



Office  
of Water

# Aquatic Landscape Planning in NSW

**Water management actions that influence aquatic  
biodiversity & implications for climate change**

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# NSW Planning & Reporting Activities

- Water Sharing Plans commenced in 2004 – new water reforms
- Water Planning driven by usage and scale – aim to protect health of rivers
- Regulated and unregulated rivers & groundwater systems
- 2006 a catchment focus adopted for unregulated rivers (macro) water sharing planning
- Monitoring & evaluation

# NSW Planning & Reporting Activities

- Threatened species assessment tools developed for works & license applications
- Monitoring Evaluation and Reporting – State Targets
- New river condition index developed in 2010 – alignment with Catchment Action Plans (CAPs)
- All these planning activities have important implications for aquatic biodiversity and adaptations to climate change

# Macro Water Sharing Plans

- whole-of-catchment
- is a risk-based process
- uses best available information on water use, instream values and dependence
- relative assessment across a catchment for rivers, or across a coastal bioregion for estuaries
- focuses on rules during critical times such as periods of low or no flow

# Landscape Management Units

## Catchment, Water Sources and Management Zones

Thora North Arm  
Bellinger River  
Water Source

Upper  
Management Zone

Lower  
Management Zone

Bellinger Catchment Area

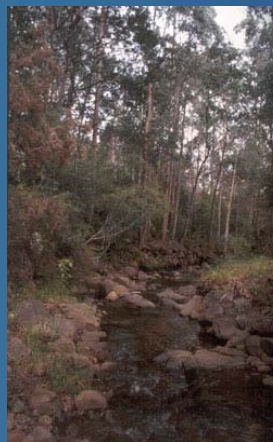


What was assessed for each water source ?

## Instream Value

*“the relative importance of retaining water in the river”*

- Presence of threatened species (especially fish)
- Other flow dependant plants and animals
- Relative rarity & diversity
- Special features
  - NP Estate, reserves etc
- Social/Cultural values
- Value rating for each water source
- Trading rules developed





# RISK to Instream Value

- Need to ID values at risk from extraction

Concept of risk:

$$\text{Risk} = \text{consequence} \times \text{likelihood}$$

- Instream risk = value  $\times$  hydrologic stress
- A 2-step process (risk to instream values & cum. Impacts of extraction)
- The relevant data values are ranked into high, medium & low categories
- Each water source gets a Risk class
- Access rules developed (ie cease-to-pump)

# Monitoring and Evaluation of Water Sharing Plans



- **Planned environmental water** is key focus for monitoring:
- **Performance indicators** are assessed - listed in both regulated and unregulated Plans and include:
  - changes in low flows
  - changes in moderate to high flows
  - ecological condition of water dependent ecosystems
  - change in water quality
  - economic benefits from water extraction and use.
- **Environmental Contingency Allowances:**
  - specific water levels for bird breeding & native fish
  - maintaining wetland and floodplain inundation
  - maintaining natural flow variability



# Threatened Species Assessment - Licensing



- Need to assess applications for works (eg new pump) within a Water Sharing Plan
- Modification to species and habitat
- Need to undertake *Assessment of Significance* – 7 part assessment process – requirement under Part 5 of NSW EP&A Act
- Developed a training manual and GIS tools to assist Licensing staff make assessment
- To determine if there will be any potential impacts on terrestrial and aquatic threatened species
- Another tool to provide for biodiversity protection





# MER SoC Riverine theme

- Key Drivers = NRC Standards & Targets, State Plan
- EEP lead agency for T5 Riverine Ecosystems and T6 Groundwater
- *By 2015 there is an improvement in the condition of riverine ecosystems.*
- Significant inter- & intra-agency collaboration
- State of the Catchment (SoC) reporting
- Reporting on key baseline data
- Key focus is riverine condition as a measure for aquatic (riverine) biodiversity

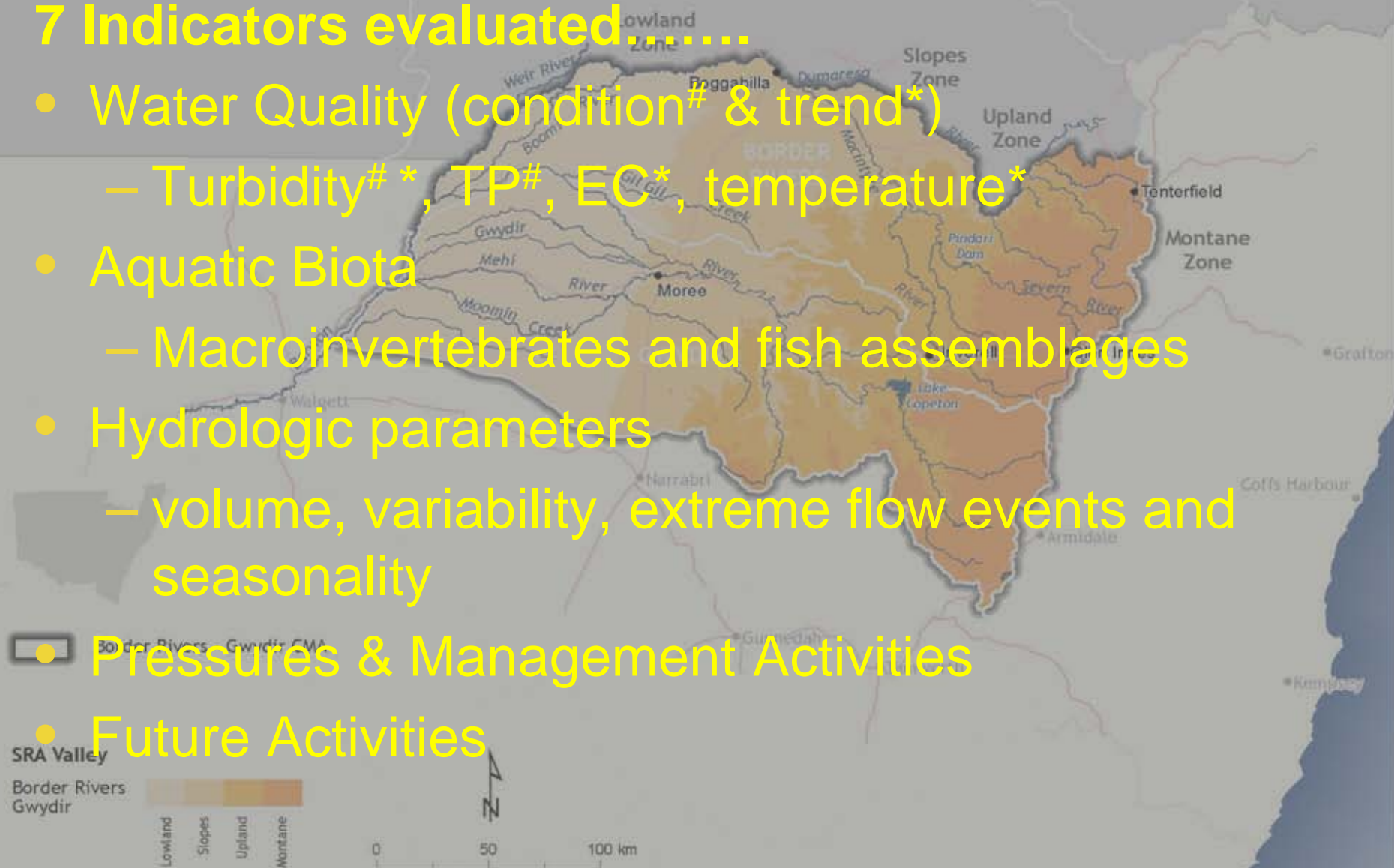
# Riverine Ecosystems

## 7 Indicators evaluated.....

- Water Quality (condition# & trend\*)
  - Turbidity#\*, TP#, EC\*, temperature\*
- Aquatic Biota
  - Macroinvertebrates and fish assemblages
- Hydrologic parameters
  - volume, variability, extreme flow events and seasonality

## Pressures & Management Activities

## Future Activities



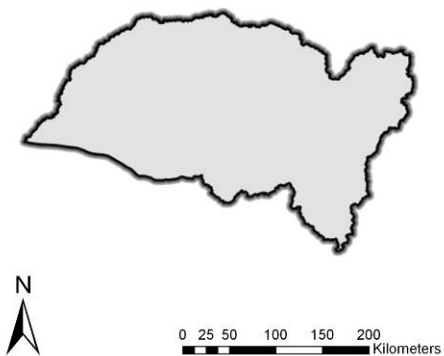


# Spatially expressed River Condition Index

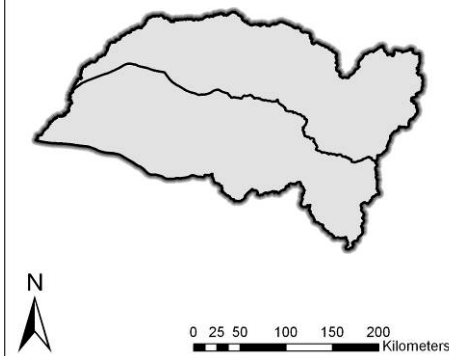
- National Water Commission (NWC) funded project
- Developed to *improve alignment of water allocation and catchment planning*.
- Project worked within existing arrangements – no new monitoring programs.
- Spatial product developed at a scale that can inform both regional Water planning, CMA investment and state-wide reporting needs.
- Develop as a surrogate condition index at a reach scale.
- River Condition Index is based on FARWH using:
  - River Styles (condition)
  - Riparian vegetation extent (regional benchmarks)
  - WSP Macro Plan assessment data (Hydrological stress)
  - Riverine MER data (macroinvertebrates and fish)

# Existing Scale of Analysis

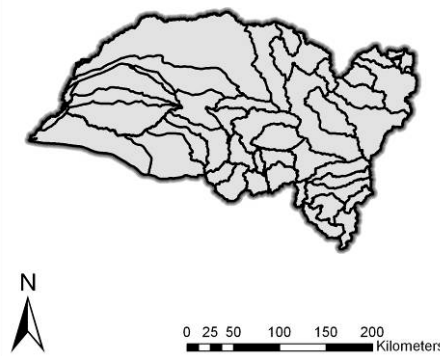
**Border Rivers-Gwydir CMA Boundary**



**NSW AWRC Boundaries**

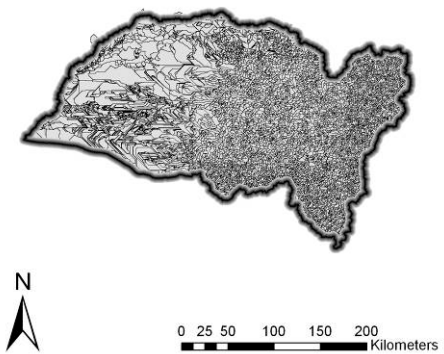


**Surface Water Sharing Plan  
Water Source Boundaries**

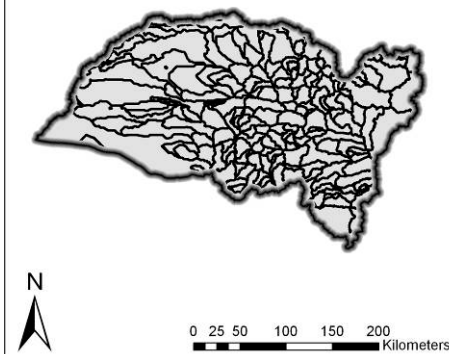


## Geofabric catchments (new scale)

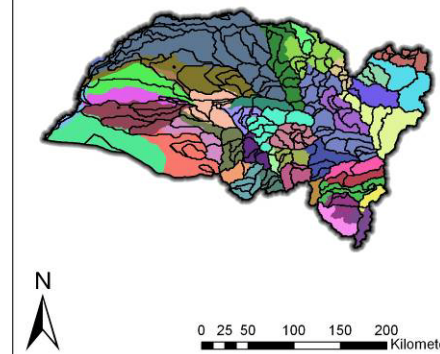
**AHGF Catchment Boundaries**



**AHGF Contracted Catchments**



**AHGF Contracted Catchments  
and Water Source Boundaries**





# River Value Assessment

- Development of a value assessment that separated the value associated with extraction of water from those associated with leaving the water in the river.
- Based at the subcatchment scale on:
  - River Styles Condition
  - Macro Water Sharing Plan – Instream Values
  - River Style condition and threatened species assessment
- Evident that a river reach level was more appropriate to use than a subcatchment level, as this is the scale at which management actions are undertaken.
- Still requires refinement - the subindices used and their weighting in the assembly into an index requires further consideration but has application in implementation of the NSW Biodiversity Strategy for example.

# River Risk Assessment

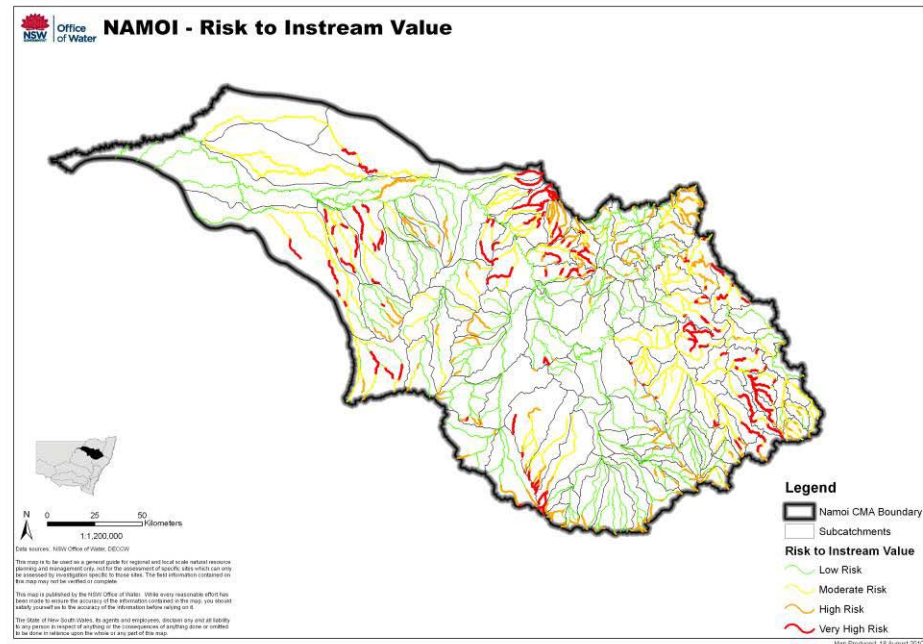
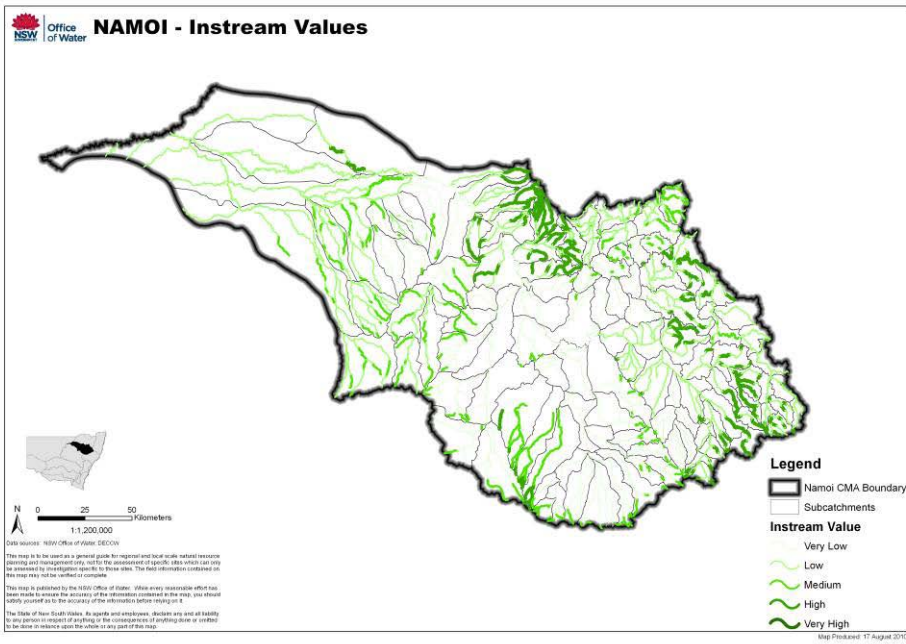
- Developed of a risk assessment that combines risk to in stream values and the potential to improve it through action.
- Based on the Macro WSP approach of:  
Risk = Likelihood x Consequence
- Uses a 'Resilience Thinking' approach - thresholds
- Developed using:
  - Recovery Potential & Fragility
  - Macro Hydrological stress scores
  - Instream Value map data
- The river risk assessment was completed in three parts:
  - Risk of Physical Disturbance to Instream Values
  - Risk of Water Extraction to Instream Values
  - (Combined) Risk to Instream Values

			THREAT					
			River Styles Recovery Potential – based on Condition					
			Conservation	Strategic	Rapid	High	Moderate	Low
			6	5	4	3	2	1
VULNERABILITY	High	3	18	15	12	9	6	3
	Medium	2	12	10	8	6	4	2
	Low	1	6	5	4	3	2	1

Likelihood Score	Category	Risk Input Score
18-15	Very High Likelihood	1
12-10	High Likelihood	0.8
9-6	Moderate Likelihood	0.6
5-4	Low Likelihood	0.4
3-1	Very Low Likelihood	0.2

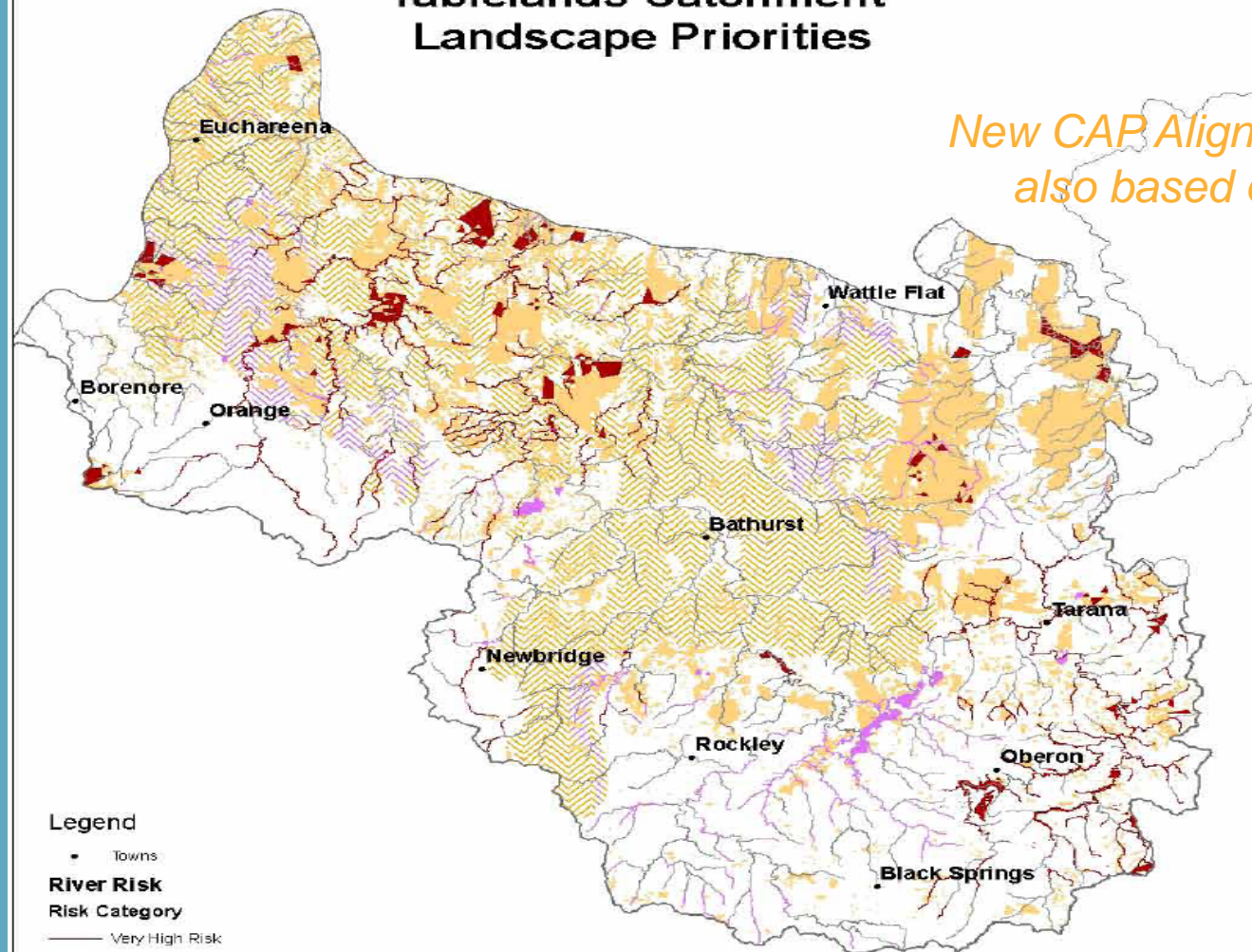
# River Value Assessment

# River Risk Assessment



# Tablelands Catchment Landscape Priorities

*New CAP Alignment process is  
also based on 'resilience'*



## Legend

- Towns
- River Risk**
- Risk Category**
- Very High Risk
- High Risk
- Moderate Risk
- Low Risk
- Wetland Priority
- Vegetation Very High Priority
- Vegetation High Priority
- Vegetation Medium Priority
- High Soil Priority
- Medium Soil Priority
- Non Priority Areas



Central West  
Catchment Management Authority



# Adaptation to Climate Change

- Water sharing rules for different aquatic systems
- Adaptive management:
  - develop specific plan environmental objectives & rules & monitoring of them
  - respond to risk associated with Climate Change model development
  - strengthen science to support and monitoring
  - Plan change can occur after 10 yr (coastal & current 2004) and 5 yr review phases (Basin Plan catchments)
- Identification and protection of reaches in good condition & key refugia
- Alignment of NRM activities to deliver multiple ecosystem benefits and enhance resilience



# Aquatic Landscape Linkages

- Water planning & land use (current & future)
- New Riverine & Groundwater theme activities (regional water quality targets and influence of landscape elements; riparian vegetation benchmarking, ID of terrestrial vegetation GDEs)
- Lateral, longitudinal & horizontal connectivity
- Healthy rivers & groundwater = healthy terrestrial biota
- Refugia
- Alignment with other NRM activities (eg WSPs & CAP alignment, NSW Biodiversity Strategy)
- Population growth and demand pressures



# Challenges ahead.....

- ID of assets/values & their spatial distributions
- ID of asset/value flow threshold requirements & 'tipping points'
- Model response of aquatic biota to flow reduction and change in temperature
- ID of trends, and establishment of long term monitoring and sampling sites
- To reduce uncertainty and improve confidence in CC model outcomes
- Revision of NSW water sharing plans with Basin (water resource plan) Plan requirements.