

Stream rehabilitation: what, how and when

Duncan Gray August 2026

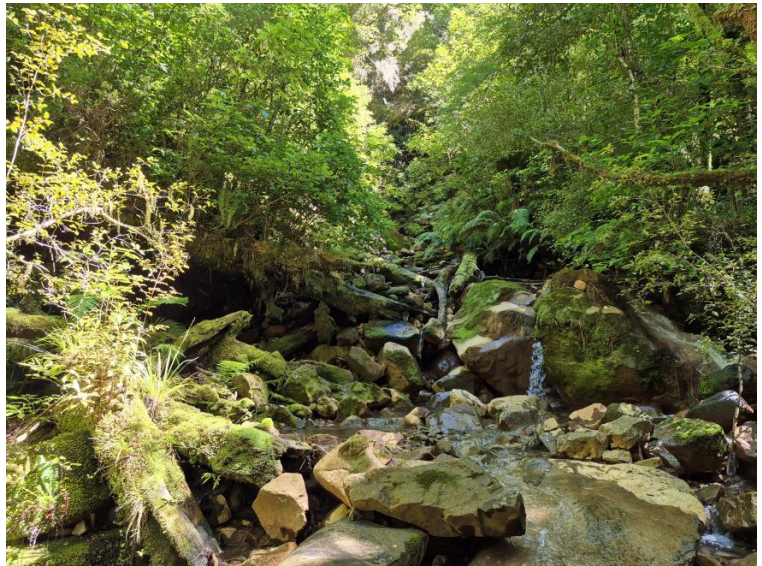
inStream CONSULTING LTD

Rehabilitation / Restoration - What?!

- Not defined in the legislation (so far?!) and so interpretation defaults to the ordinary meaning

Rehabilitate – return to **a** former state.
Restore – return to a **functional** condition, not necessarily the original one.

To achieve good ecological health (RMA/NPS-FM)





Former state - Ecological context

- What sort of streams have we got nearby or now





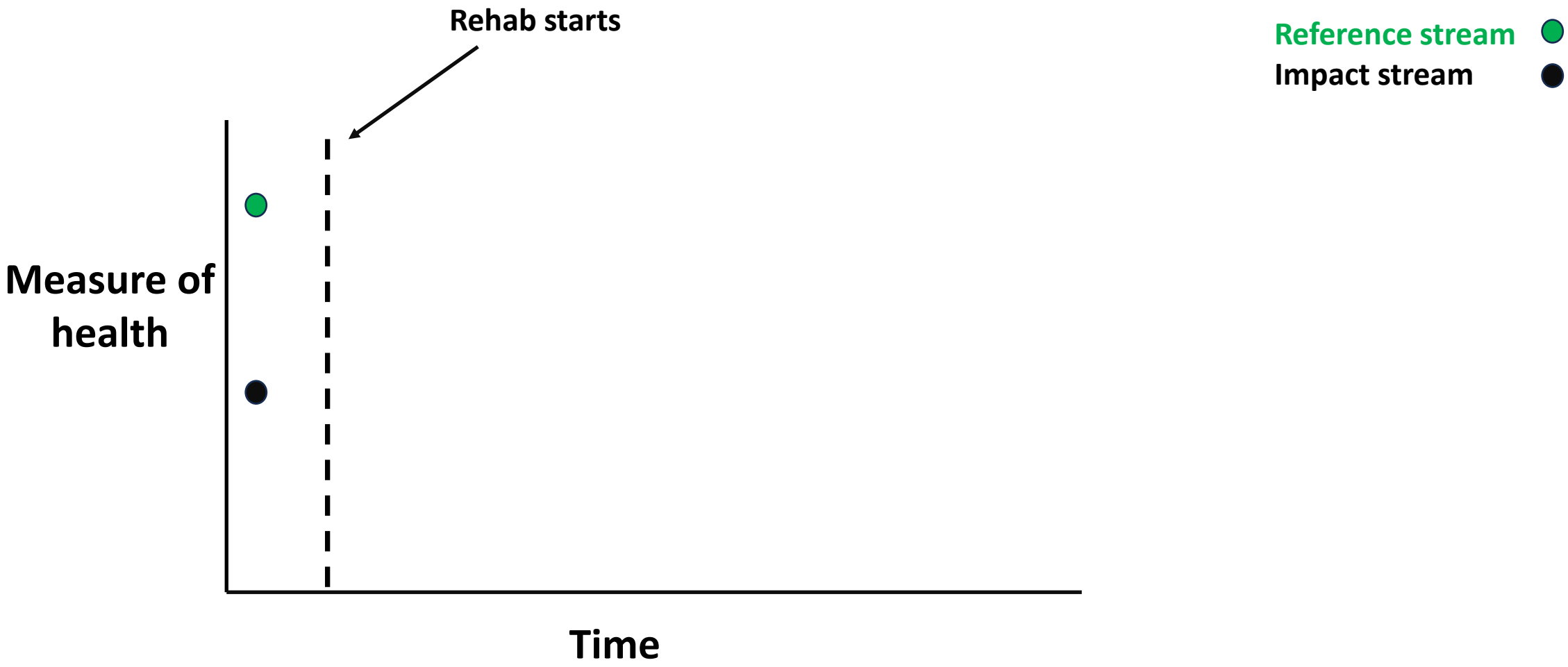


Critical to establish your reference condition

Before versus after
Reference versus impacts sites → Avoids generic defaults
Ideally both

inStream CONSULTING LTD

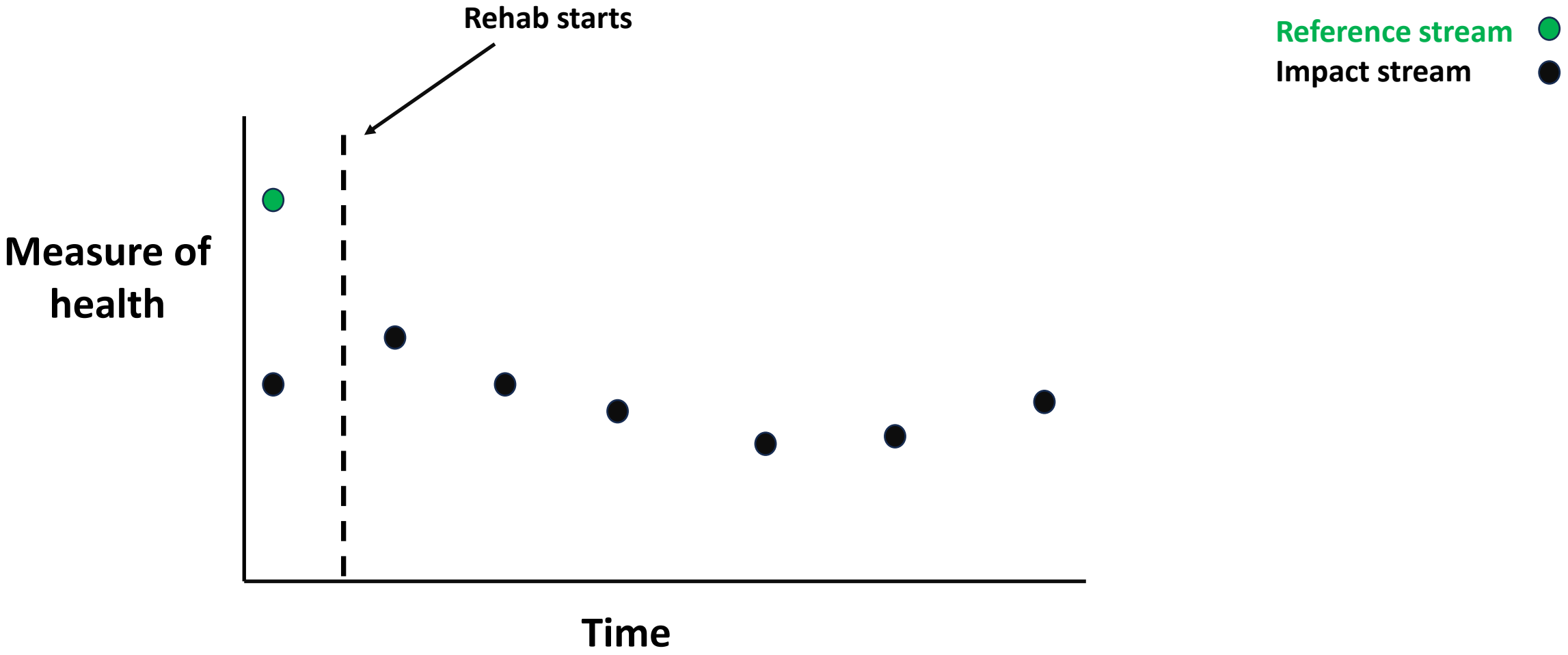
Former state – Reference condition



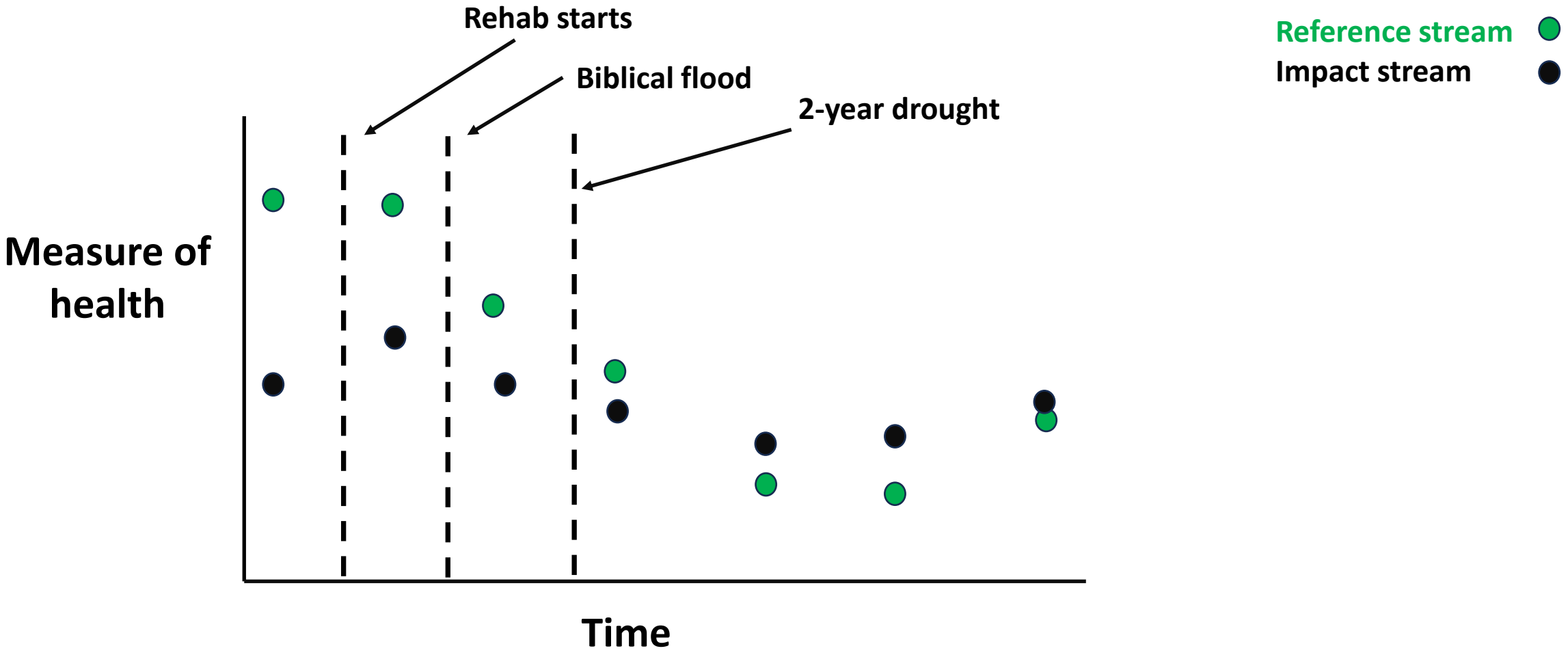
Reference condition is not static over time

inStream CONSULTING LTD

Former state - Ecological context



Former state - Ecological context



Don’t scrimp on reference sites as they are the barometer that keeps your compliance rooted in reality rather than a idealised state

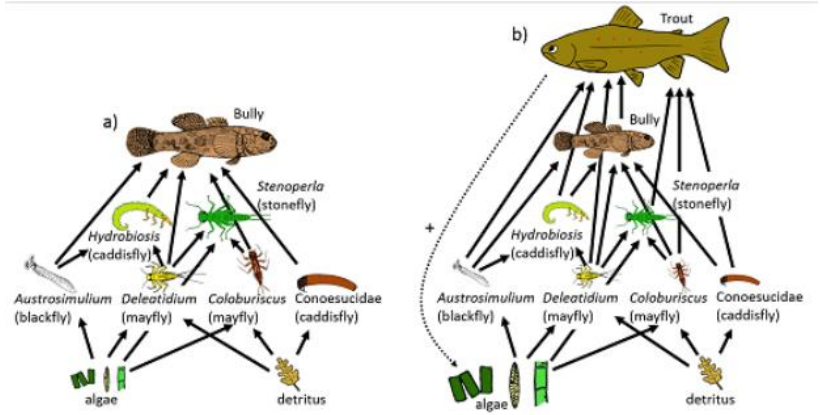
inStream CONSULTING LTD

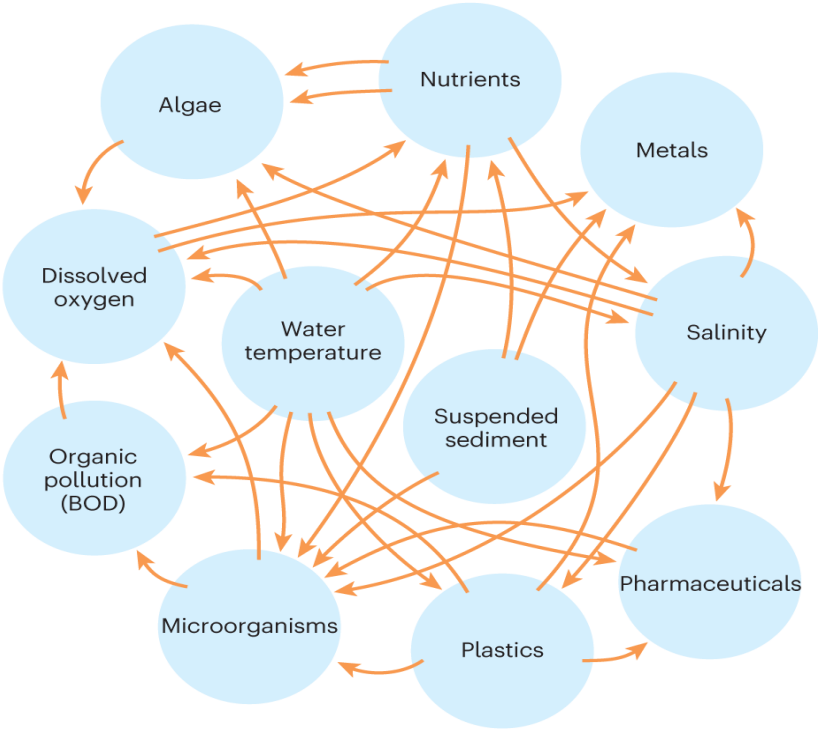
Functional state, but not always original

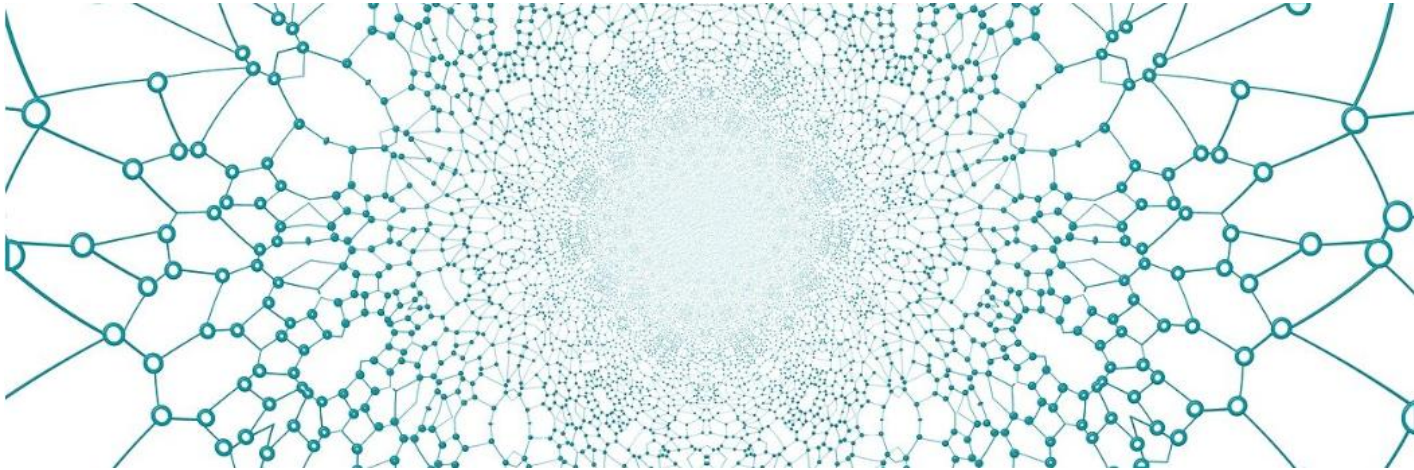
Ecosystem function refers to the **biological, geochemical, and physical processes and interactions that make an ecosystem**

Our rehabilitated stream will show similar functional complexity to our reference condition which is assumed will achieve our health criteria etc.

Help we need proxies!

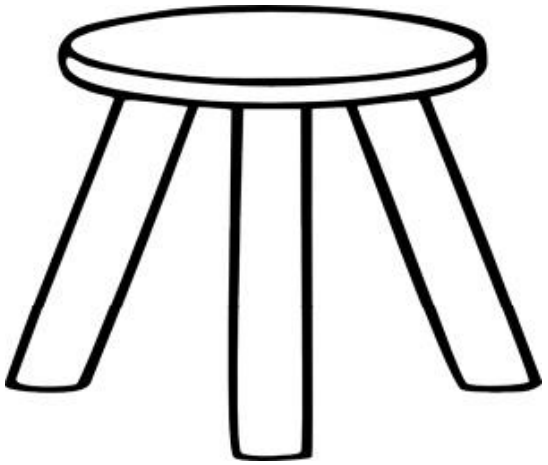






Functional state, but not always original

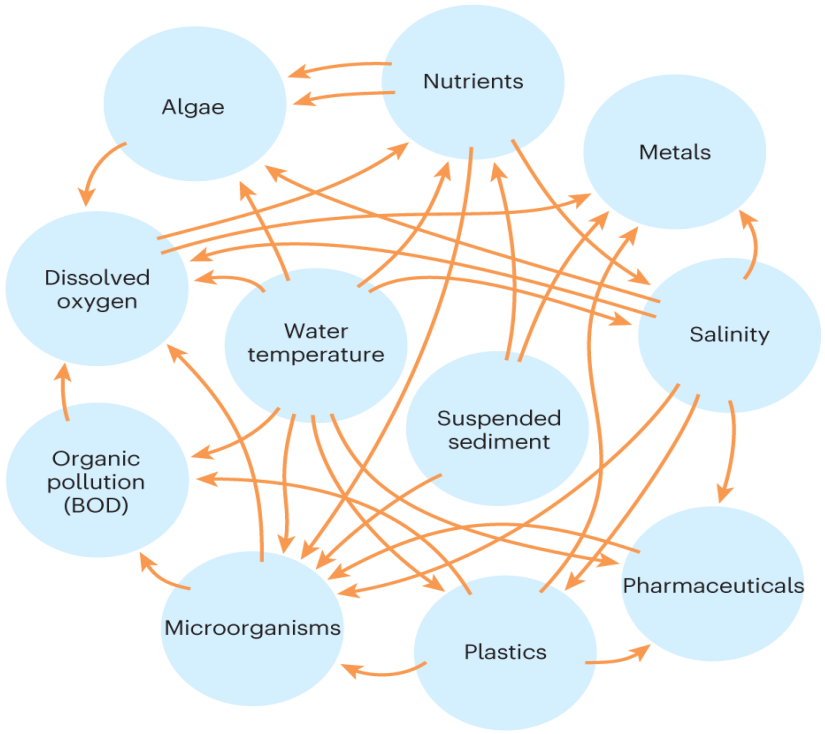
Ecosystem Health etc.



Water quality – chemistry

Habitat
Real estate & food resources

Water quantity-
Flows high & low



inStream CONSULTING LTD

Ecological health – water quality

Measure contaminants and compare to toxicity and eutrophication guidelines.

ANZG guidelines may be subject to modification

e.g. copper toxicity

- More toxic at lower pH,
- Less toxic at high DOC



instream CONSULTING LTD

Ecological health – water quality

Measure contaminants and compare to toxicity and eutrophication guidelines.

ANZG guidelines may be subject to modification

e.g. copper toxicity

- More toxic at lower pH,
- Less toxic at high DOC



ANZG contaminant thresholds are defaults –not always appropriate for your streams

instream CONSULTING LTD

Ecological health – water quantity

Stable



Sets the character of the stream and the biota present

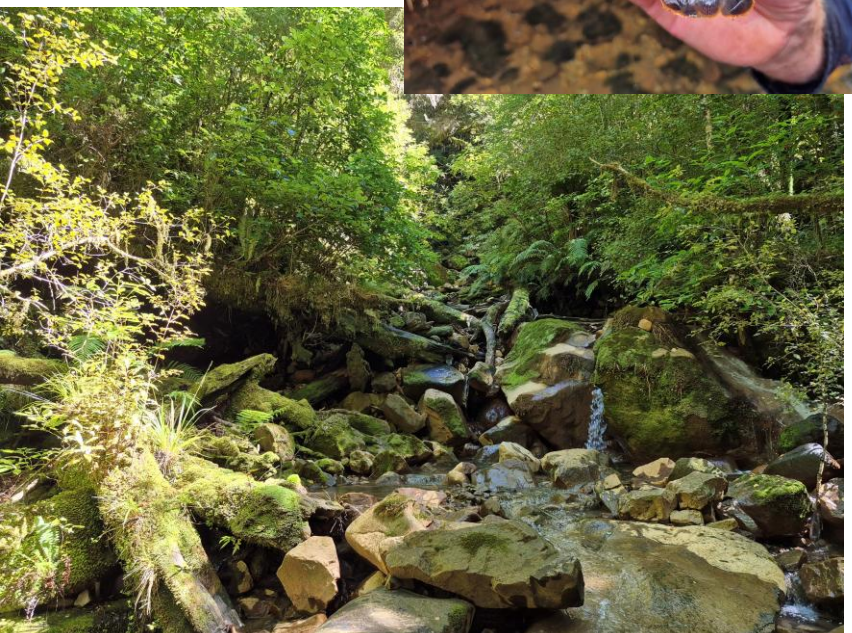
Flashy



Ecological health - habitat







Geomorphology
Wood debris
Overhung banks
Substrate
Vegetation







Ecological health - habitat

Natural stream water quality and flow

Low measures of health

Bedrock provides limited habitat and no refuge



Habitat is key context

To restore function and health, habitat must be considered

inStream CONSULTING LTD

Ecological health – critters

Macroinvertebrates

- >0.25mm
- >600 species in New Zealand
- Time integrate all stressors
- Relatively sedentary, diverse and abundant
- They display a broad range in tolerance to stressors
- We know how each species responds and have crafted numeric indices

But











Ecological health – critters

But

Generic indices used for national reporting typically cater for the

Beware the Macroinvertebrate Community Index (MCI)

Use Acid Mine Drainage Index (AMDI) or reference site taxa list











Ecological health – critters

Fish

Less informative on function and health, but high cultural public interest









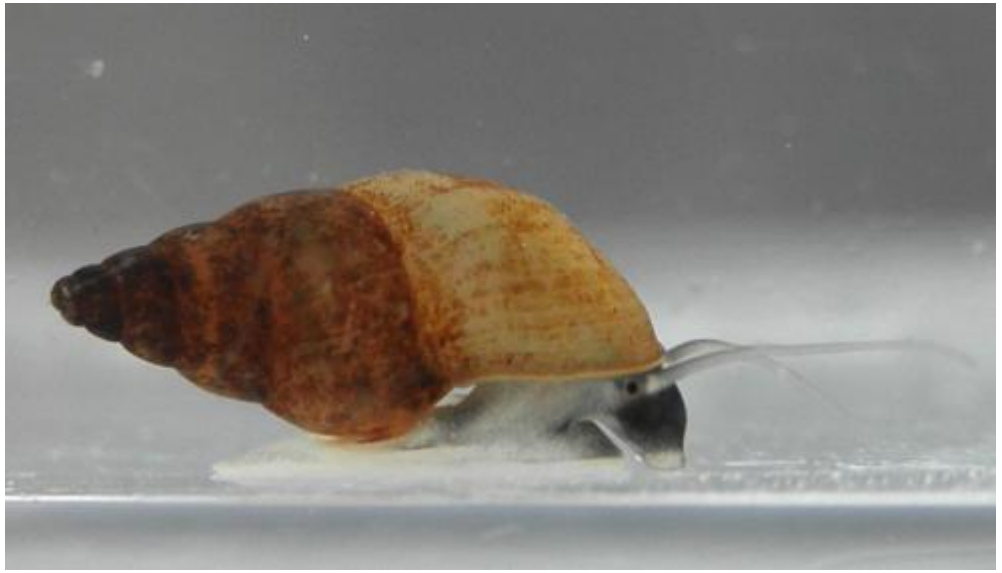


When?

Flow, quality and habitat looking great.
Where are the bugs and fish?



- Dispersal takes time
- Where is the source?
- Fish cant fly
- Translocations





inStream CONSULTING LTD

Summary

- **Set the endpoint yourself –define a site-specific and dynamic reference condition or a generic default may be applied.**



inStream CONSULTING LTD

Summary

- **Set the endpoint yourself –define a site-specific and dynamic reference condition or a generic default may be applied.**

- **Reference data is cheap insurance – Paired reference sites separate exogenous effects from your operation**



inStream CONSULTING LTD

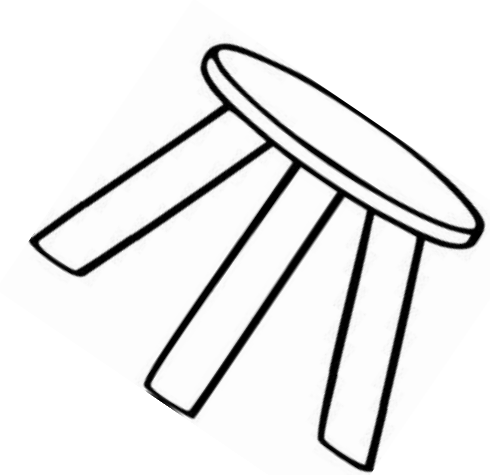
Summary



- **Set the endpoint yourself –define a site-specific and dynamic reference condition or a generic default may be applied.**

- **Reference data is cheap insurance – Paired reference sites separate exogenous effects from your operation**

- **Manage/measure the whole system- water quality, flow, habitat**



inStream CONSULTING LTD

Summary



- **Set the endpoint yourself –define a site-specific and dynamic reference condition or a generic default may be applied.**
- **Reference data is cheap insurance – Paired reference sites separate exogenous effects from your operation**
- **Manage/measure the whole system- water quality, flow, habitat**
- **Budget for time, not just works – biota may lag behind changes to water quality, flow and habitat, so set staged, realistic milestones**