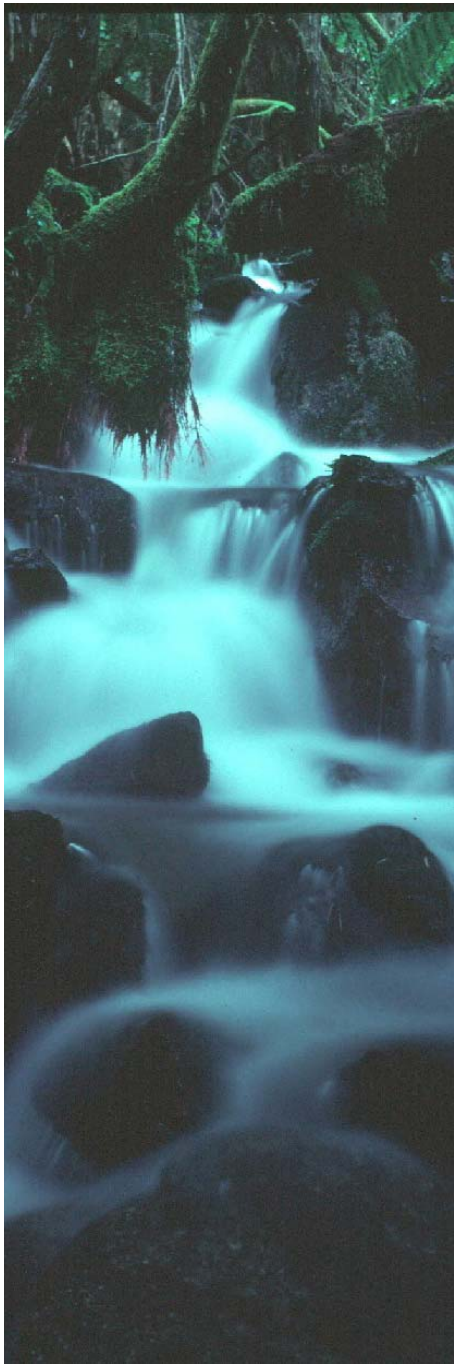
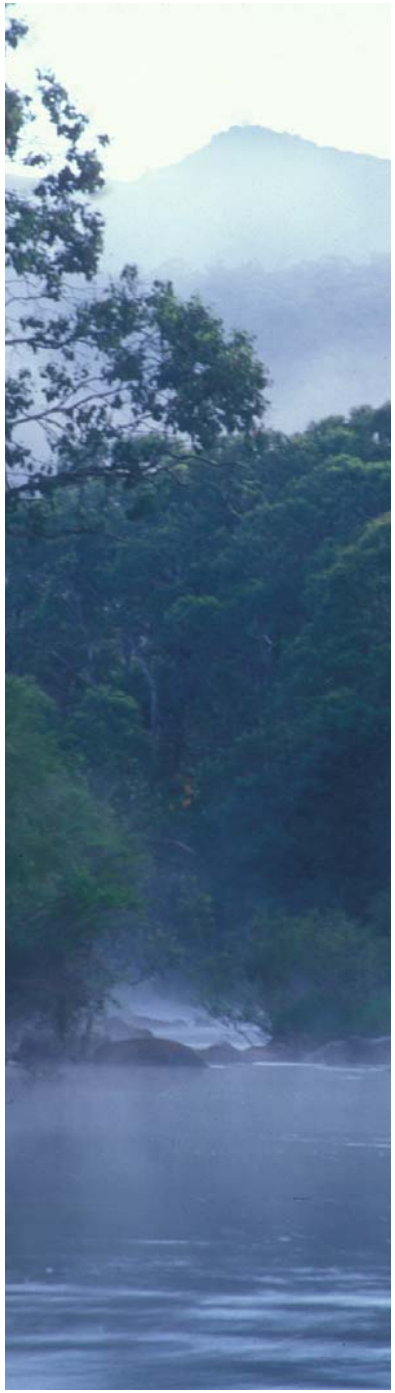


Freshwater Ecosystem classifications for natural resource planning in NSW

Planning activities using freshwater ecosystem classifications in NSW

- Biodiversity management plans: Local government, CMAs, DECCW
- Catchment Action Plans: CMAs setting targets, meeting targets
- Investment prioritization: allocation of funds to landholder for on-ground actions



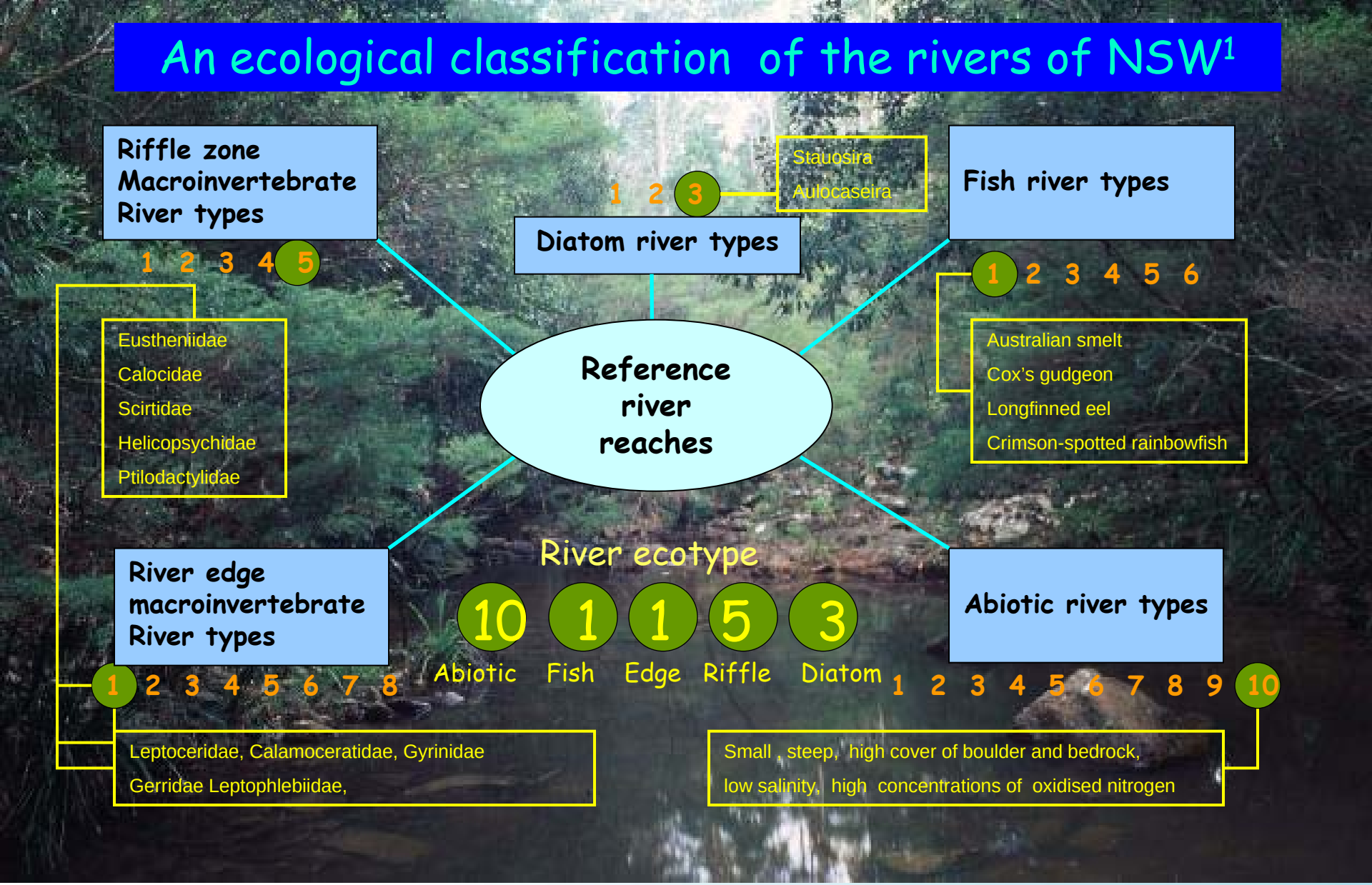
Planning for biodiversity conservation

- Persistence (including climate change considerations).
- Spatial prioritization
  - Places to protect
  - Places to restore
- Principles
  - Comprehensivenes
  - Adequacy
  - Representativeness
  - Efficiency
- Conservation Science: Systematic conservation planning

Classification and planning

- Targeting each major type of ecosystem
- Identifying types is critical for planning
- Effectiveness of plans depend on how well regional biodiversity is represented by classifications

An ecological classification of the rivers of NSW[1]



[1]Turak E. & Koop K. (2008) A multi-attribute ecological river typology for assessing river condition and conservation planning. Hydrobiologia, 603, 83-104.

River types

Abiotic-fish-edge-riffle-diatom

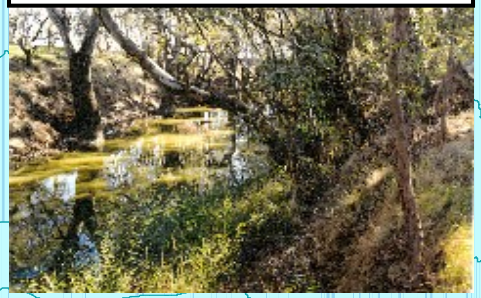
Paroo R 6-5-5-X-X

Wooli wooli R 5-4-4-X-1

Identification keys

- Distance from source
- Elevation
- Latitude
- Slope
- Mean annual rainfall

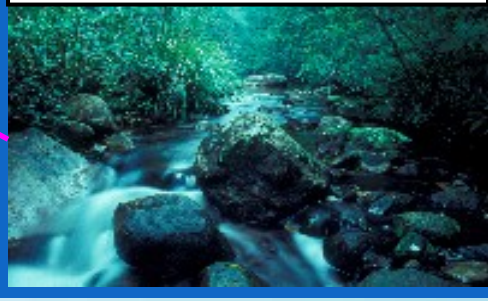
Billabong Ck 4-5-5-X-X

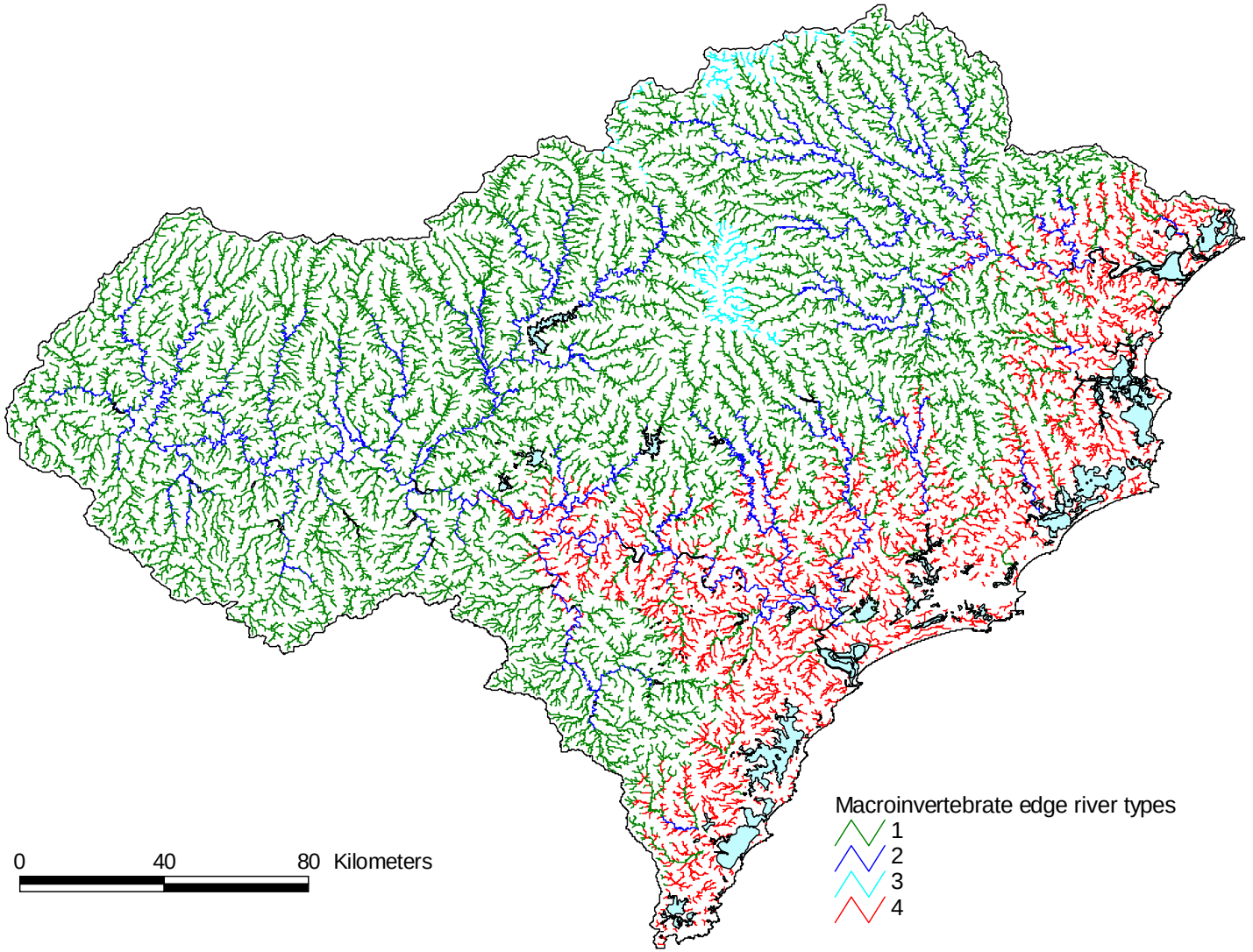


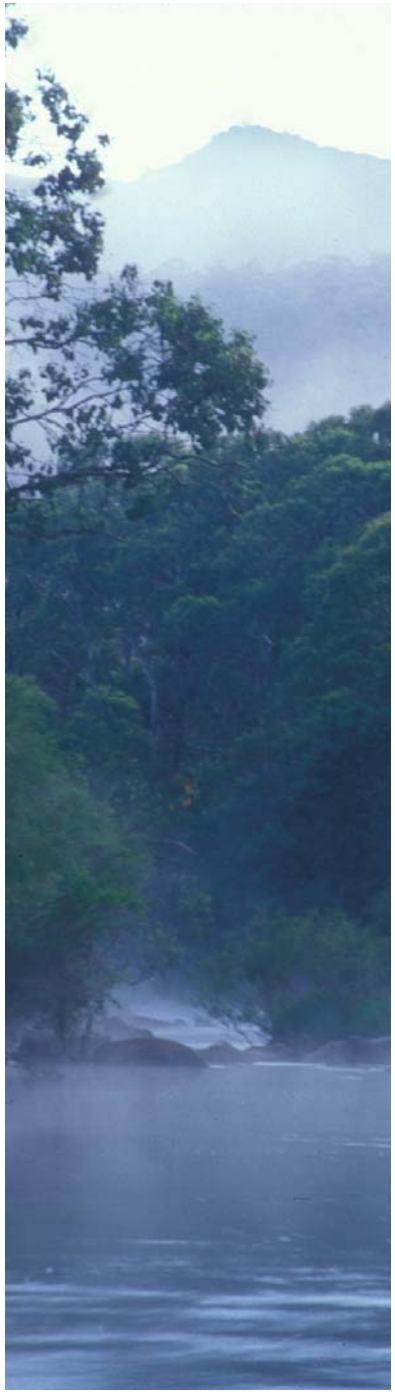
Shoalhaven R 1-1-2-2-2

Snowy R 3-2-3-3-1

Bunnair Ck 2-3-7-1-1

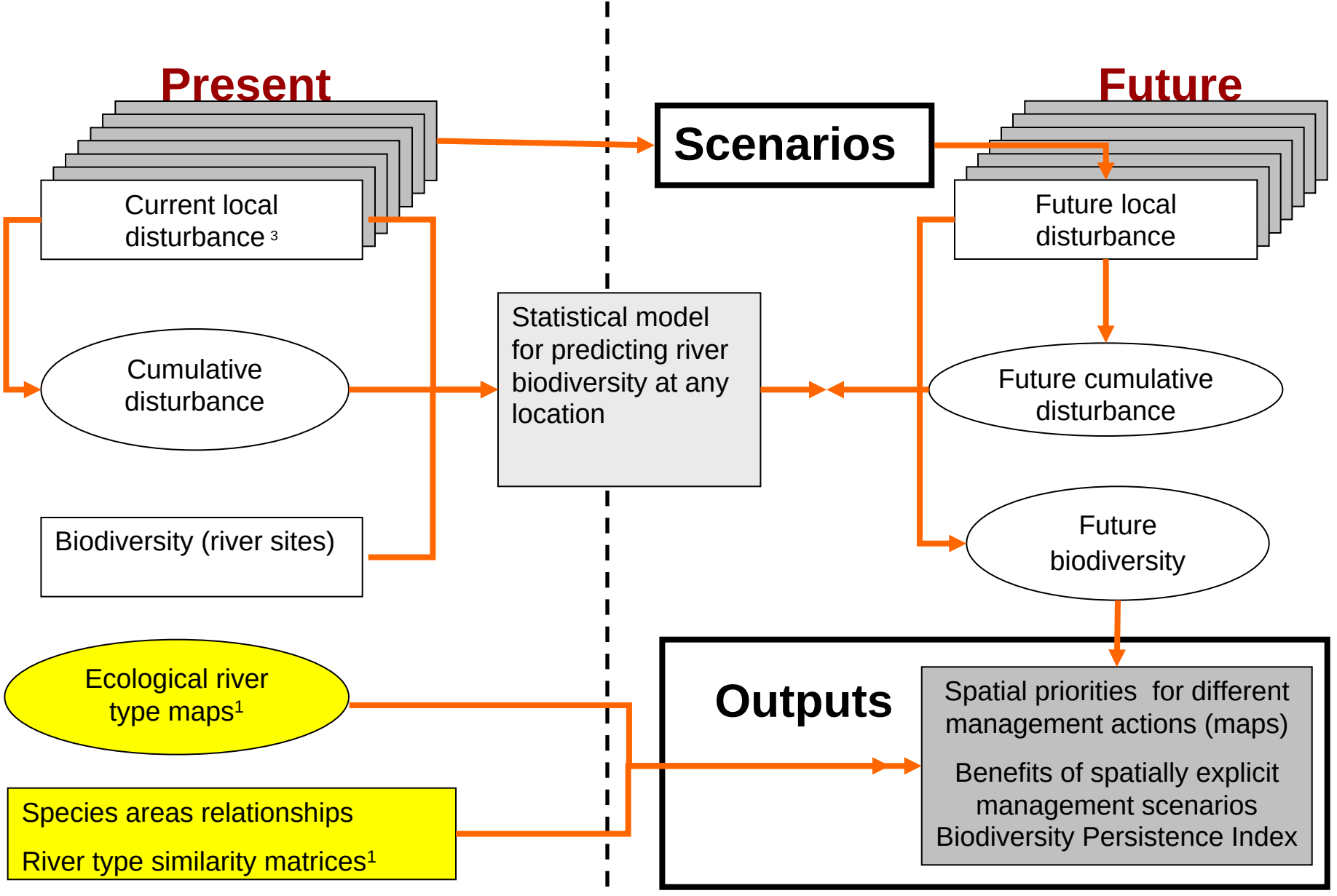



0
40
80 Kilometers
Macroinvertebrate edge river types
1
2
3
4



Ecological distance among river types

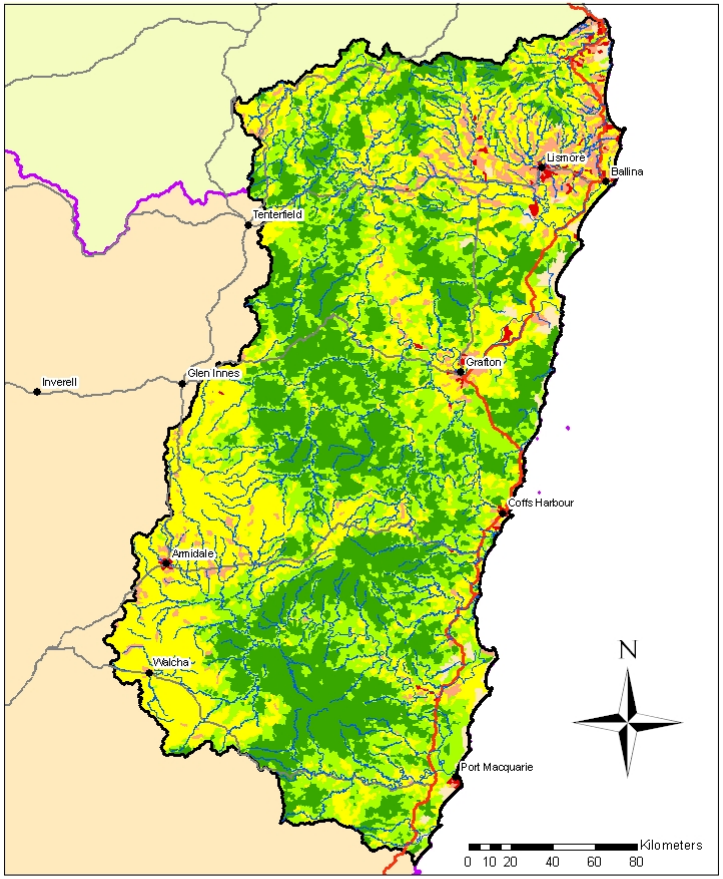
Edge River type	Dissimilarity				
	E1	E2	E3	E4	E6
E1	0				
E2	0.23	0			
E3	0.47	0.54	0		
E4	0.33	0.35	0.57	0	
E6	0.25	0.37	0.32	0.47	0
E7	0.17	0.32	0.51	0.27	0.35

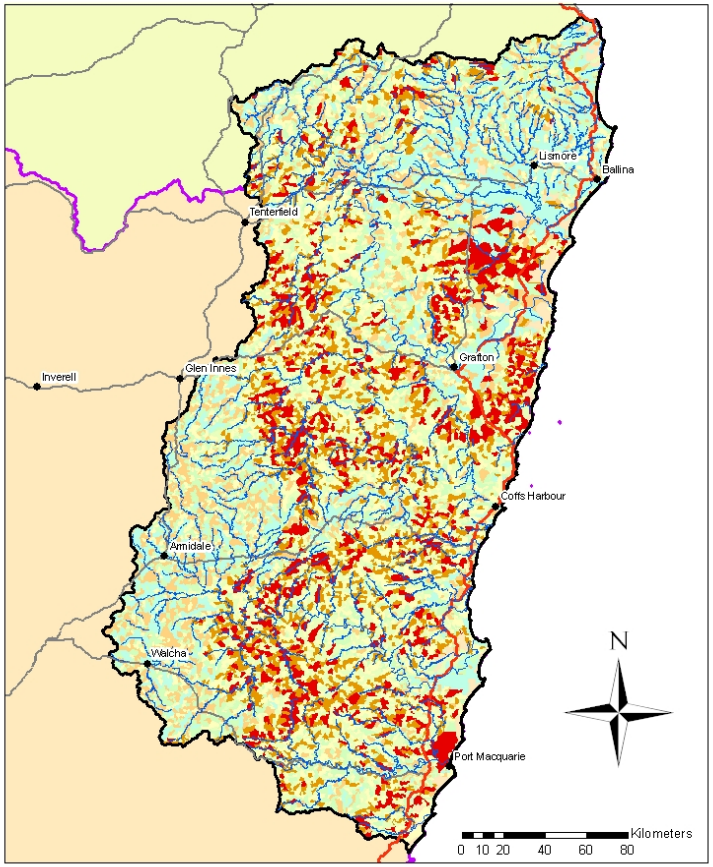


[2]Turak E, Ferrier S, Barrett TW, Mesley E, Drielsma MJ, Manion G, Doyle G, Stein J and Gordon G. (in press). Planning for persistence of river biodiversity: exploring alternative futures using process-based scenario modelling. *Freshwater Biology.*

[3]Stein, J.L, Stein J.A., Nix, H.A. 2002, Spatial analysis of anthropogenic river disturbance at regional and continental scales: identifying the wild rivers of Australia Landscape and Urban Planning, 60, 1-25.

Outputs: biodiversity condition and conservation value of river sections in the Northern Rivers Region[4]





Legend

Main Rivers
Pacific Highway
Highway
Northern Rivers CMA

NSW **River Biodiversity** / QLD **Condition**
Very good
Good
Moderate
Poor
Very poor

Legend

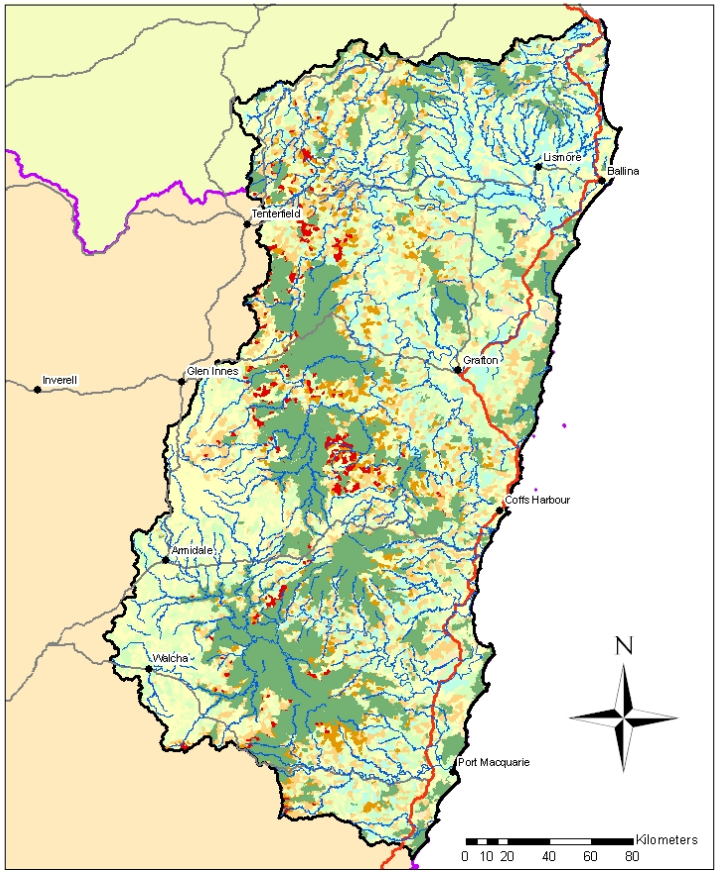
Main Rivers
Pacific Highway
Highway
Northern Rivers CMA

NSW QLD **River Section** / **Conservation Priority**
Very high
High
Low
Moderate
Moderate-high
Moderate-low
Very low

Department of Environment, Climate Change and Water NSW

[4]DECC 2009 Draft Northern Rivers Regional Biodiversity Management Plan: Appendix 9. Planning for the persistence of river biodiversity in the Northern Rivers Region. Department of Environment and Climate Change.

Outputs: catchment protection and restoration priorities in the for river biodiversity in the Northern Rivers region

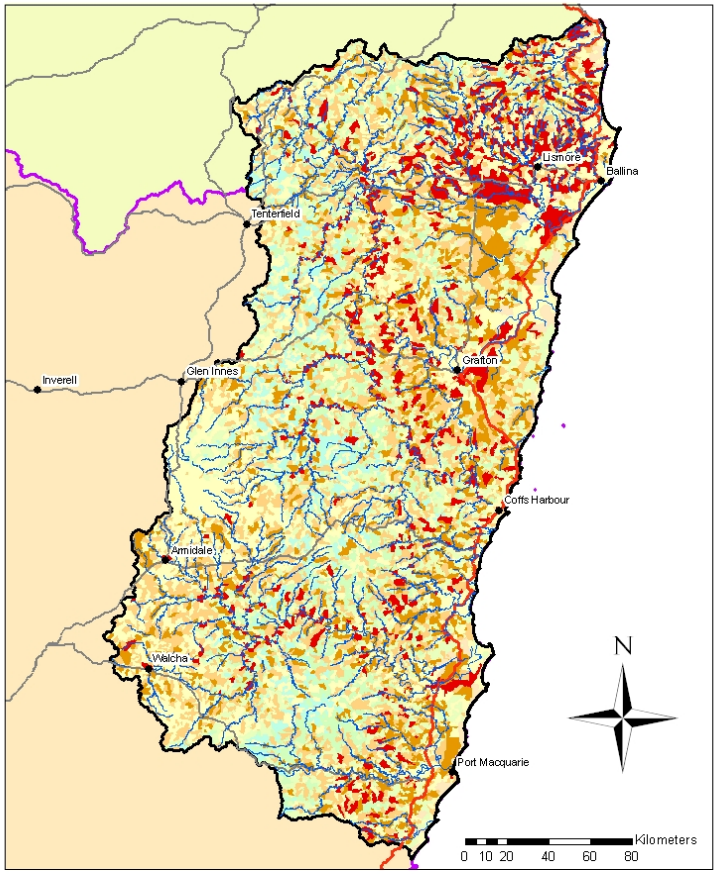


Legend

- Main Rivers
- Pacific Highway
- Highway
- Northern Rivers CMA
- National Parks
- NSW
- QLD

Protection Priority

- Very high
- High
- Moderate-high
- Moderate
- Moderate-low
- Low
- Very low



Legend

- Main Rivers
- Pacific Highway
- Highway
- Northern Rivers CMA
- NSW
- QLD

Restoration Priority

- Very high
- High
- Moderate-high
- Moderate
- Moderate-low
- Low
- Very low

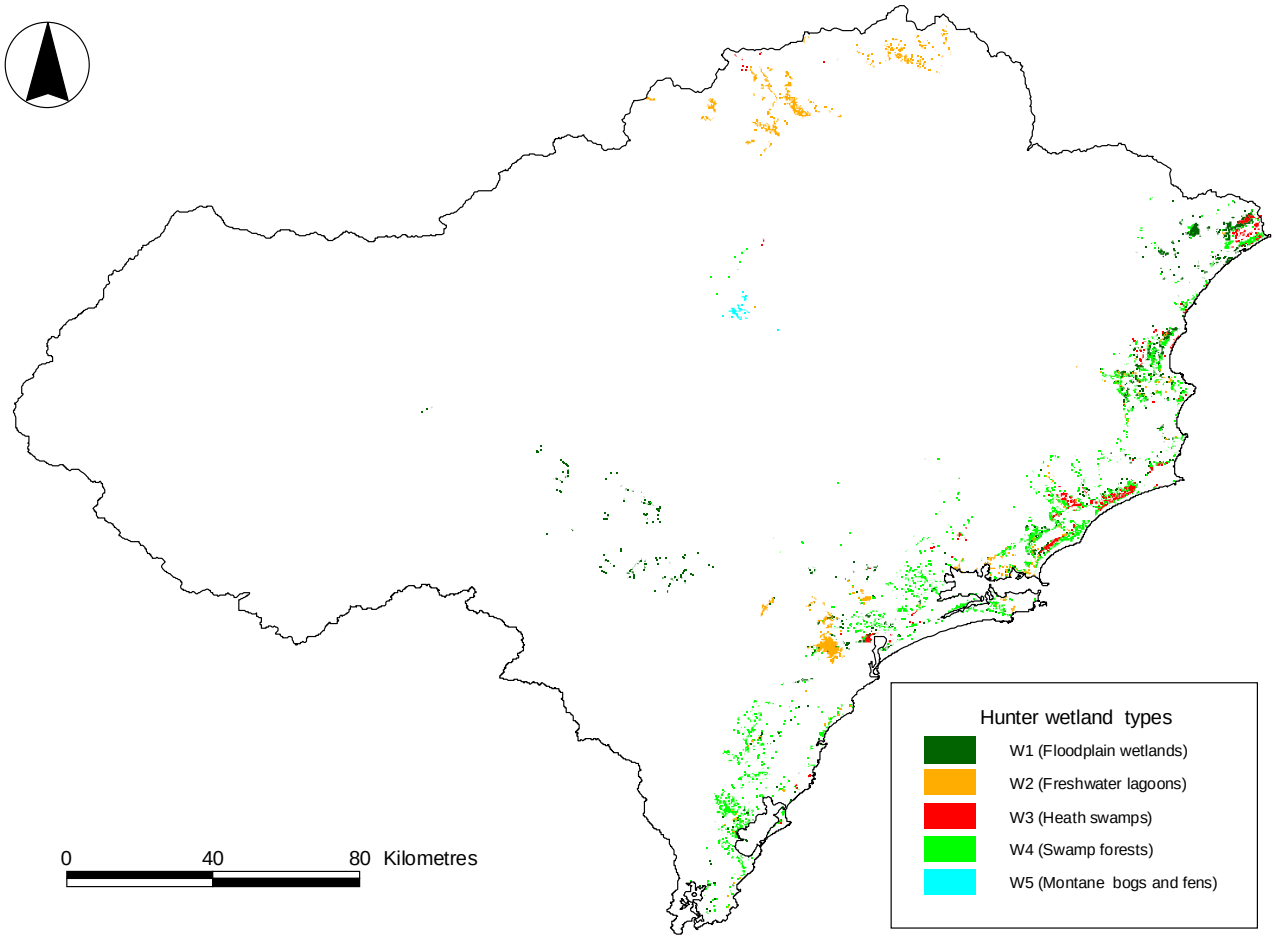
How about wetlands ?

- **A top-down hierarchical, hydrogeomorphic classification**
  - **Not mapped**
  - **Exploring mapping rules using classification trees**
- **Vegetation formations[5]**
  - **State-wide mapping at poor resolution**
  - **Converted in to finer resolution maps in the Hunter region**
- **Vegetation Classification and Assessment database[6]**
  - **Detailed mapping in the Murray**
  - **Plant assemblage matrix can be constructed**

[4]Keith D.A. 2004. Ocean Shores to Desert Dunes. The Native Vegetation of NSW and the ACT. Department of Environment and Conservation

[6]Benson, J.S. (2006) New South Wales Vegetation Classification and Assessment: Introduction - the classification, database, assessment of protected areas and threat status of plant communities. *Cunninghamia* 9(3): 329-381.

Wetland vegetation formations in the Hunter region



Ecological distance between wetland types

Wetland type	Dissimilarity				
	W1	W2	W3	W4	W5
W1	0				
W2	0.827	0			
W3	1	0.959	0		
W4	0.871	0.938	0.797	0	
W5	0.976	0.955	0.922	0.971	0

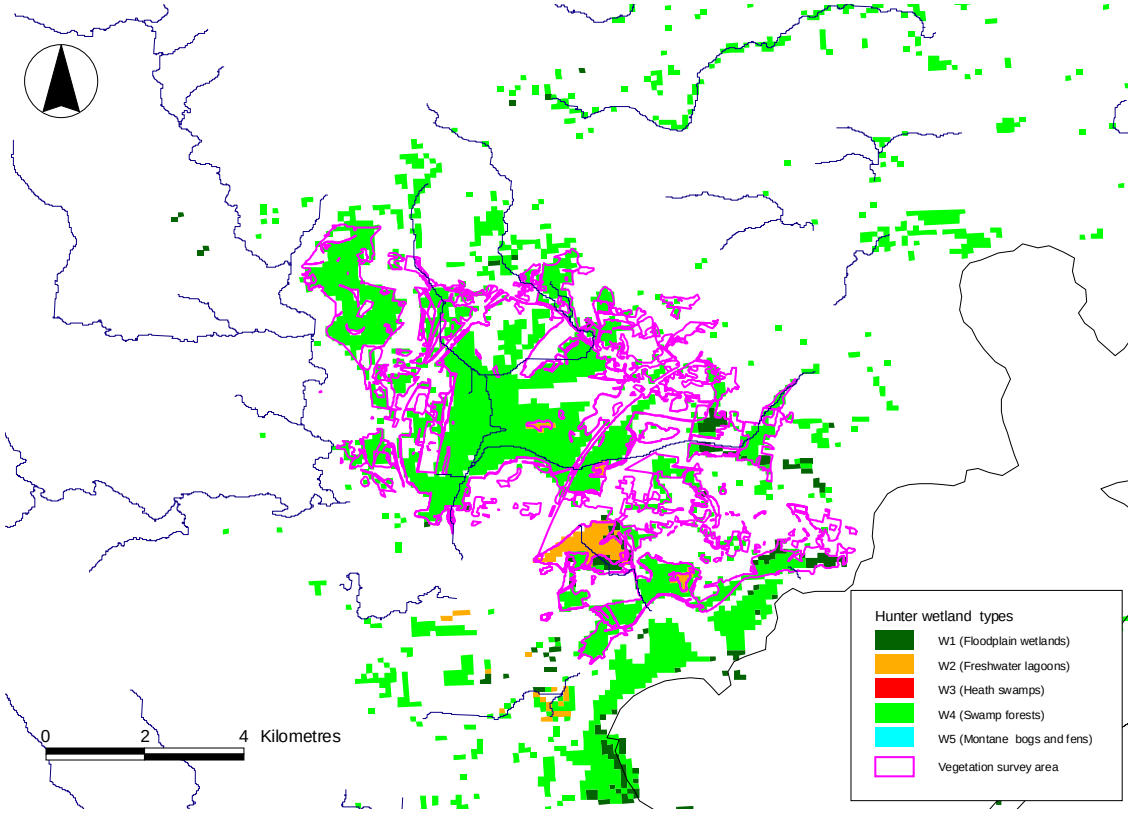
Department of Environment, Climate Change and Water NSW

[1]Stein, J.L, Stein J.A., Nix, H.A. 2002, Spatial analysis of anthropogenic river disturbance at regional and continental scales: identifying the wild rivers of Australia Landscape and Urban Planning, 60, 1-25.

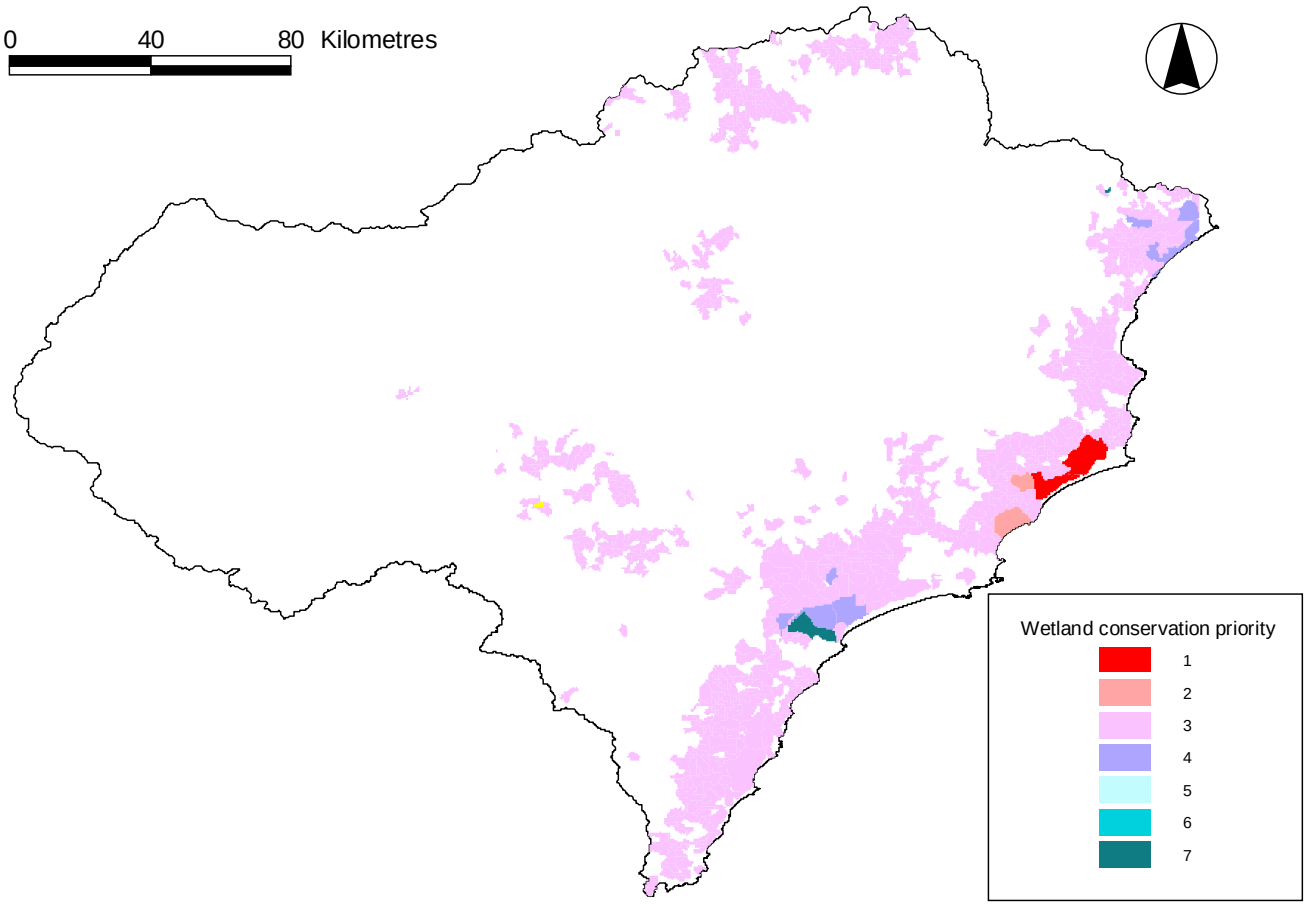
[2]Turak E. & Koop K. (2008) A multi-attribute ecological river typology for assessingriver condition and conservation planning. Hydrobiologia, 603, 83-104.

[3]Turak E, Ferrier S, Barrett TW, Mesley E, Drielsma MJ, Manion G, Doyle G, Stein J & Gordon G. (in press). Planning for persistence of river biodiversity: exploring alternative futures using process-based scenario modelling. Freshwater Biology.

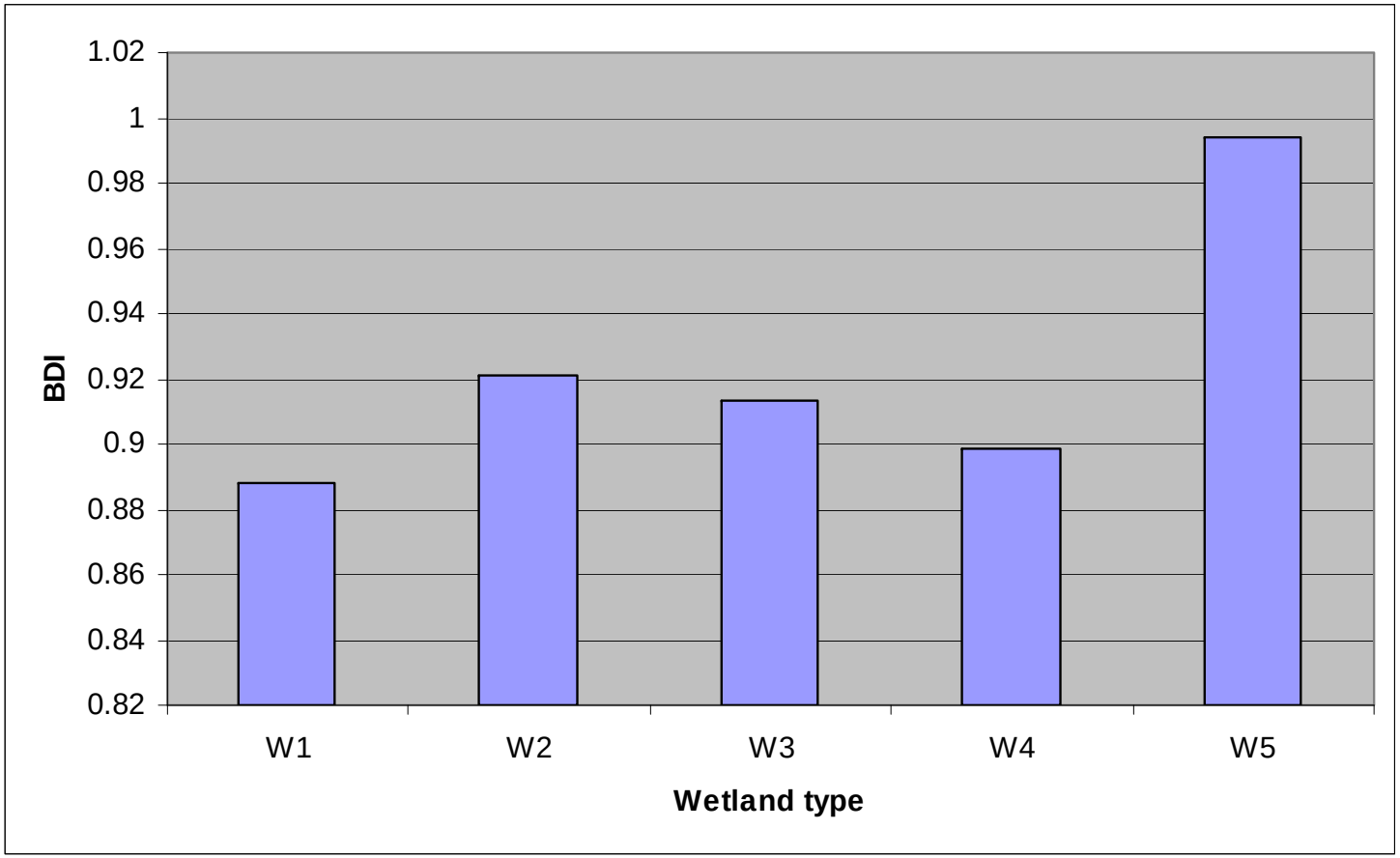
Wyong wetlands: vegetation formations and survey area



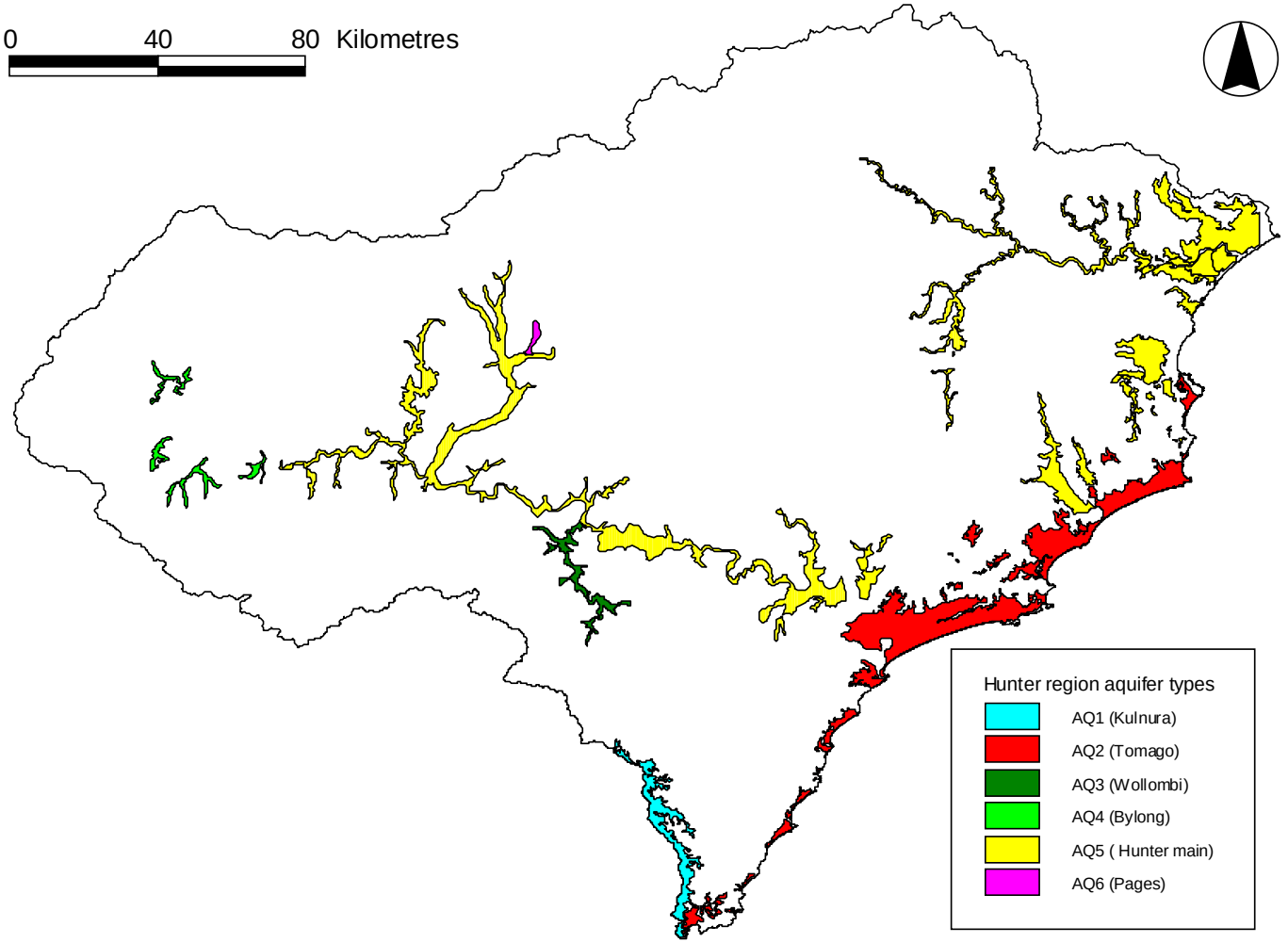
Wetland conservation priority

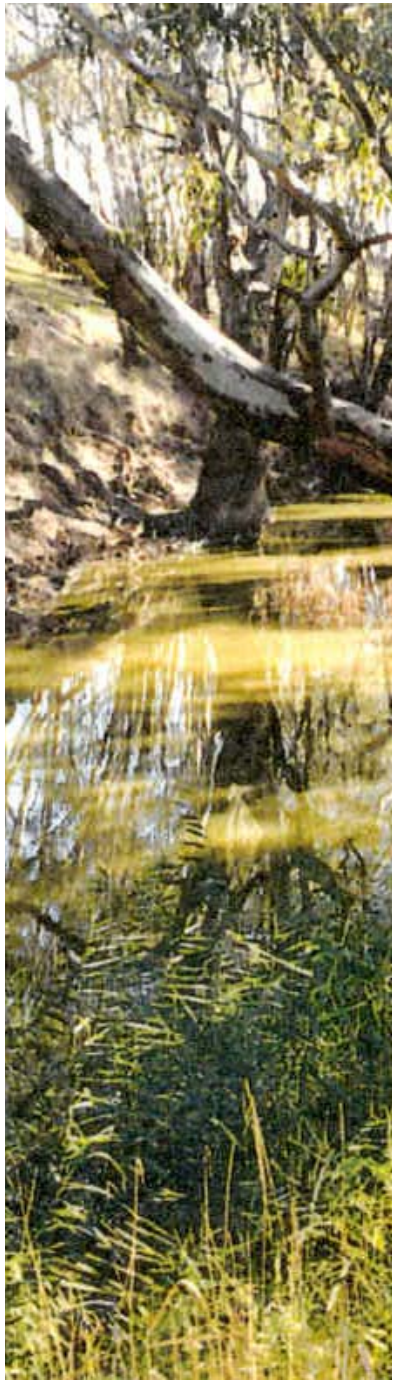


Wetland types

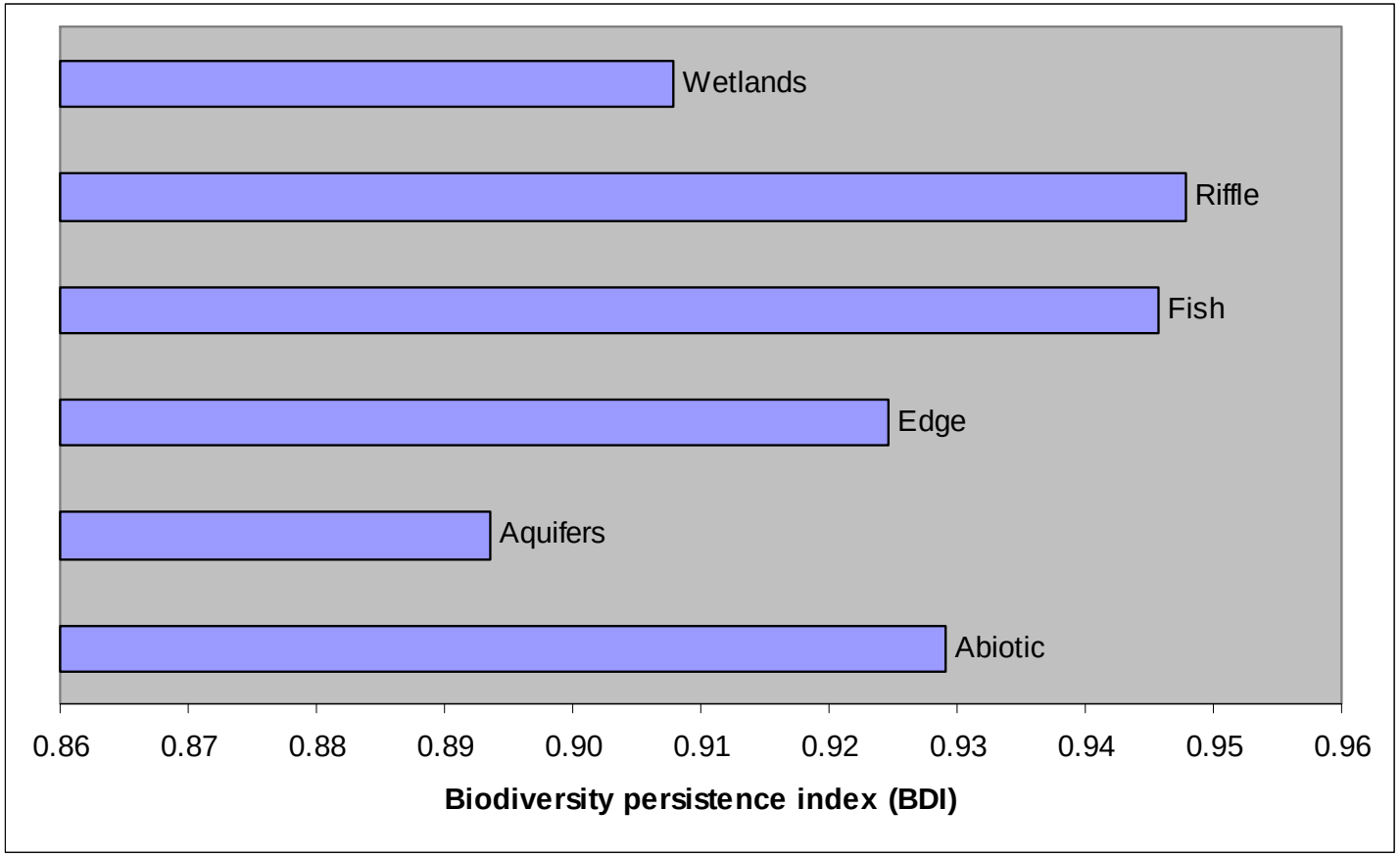


Aquifer types in the Hunter region





Regional biodiversity assessment of different aquatic ecosystem types in the Hunter



results

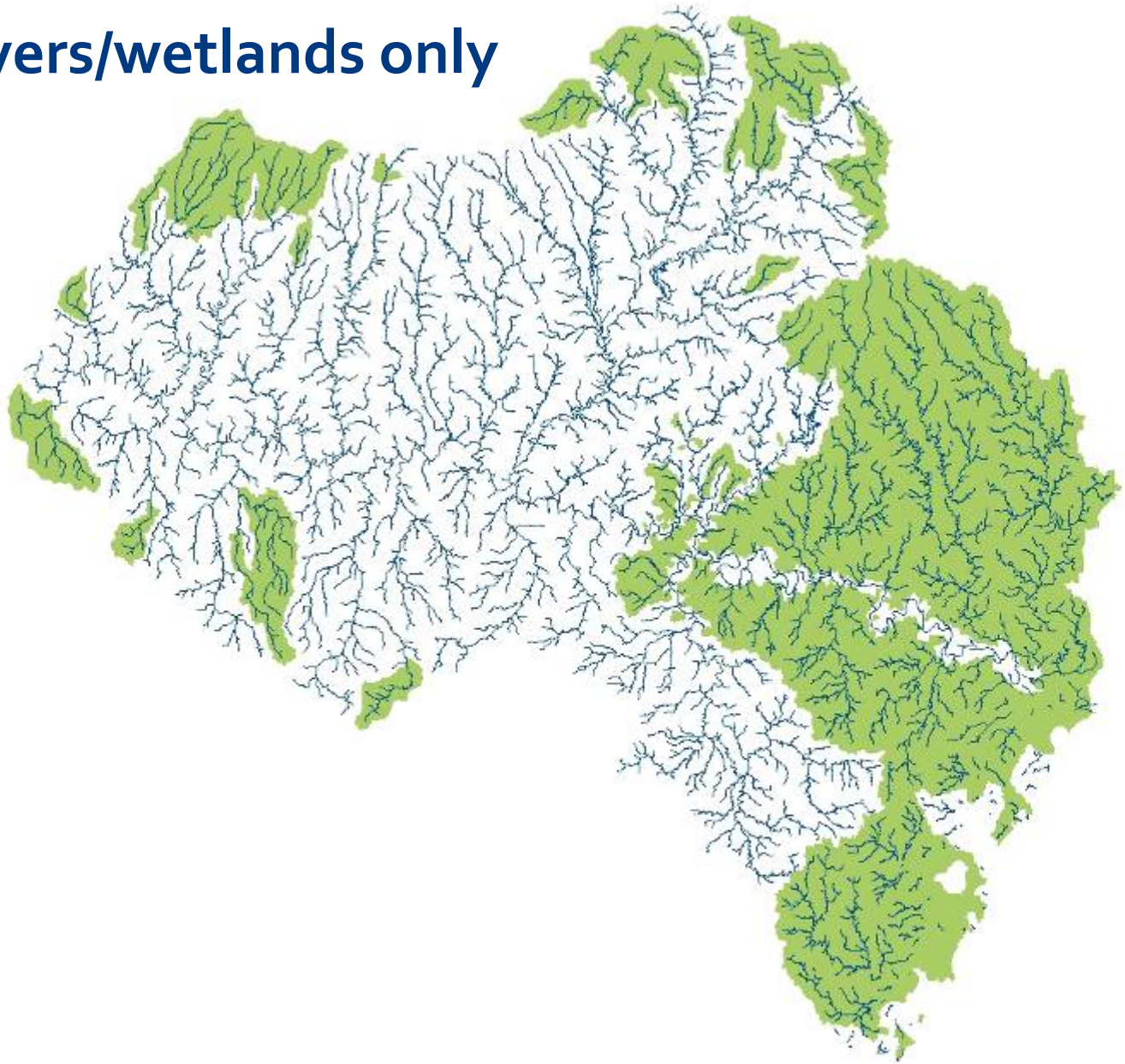
MARXAN run rivers/wetlands only

CP

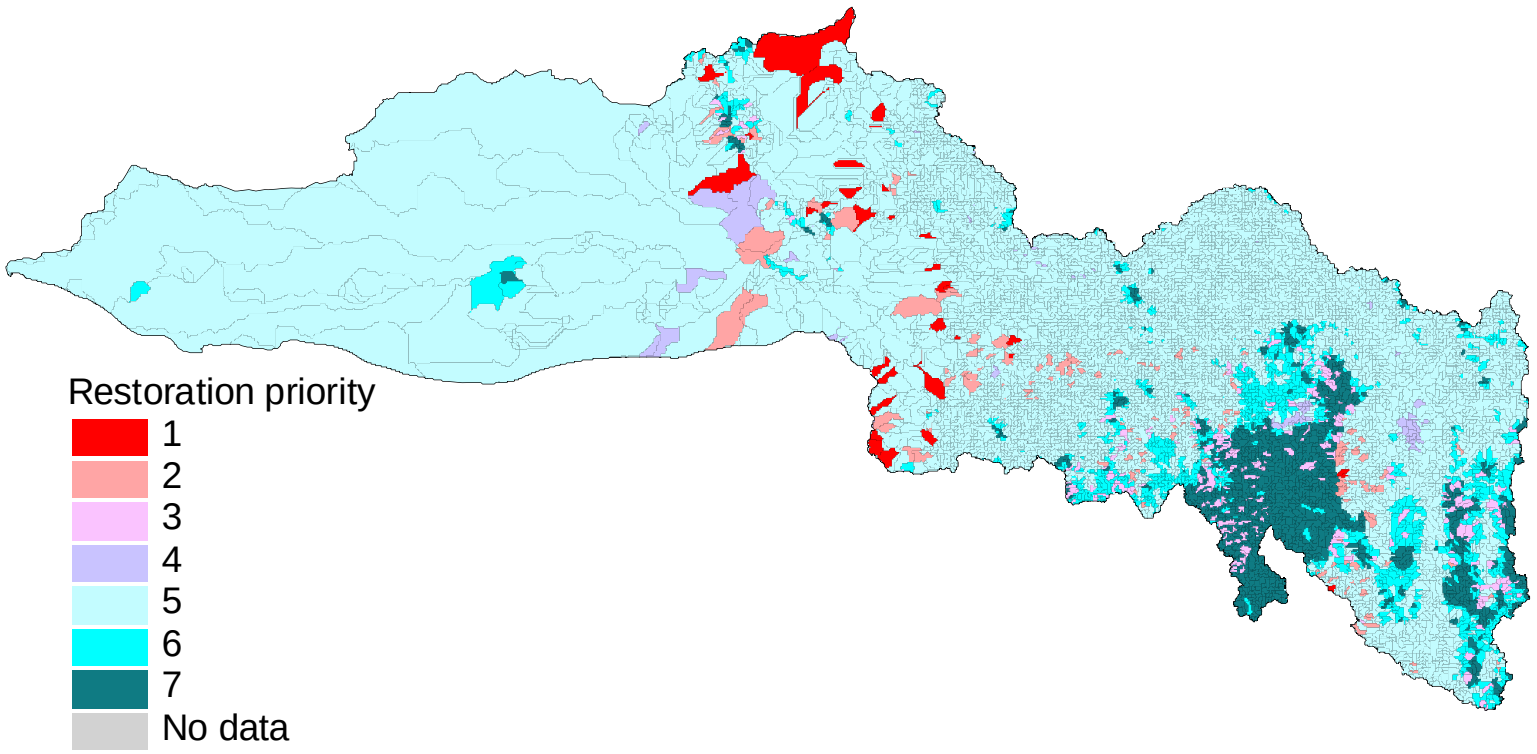
2

1

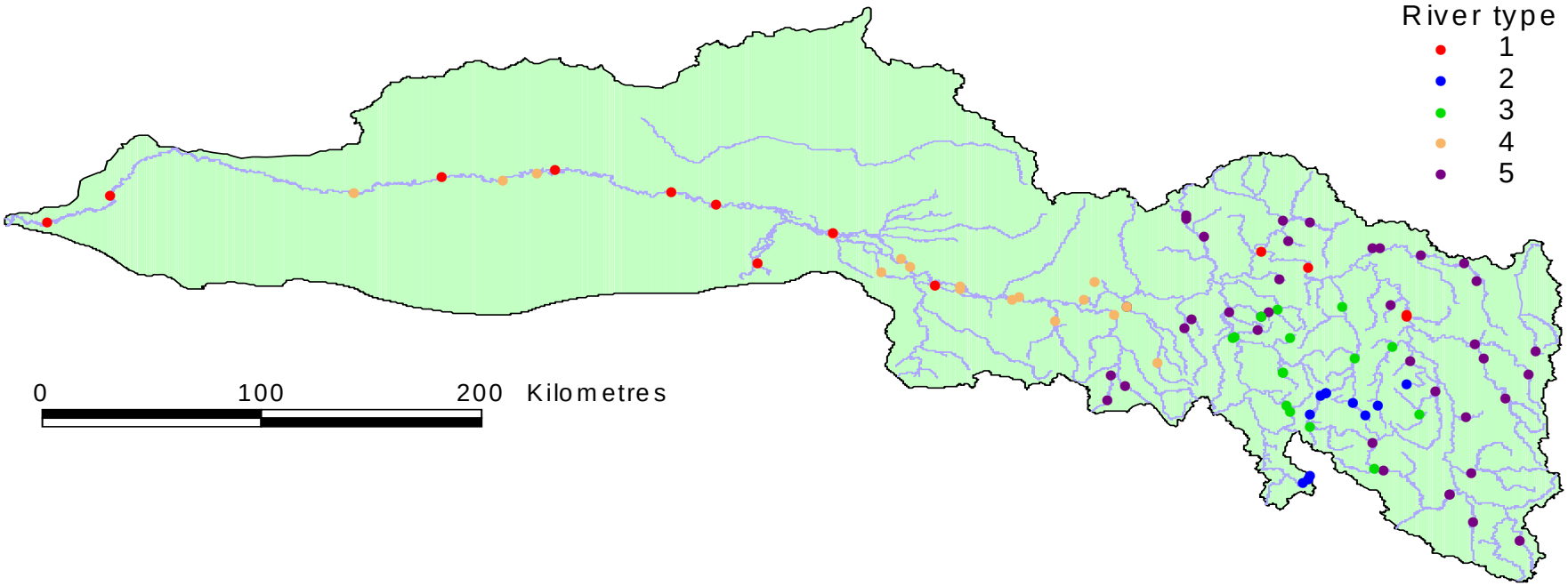
0

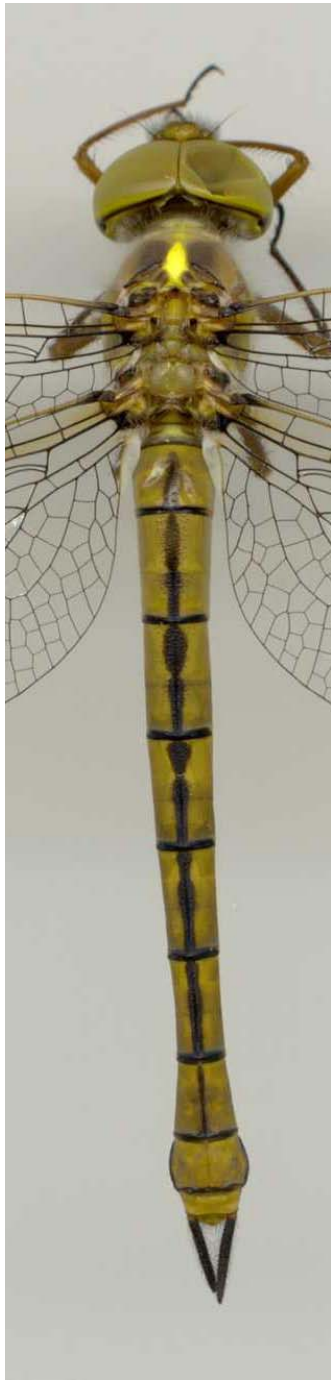


Spatial priorities for river restoration in the Murrumbidgee CMA region



Defining river types in the Murrumbidgee[1]





Top down vs. bottom-up classifications

- It does not matter where you start.
- Top down classifications need to be validated, often modified
  - Redundancy
  - Splitting
- Data rich areas can be used for this

Outlook for the MDB plan

- Focus on biodiversity
- Scientific rigour is essential in each major step:
  - classification and
  - application to planning
- MDB is data rich !
  - Fish and macroinvertebrate data
  - Consistent collection
  - Vegetation mapping
  - Disturbance data layers