



# Catchment Audit for Priority Catchments: Avana and Turangi



# Purpose of catchment audits

*A Catchment Audit (CA) can identify key landscape and landuse features that have potential to affect waterways, including downstream cumulative effects where the waterway flows into the nearshore zone.*

- **Establish Indicators:** Use measurable attributes to monitor ecosystem health
- **Identify Sources:** pinpoint significant nutrient and pollution contributors
- **Implement responses:** management & mitigation measures developed & applied
- **Evaluate Trends & Compliance:** specific pollutants, overall ecosystem health

# Key stages

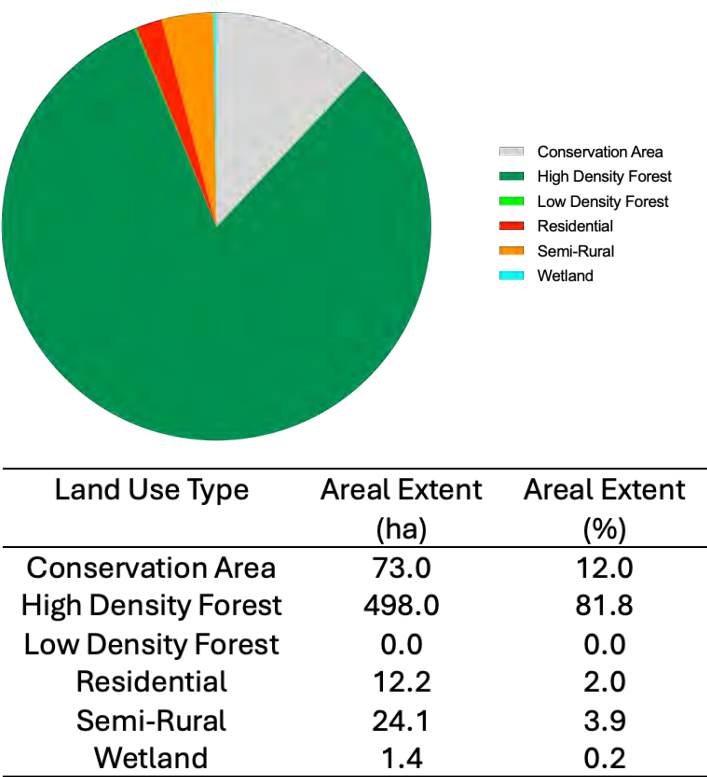
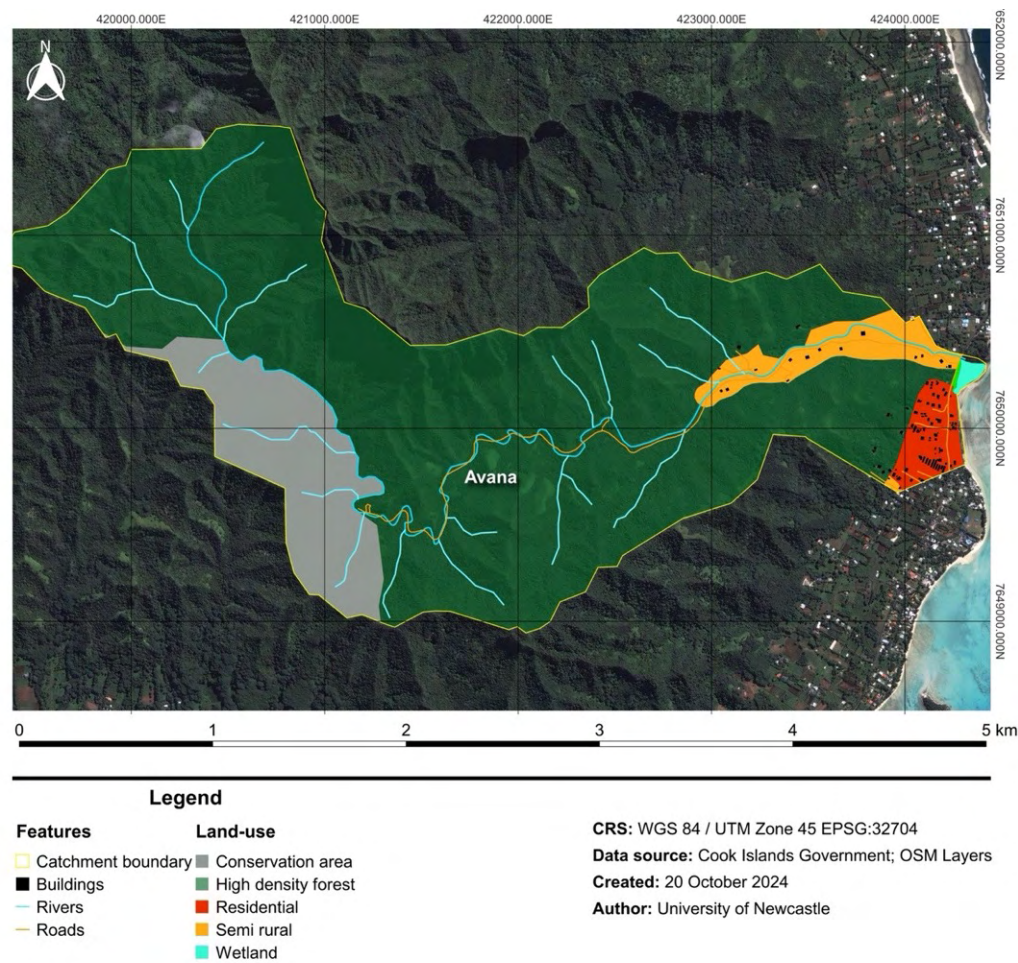
- **Data collection and desktop analysis:** gather spatial information and high-resolution aerial imagery
- **Source identification:** desktop analysis and ground-truthing
- **Fieldwork surveys:** water quality, nutrients, freshwater macroinvertebrates, stream sediment pH, indicators of anthropogenic influence
- **Inform catchment management plans:** empirical data and community-led



# Aims

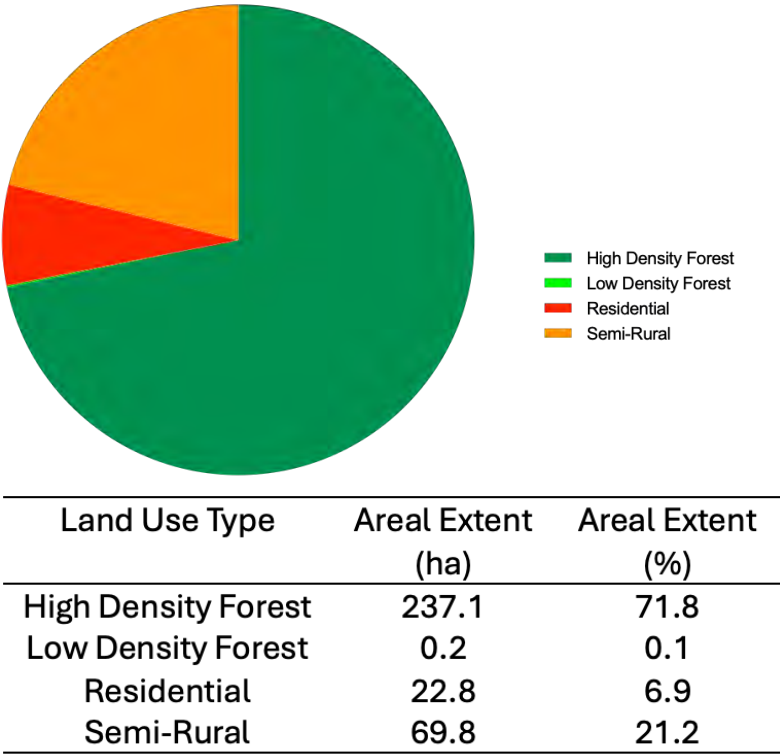
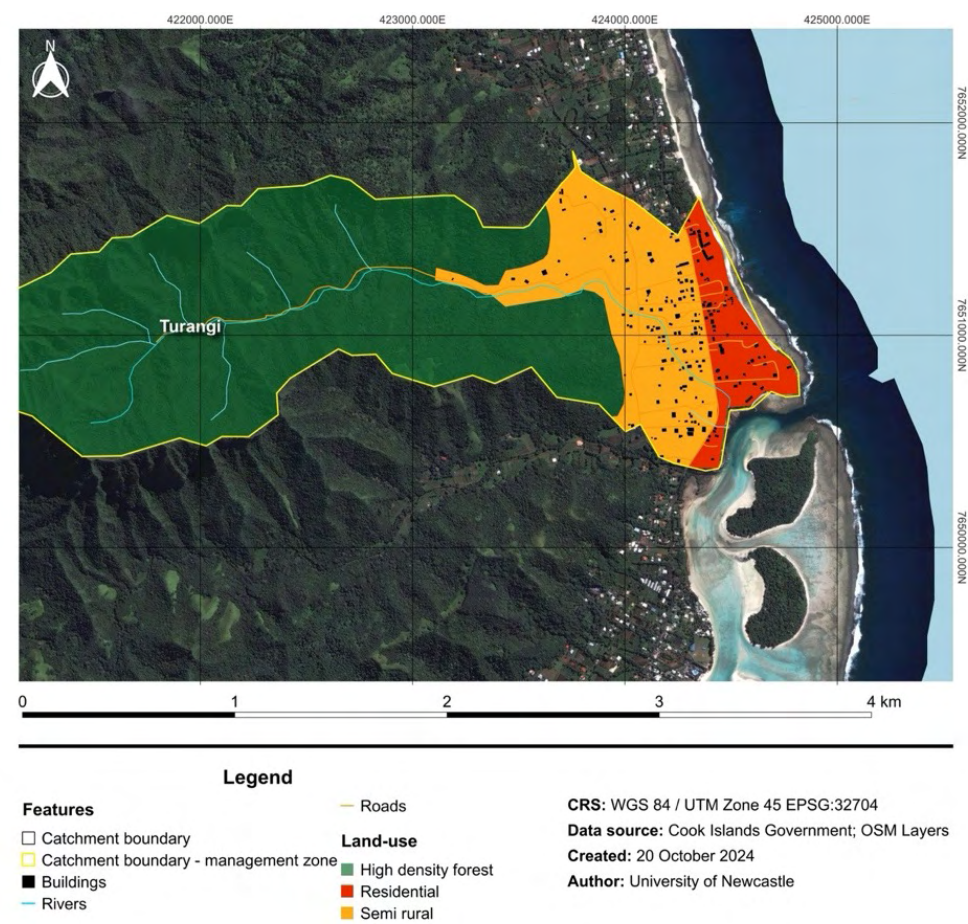
- Desktop review of catchment land uses and identify any areas that may have nutrient, contaminant or pathogen source
- Measurement of water quality at sites from the upper to lower catchment
- Measurement of indicators of anthropogenic influence: stable isotopes of C and N of in-stream periphyton (microalgae), Optical Brighteners and chlorine
- Assessment of benthic aquatic ecosystem health using aquatic macroinvertebrates and sediment pH as indicators

# Findings



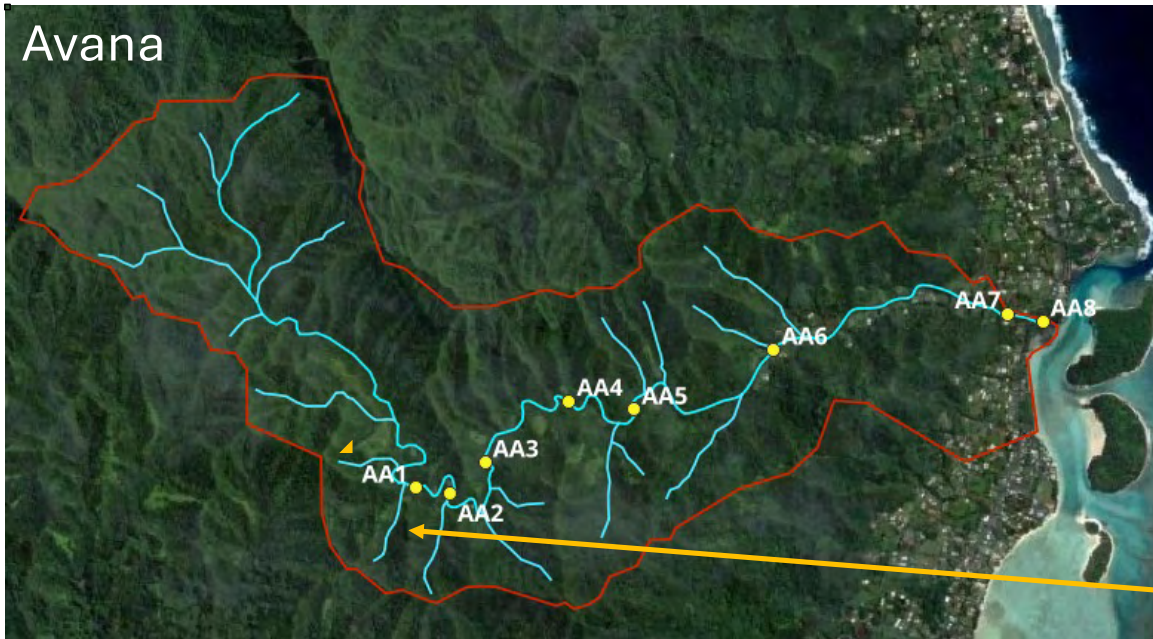
*Desktop catchment audit indicate a low pollution intensity/load from residential (urban) and rural (farming) activities*

# Findings



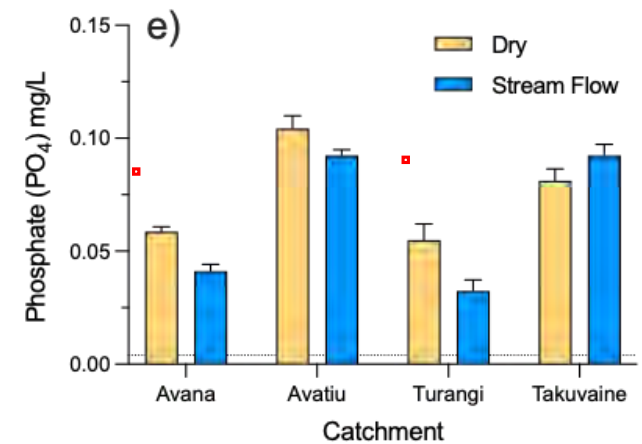
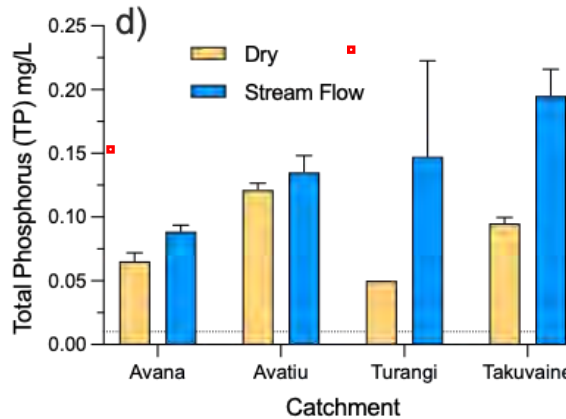
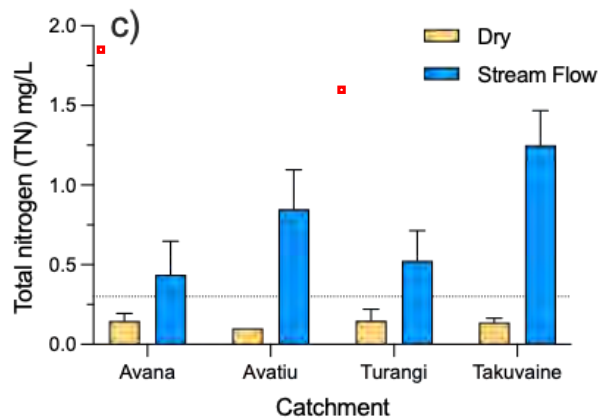
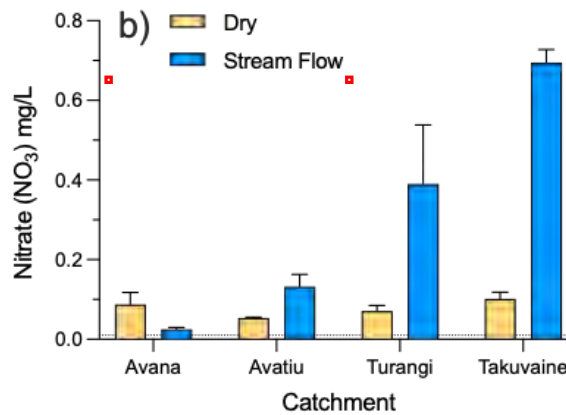
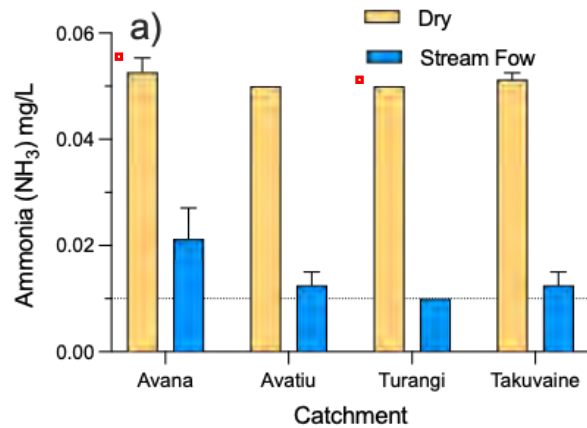
*Preliminary results from the catchment audit indicate a medium pollution intensity/load from residential (urban) and rural (farming) activities*

# Findings



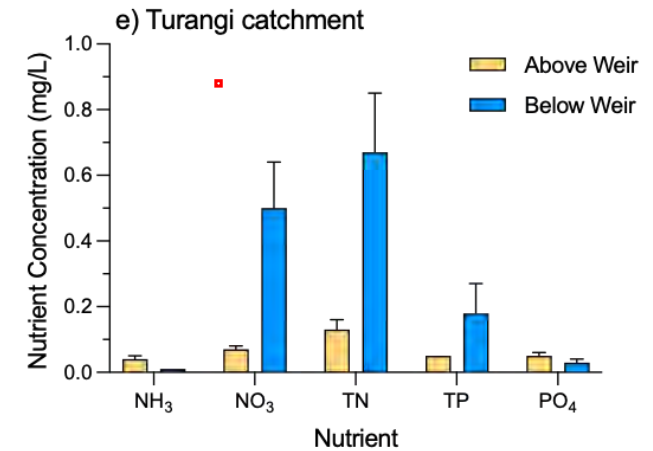
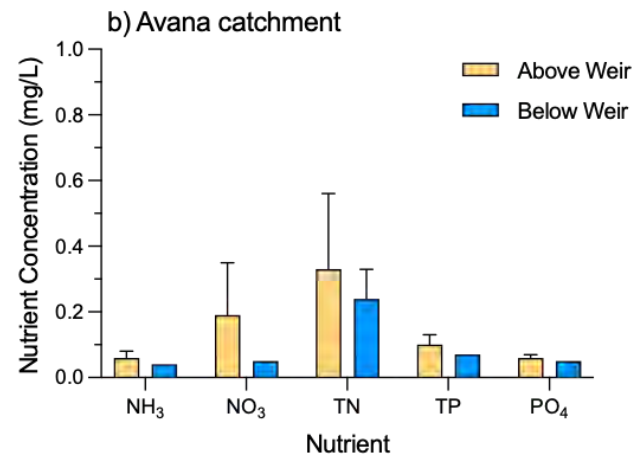
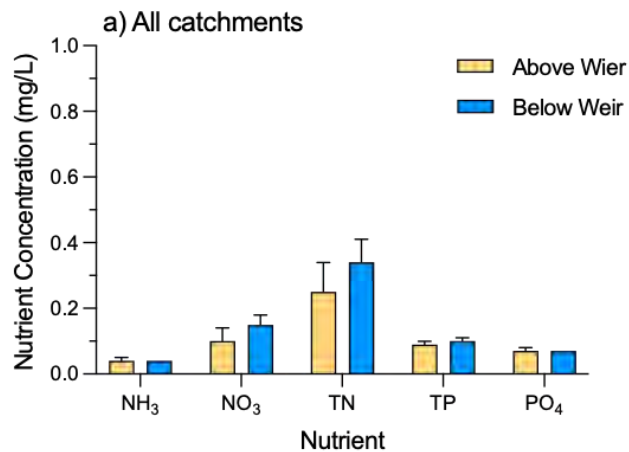
Above the weir (water off-take)

# Findings (nutrients)



*Phosphate is continually above adapted guidelines*

# Findings (nutrients)



pH ✓

Conductivity ✓

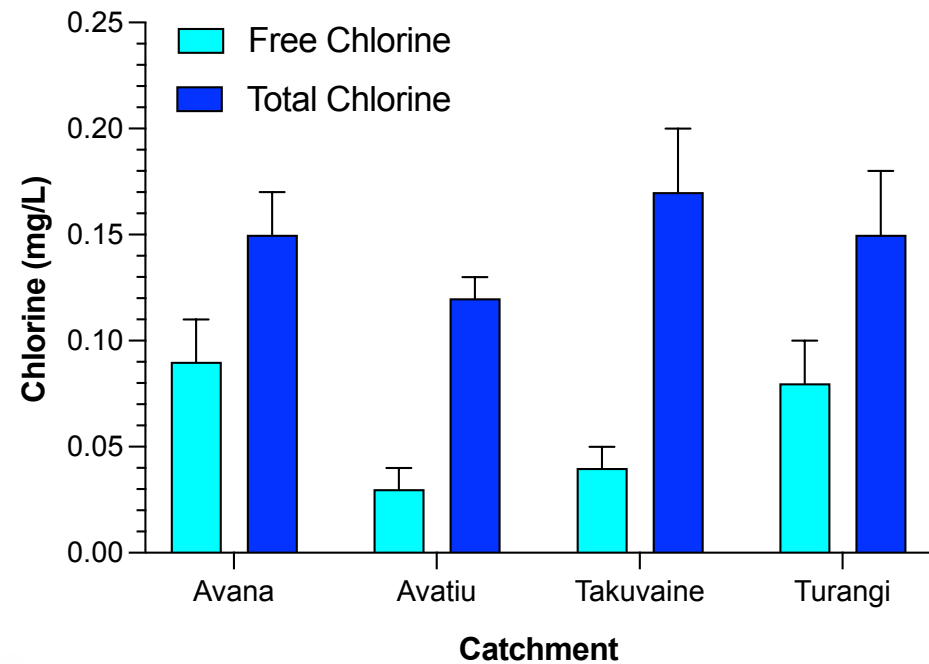
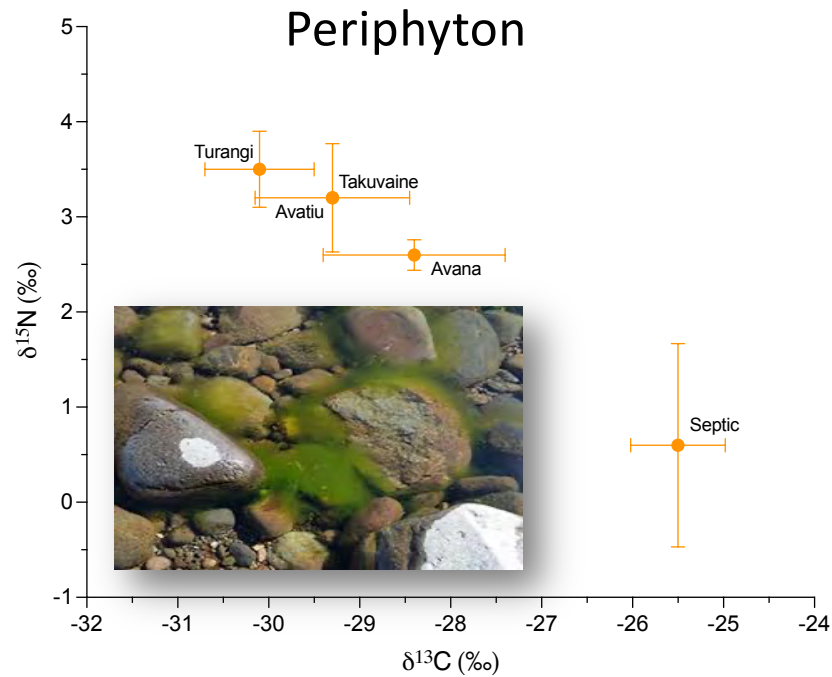
Dissolved Oxygen ✓

Turbidity ✓

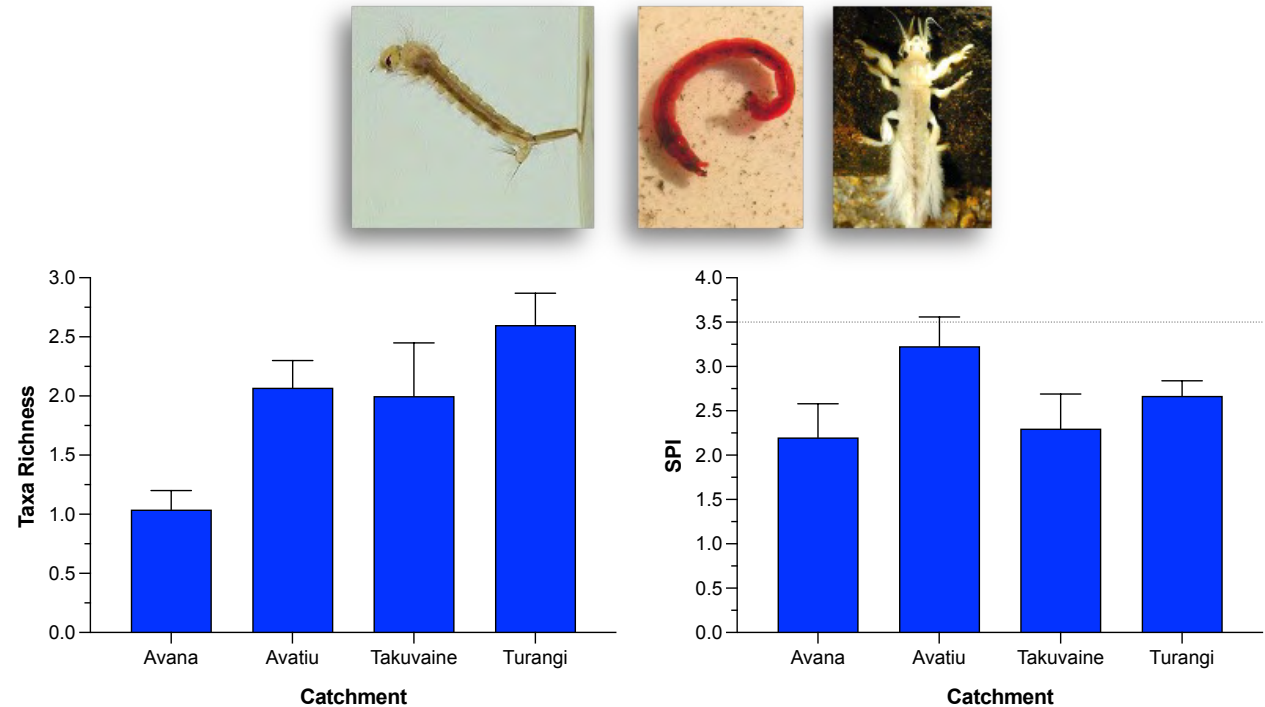
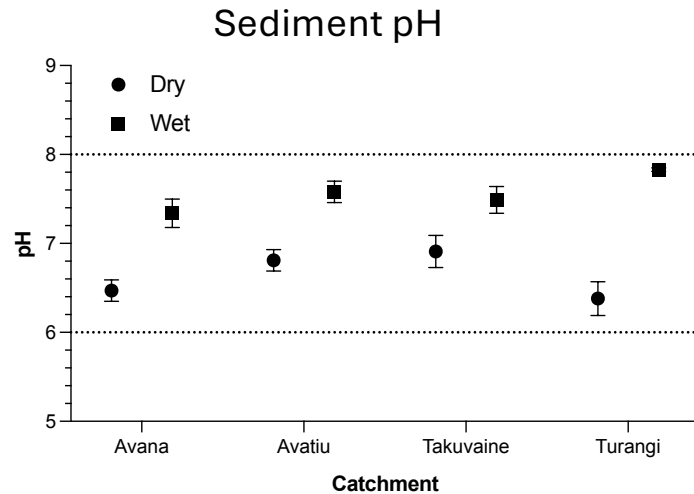
(during dry conditions)

*Nutrient concentrations increase downstream of the weir AND associated with rainfall*

# Findings (indicators of anthropogenic influence)



# Findings (benthic ecosystem health)



*Waterways are affected by human use such as urban, industrial or agricultural pollution, or by the downstream effects of infrastructure*

# Outcomes

- Catchments have a potential pollution intensity/load ranging from low to high (related to the proportion of urban and rural catchment land uses)
- Extraction of water has greatly reduced environmental flows (but also climate change)
- Extremely low aquatic macroinvertebrate richness & stream pollution index (SPI)
- Turangi catchment had significantly increased nitrate ( $\text{NO}_3$ ), total nitrogen (TN) and total phosphorus (TP) following rainfall (and below the weir)
- Extracting water for human use has significantly altered ecosystem condition

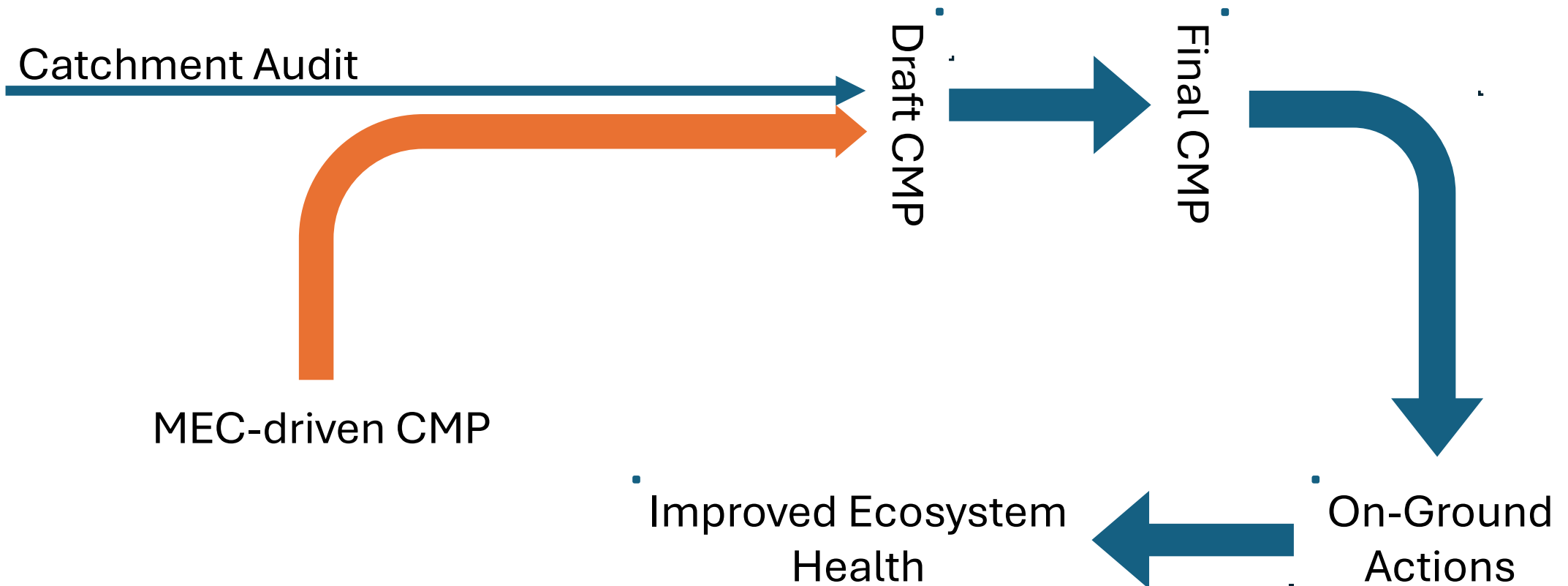
# Recommendations

- Governance structures
- Alignment with existing regulatory frameworks/management plans
- Water security
- Environmental monitoring and reporting
- Improved environmental and ecological health
- Education and awareness

# Activity

- What does a “healthy catchment” look like to you?
- What does a “healthy stream” look like to you?
- What management actions do you think are required to achieve these outcomes?

# The journey and what happens now?



# Adapted guidelines for water quality

| Parameter                                                 | Upland Streams Threshold | Lowland Streams Threshold | Unit         | Justification                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------|--------------------------|---------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ammonia as N (NH <sub>4</sub> -N)                         | 0.006                    | 0.01                      | mg/L         | ANZECC/ARMCANZ (2000) table 3.3.4.                                                                                                                                                                                                                                                                                                                                                                                                 |
| Nitrate as N                                              | 0.03                     | 0.01                      | mg/L         | ANZECC/ARMCANZ (2000) table 3.3.4 provides NO <sub>x</sub> -N (nitrate+nitrite). Using the same number for “nitrate only” is recommended a conservative threshold.                                                                                                                                                                                                                                                                 |
| Nitrite + Nitrate as N (NO <sub>x</sub> -N)               | 0.03                     | 0.01                      | mg/L         | ANZECC/ARMCANZ (2000) table 3.3.4. Guideline for oxidised nitrogen.                                                                                                                                                                                                                                                                                                                                                                |
| Total Kjeldahl Nitrogen (TKN)                             | 0.15                     | 0.3                       | mg/L         | No ANZECC default value for TKN; TN as a proxy. 0.3 mg/L also appeared as an upper threshold for TKN of healthy streams on a non-peer reviewed engineering/enviro blog <a href="https://www.fehrgraham.com/about-us/blog/mastering-water-quality-parameters-for-wastewater-ensures-community-health-fg">https://www.fehrgraham.com/about-us/blog/mastering-water-quality-parameters-for-wastewater-ensures-community-health-fg</a> |
| Total Nitrogen (TN)                                       | 0.15                     | 0.3                       | mg/L         | ANZECC/ARMCANZ (2000) table 3.3.4                                                                                                                                                                                                                                                                                                                                                                                                  |
| Total Phosphorus (TP)                                     | 0.01                     | 0.01                      | mg/L         | ANZECC/ARMCANZ (2000) table 3.3.4                                                                                                                                                                                                                                                                                                                                                                                                  |
| Reactive Phosphorus as P (aka FRP/DRP/PO <sub>4</sub> -P) | 0.005                    | 0.004                     | mg/L         | ANZECC/ARMCANZ (2000) table 3.3.4                                                                                                                                                                                                                                                                                                                                                                                                  |
| pH                                                        | < 6.0 or > 7.5           | < 6.0 or > 8.0            | pH           | ANZECC/ARMCANZ (2000) table 3.3.4                                                                                                                                                                                                                                                                                                                                                                                                  |
| Dissolved oxygen (DO)                                     | < 90% or > 120%          | < 85 or > 120             | % saturation | ANZECC/ARMCANZ (2000) table 3.3.4 . Below 85-90% is low oxygen; above 120% is supersaturation.                                                                                                                                                                                                                                                                                                                                     |
| Turbidity                                                 | > 15                     | > 15                      | NTU          | ANZECC/ARMCANZ (2000) table 3.3.5                                                                                                                                                                                                                                                                                                                                                                                                  |
| Salinity                                                  | <20 or >250              | <20 or >250               | µScm -1      |                                                                                                                                                                                                                                                                                                                                                                                                                                    |