Describing river natural character

Richard Storey

Natural Character attributes

Identified by RWC	Suggested for Bayesian Network
Morphology (pool:riffle ratio, sinuosity, bank condition)	River shape: braidedness, sinuosity, channel shrinkage, diversity of flow types (?), mechanical modifications
Flow regime	Baseflow (% of MALF)
Visual clarity/Suspended sediment	Visual clarity
Macrophyte cover	Encroaching vegetation
Riparian index: vegetation amount	Riparian vegetation extent
Riparian index: vegetation type	Riparian vegetation type
Periphyton (algal) cover and biomass	Periphyton biomass or % cover
Sediment deposition	Deposited fine sediment
Primary senses (blind person test)	
Instream habitat	
	Structures/mechanical modifications

Natural Character attributes

Identified by RWC	Suggested for Bayesian Network
Morphology (pool:riffle ratio, sinuosity, bank condition)	River shape: braidedness, sinuosity, channel shrinkage, diversity of flow types (?), **mechanical modifications**
Flow regime	Baseflow (% of MALF)
Visual clarity/Suspended sediment	Visual clarity
Macrophyte cover	Encroaching vegetation
Riparian index: vegetation amount	Riparian vegetation extent
Riparian index: vegetation type	**Riparian vegetation type**
Periphyton (algal) cover and biomass	Periphyton biomass or % cover
Sediment deposition	Deposited fine sediment
Primary senses (blind person test)	
Instream habitat	
	Structures/mechanical modifications

Encroaching vegetation

Discussion points

- Any attributes missing?

- Can any attributes be removed?

Consider:

- Attributes should be visual (Natural character is "perceived").

- As few attributes as possible

- Attributes must relate strongly to values

- Attributes should be only those that could change under the plan change

- Attributes that affect a high proportion of the river network are more useful than those that have only local impact.

States of attributes

Attribute		State 1	State 2	State 3	State 4
River shape	braidedness	low	high		
	sinuosity	low	high		
	channel shrinkage	low	high		
	Flow diversity	low	high		
	mechanical modification	?	?	?	?
	baseflow				
	water clarity	0 to 1.4 m	1.4 to 3.75 m	3.75 to 5 m	> 5 m
	encroaching veg	low	high		
	riparian veg extent	low	med	high	
	riparian veg type				
	periphyton cover	0-50 mg/m²	50-120 mg/m²	120-200 mg/m²	>200 mg/m²
	deposited sediment				

Discussion points

Attribute	Issue
Mechanical modifications to shape or appearance (for flood control) Structures	How can it be measured?
Riparian vegetation type	What types to consider? e.g. exotic vs. native, tree vs. shrub What types would score high vs. low?

How to combine attributes?

- Straight average?

- Weighted average? What weights?

- Other (e.g. minimum value)?

States of attributes

Attribute	Sub-attribute	weight
River shape	braidedness	
	sinuosity	
	channel shrinkage	
	flow diversity	
	mechanical mod	
baseflow		
water clarity		
encroaching veg		
structures/mod		
riparian veg extent		
riparian veg type		
periphyton cover		
deposited sediment		

Bayesian Network for examining effects on ecological values

Richard Storey

Ecological attributes in the network

Attribute	measure	States
River birds	Abundance or no. of species	OK, not OK
Periphyton (algae)	Biomass (mg/m^2)	Four NOF bands
Cyanobacteria (toxic algae)	% cover	<20%, >20%
Macroinvertebrate Community Index	MCI units	Four quality classes
Native fish: taonga spp (LF&SF eels, inanga, black flounder, mudfish, lamprey FW mussels, koura)	Abundance (% change from present)	Decline, stable, increase
Native fish: ecological indicator (redfin bullies)	Abundance (% change from present)	Decline, stable, increase
Trout	size & abundance	
Suitability for swimming		OK, not OK
Natural character		Poor, med, good

Supporting attributes

- Water quality:
  - clarity
  - Water temperature
  - Dissolved nutrients (N, P)
  - Dissolved oxygen
  - Suspended sediment
  - *E. coli* bacteria
- River physical habitat
  - Deposited sediment
  - river shape, form
- Flows:
  - Low flow
  - Flood magnitude and frequency

Scale of outcomes

- Not location-specific
- Mostly reach-based (100s or 1000s of metres)
  - Some "point" attributes
- Usable at scale of Freshwater Management Unit (~6 administration points)
- Note: all attributes relate to Ruamahanga River and main tributaries.
  - No lake, wetland or groundwater attributes
  - No small streams

Scenarios that could be modelled

- New dam

- Changes to water abstraction

- Land use change

- Riparian planting

- Other on-farm mitigations

- Changes to river works for flood management (e.g. beach raking) and gravel extraction