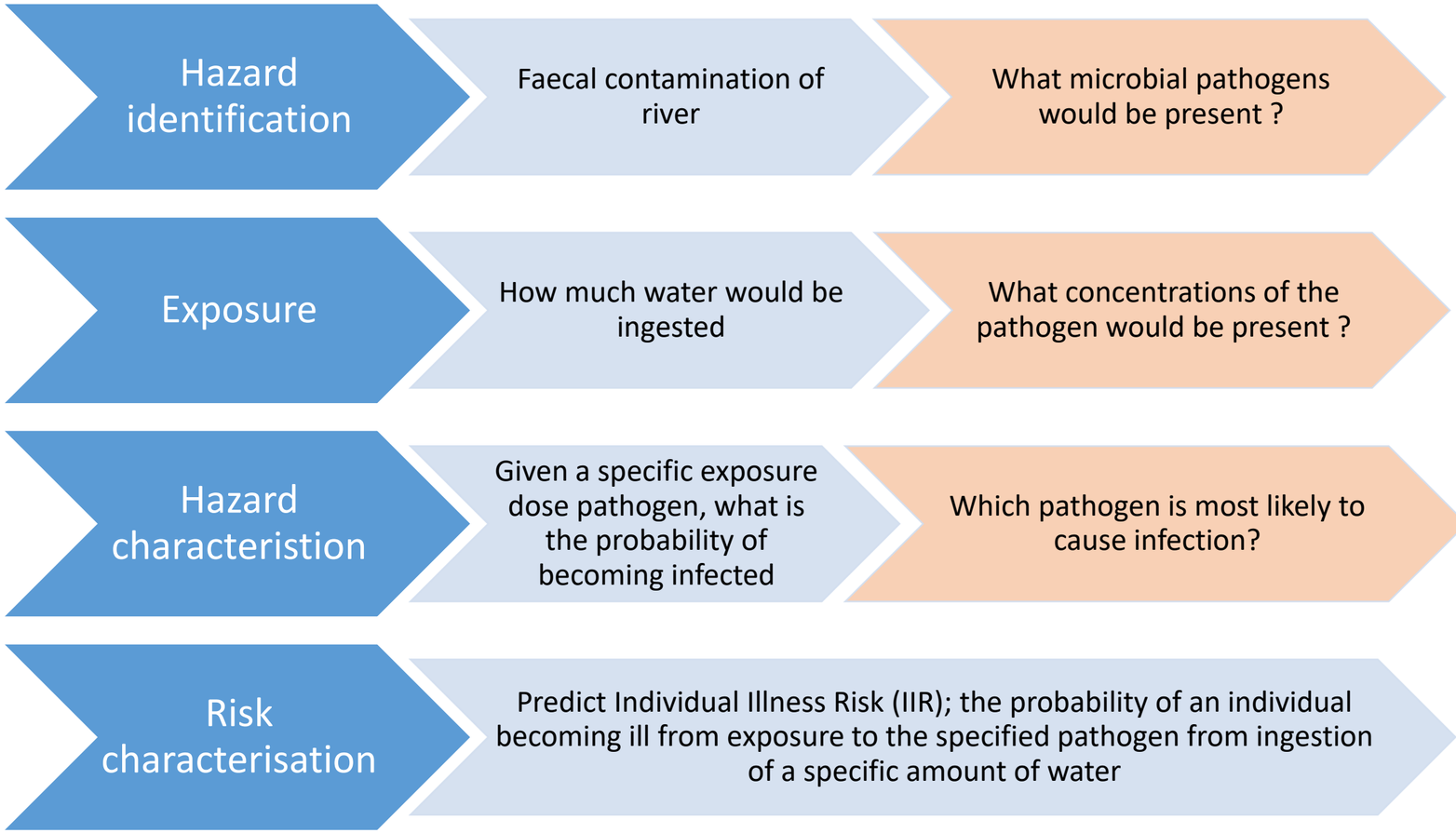
Aims of Pilot Freshwater Study

QMRA Framework



- Purpose – to inform QMRA
  - What to measure?
  - Samples -how many & where
- Confirm methodologies
- Engage with iwi and hapū
- Logistics
- Design and cost of Full Study

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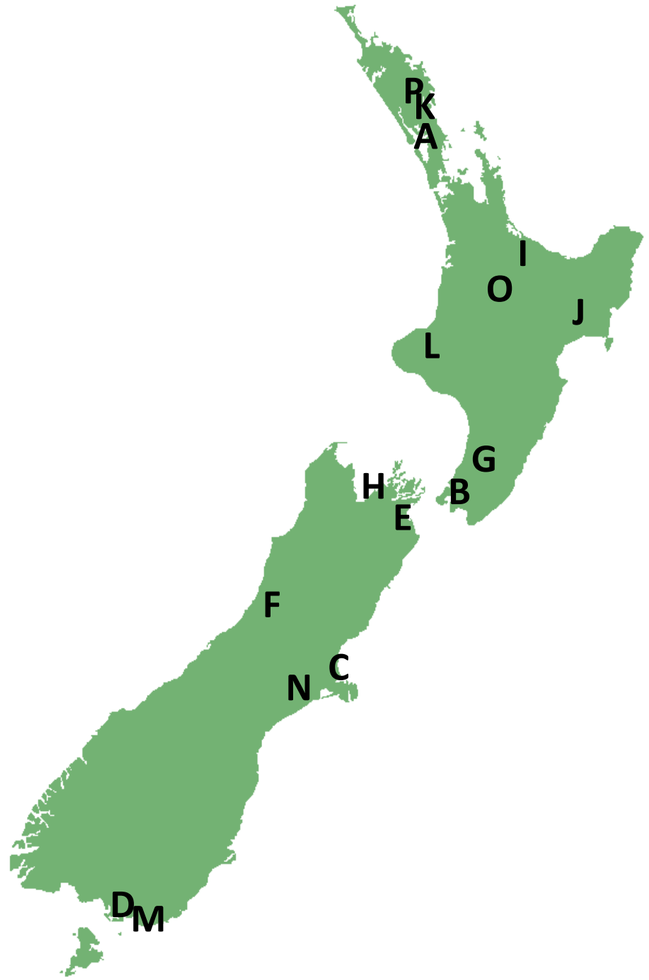
Study design

- 16 rivers likely to be contaminated
- Land use- beef & sheep, dairy, urban
- 50 samples between Feb-Mar 2020
- Engage with iwi and hapū
- Target pathogens
  - Bacteria – *Campylobacter, Salmonella,* STEC
  - Protozoa - *Giardia, Cryptosporidium*
  - Viruses – enterovirus, norovirus GI & GII, adenovirus
- Faecal Source Tracker (FST) markers
  - human, ruminants, wildfowl



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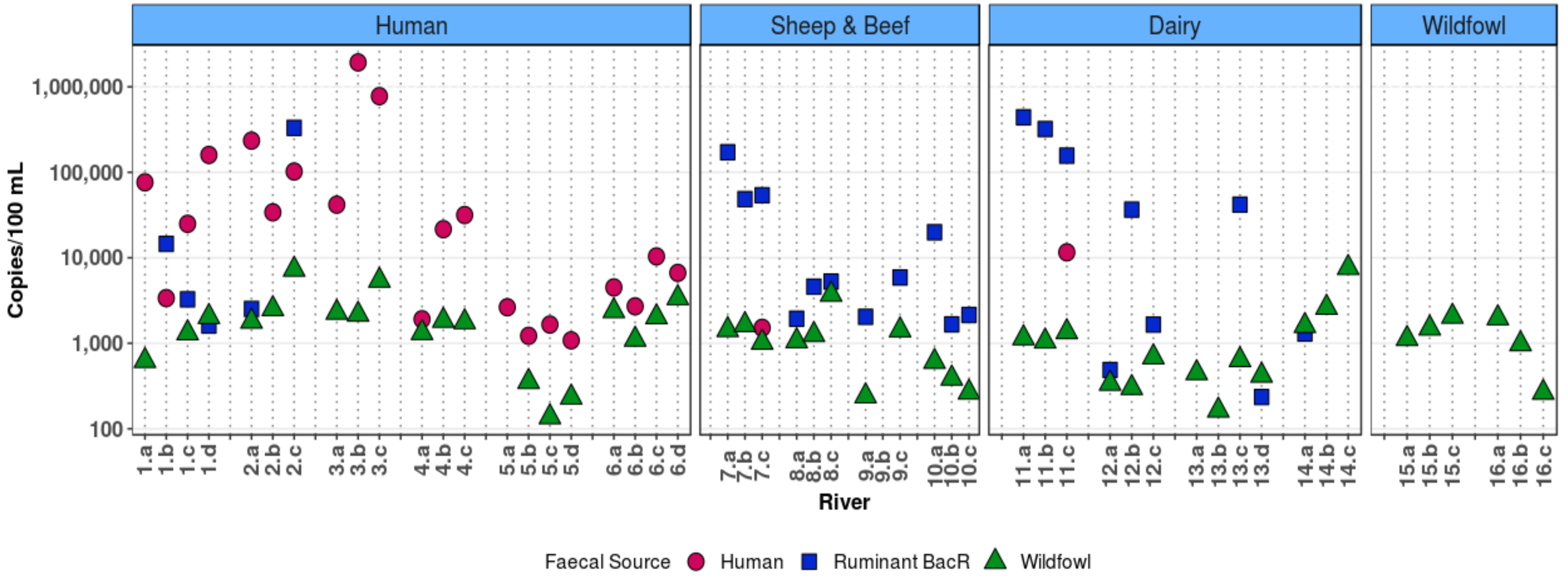
What do faecal source tracker markers tell us?



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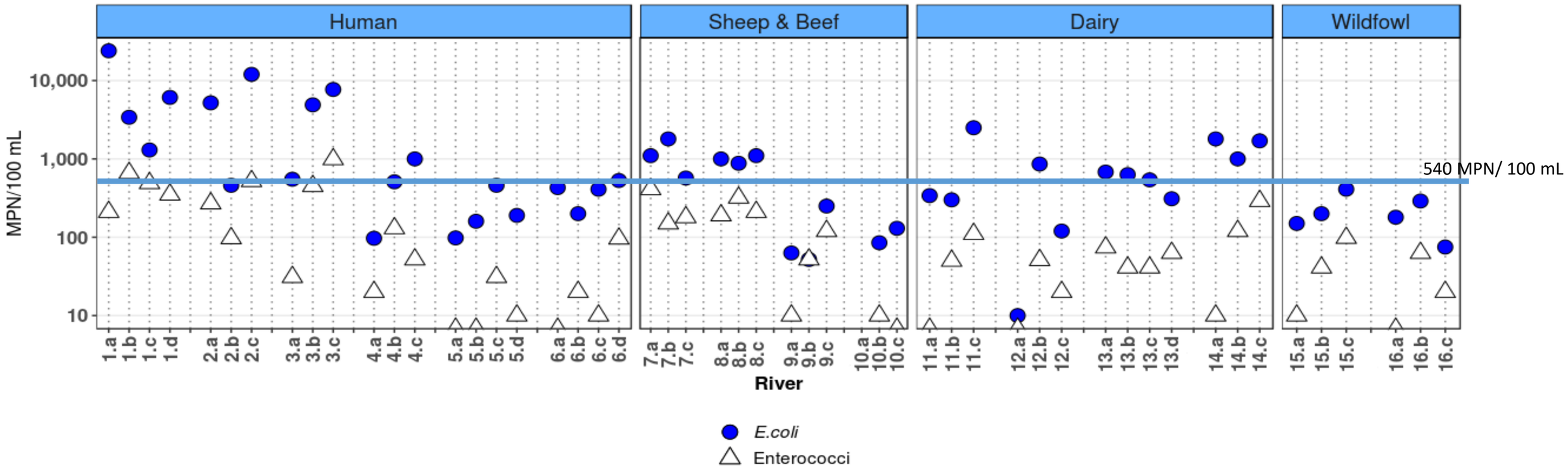
Faecal Indicator Bacteria - *E. coli* and enterococci



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Prevalence of Pathogens against *E. coli* criteria

Prevalence	*Campylobacter* (MPN/100 mL)	*Salmonella* (MPN/100 mL)	*Cryptosporidium* (cysts/100 L)	*Giardia* (cysts/100 L)
Overall	47%	18%	42%	81%
> 540 *E. coli* /100mL	82%	36%	55%	77%
≤ 540 *E. coli* /100mL	57%	4%	32%	82%

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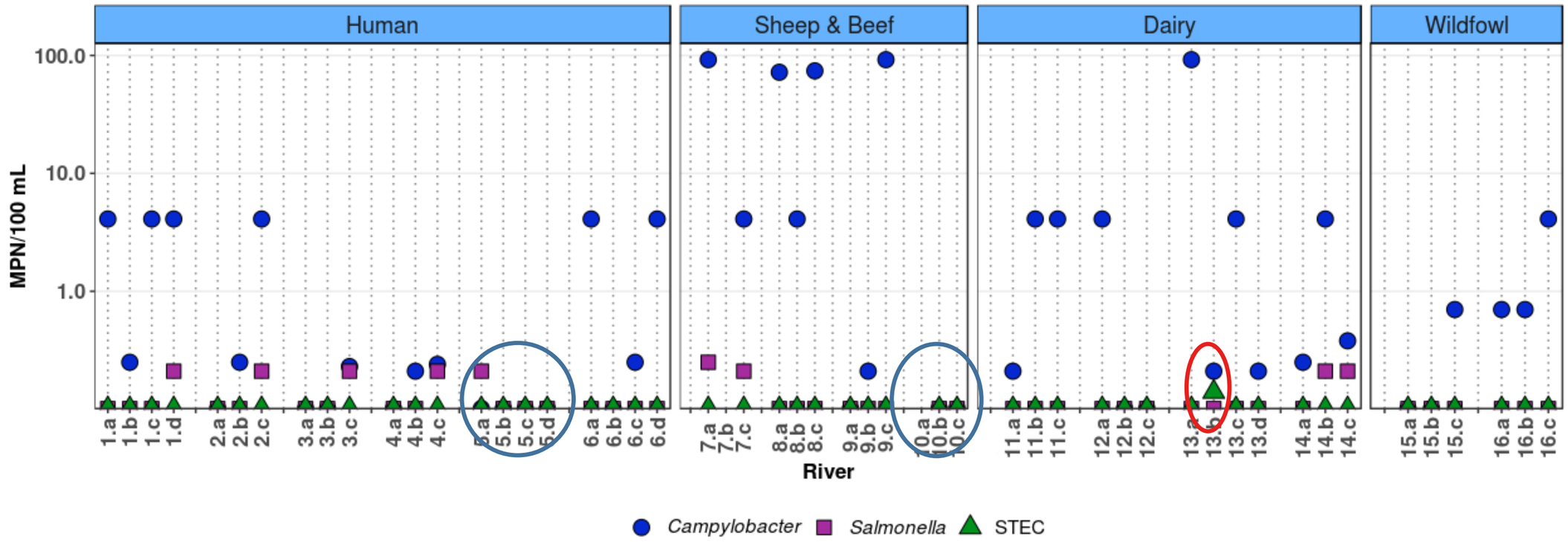
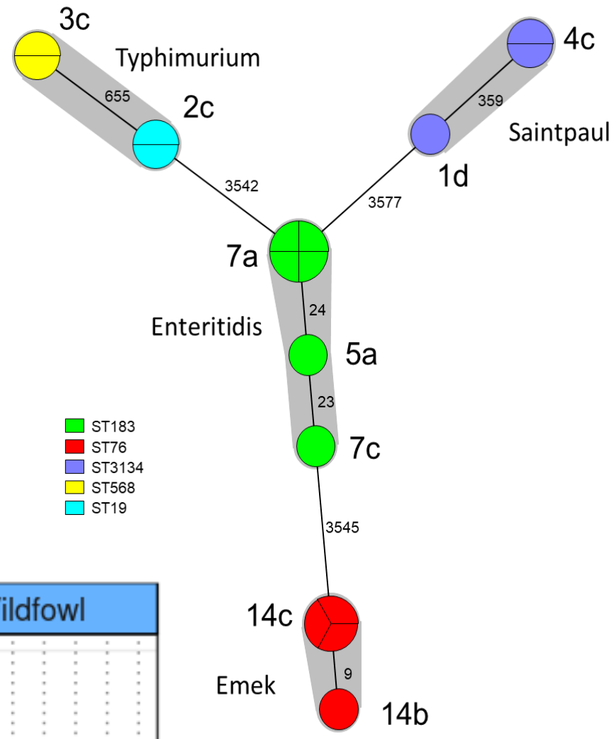
Campylobacter, Salmonella and STEC





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Which pathogen to target in QMRA?

Micro-organism	Concentrations recorded in study	Average dose based on 280 mL water consumed	Single point estimate of probability of infection given dose from consuming 280 ml of water[a]
Campylobacter	4 MPN/100mL 92 MPN/100mL	12 258	0.12 (120 from 1000 exposures) 0.40 (400 from 1000 exposures)

[a] Dose response calculated using the liberal dose response relationships

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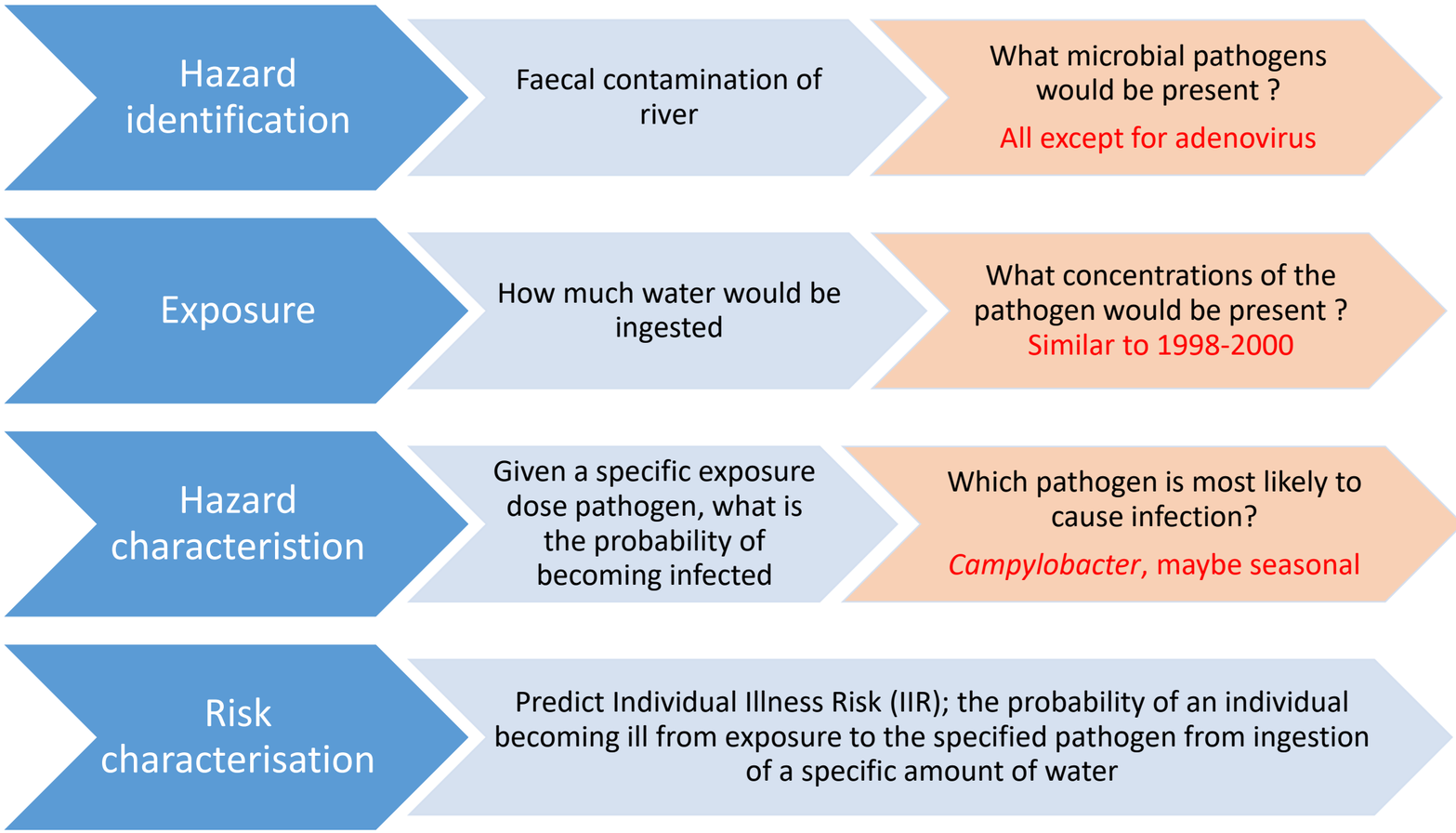
Implications for Phase 2 QMRA



- Pathogens are still present
  - *Campylobacter* is key target
  - Require temporal data
- Land uses
  - urban
  - dairy
  - sheep & beef
  - natural/wildfowl
- Iwi and hapū engagement

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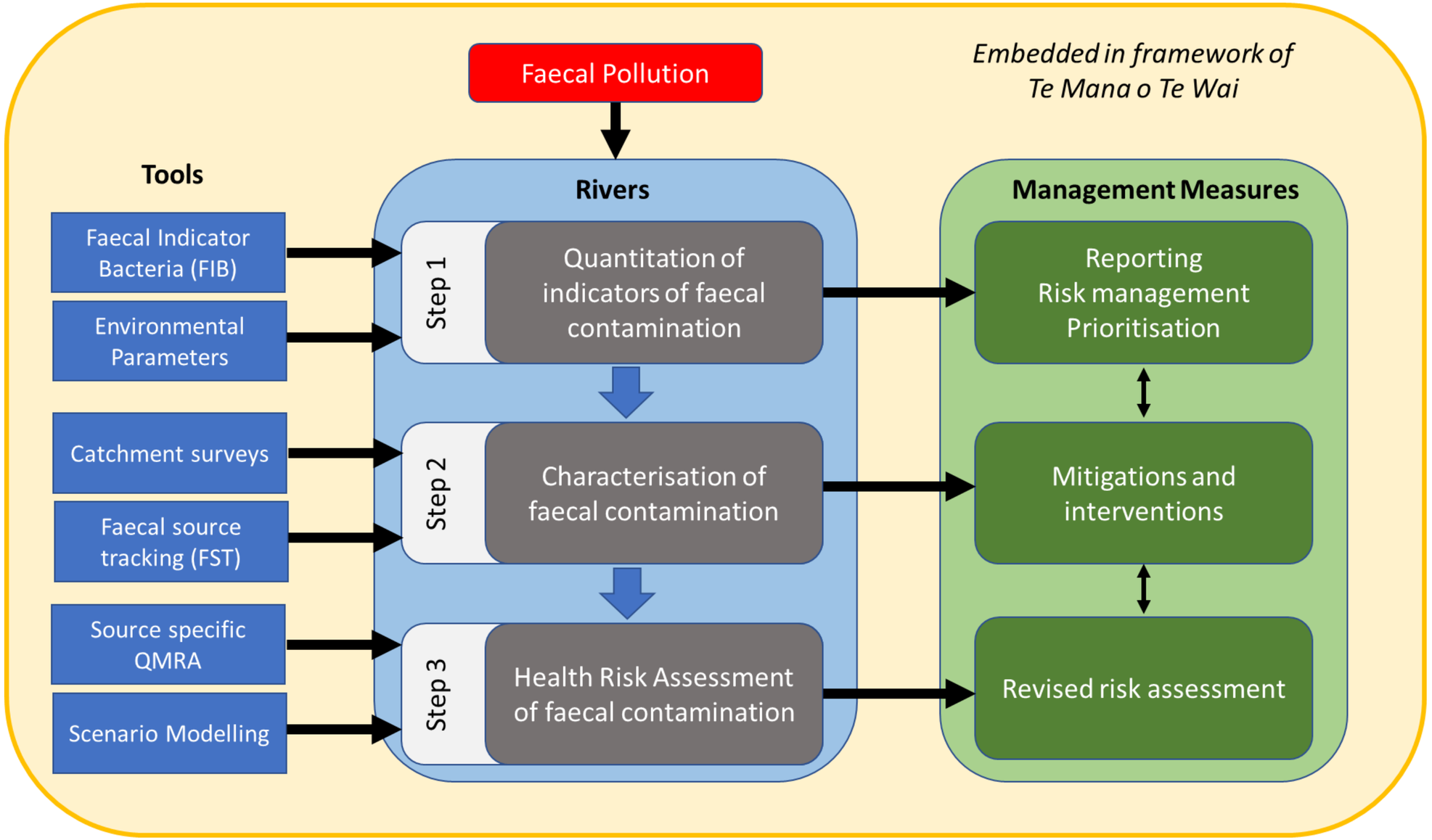

Conceptual framework for water quality assessment

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Summary

- Pathogens are present in freshwater with high *E. coli* concentrations but mostly at low concentrations
- FIB are useful indicators
- FST are more accurate at determining the sources of faecal contamination than observation
- Refined methodology for Full Study
  - *Campylobacter* is target pathogen
  - Viruses are not useful indicators
  - Sampling to cover seasonality
- A framework would assist implementation

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Questions

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