Department of Natural Resources, Mines and Energy

Connecting Science, Modelling and Policy Development in Water Planning

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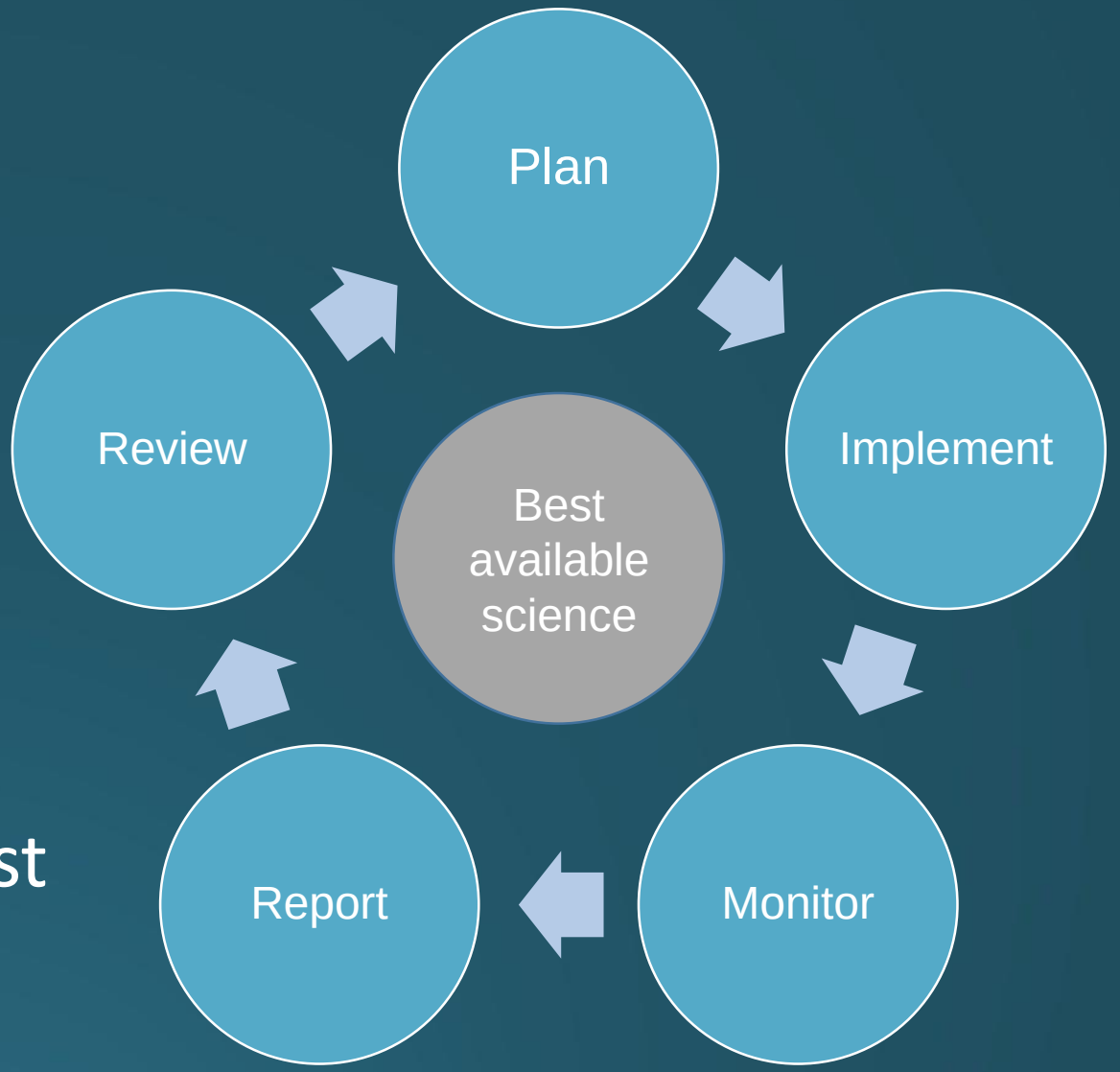
Queensland Government

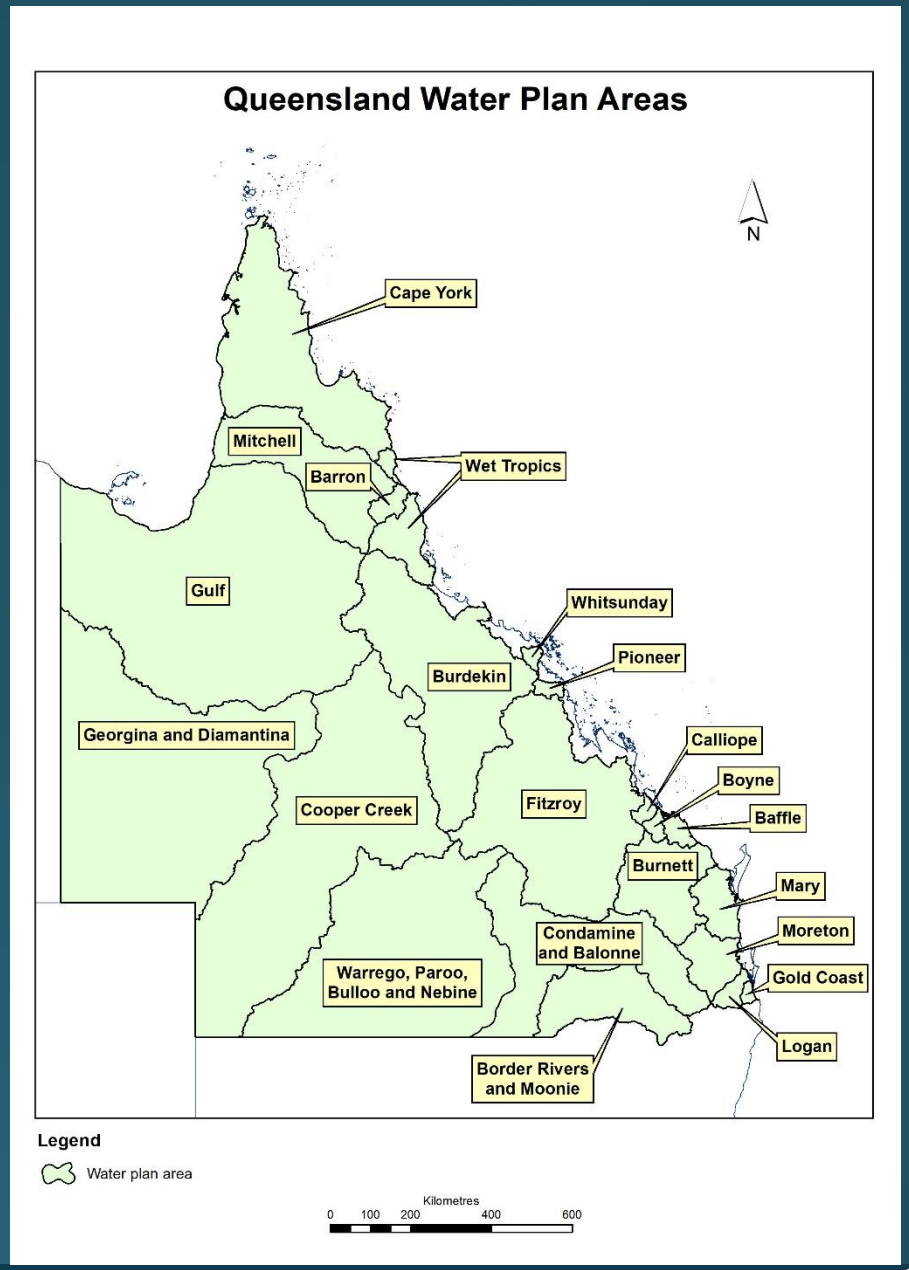
Water Plans

- Water is managed under the *Water Act 2000* through Water Plans
- Water Plan:
  - Framework for sustainable allocation and management of water resource
  - Balance between social, economic, environmental and cultural outcomes
- Adaptive management based on best available science

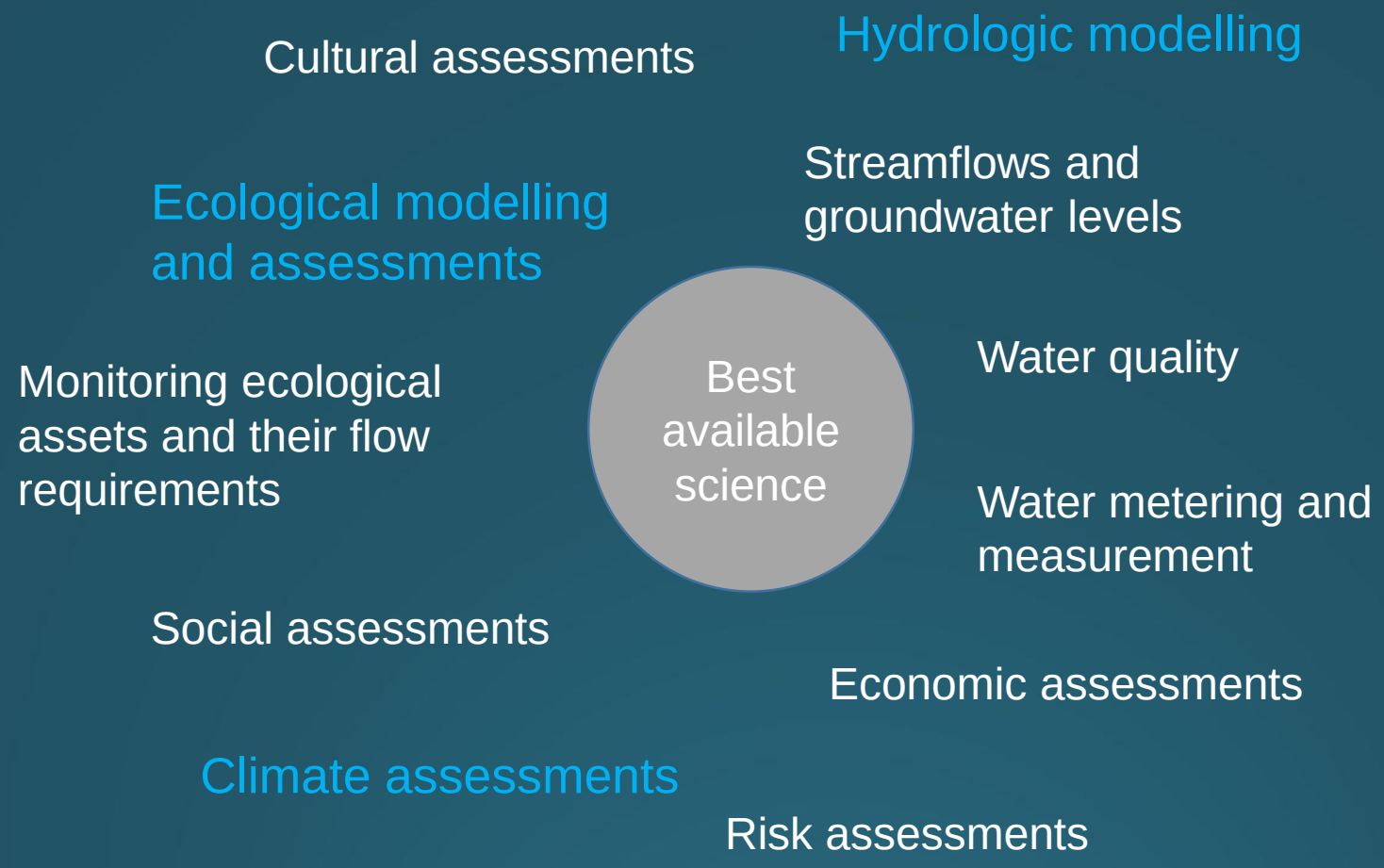


Water Plan – status

- 23 water plans across Queensland
- 99% of Queensland covered
- Total volume available water 7,980,000 megalitres
- Total water consumption 3,800,000 megalitres (2016 -17)
- Tradeable water allocations 18,174 (or 4,760,000 megalitres)
- Consideration of climate change and cultural flows included (October 2018)

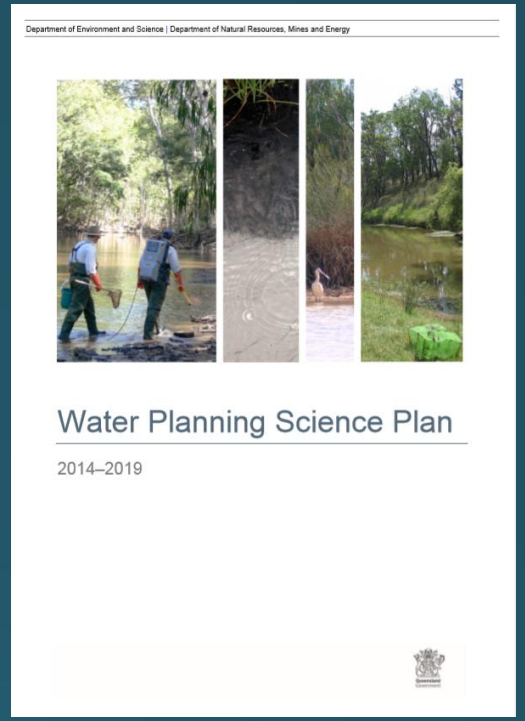


Science to support water planning



Science and Water Plan Development

- Science has always been an important component of water management
- Collaborative monitoring and targeted research guided by science plan
- Modelling – hydrological and ecological
- Public consultation



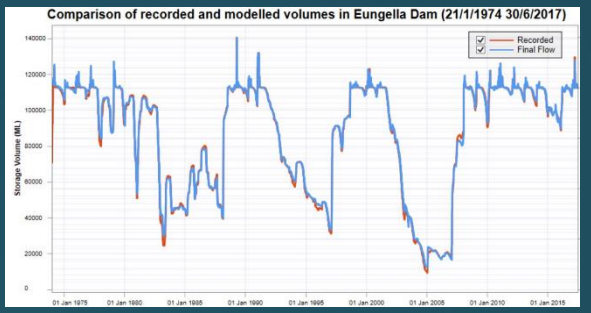
2000 **2010** **2020**

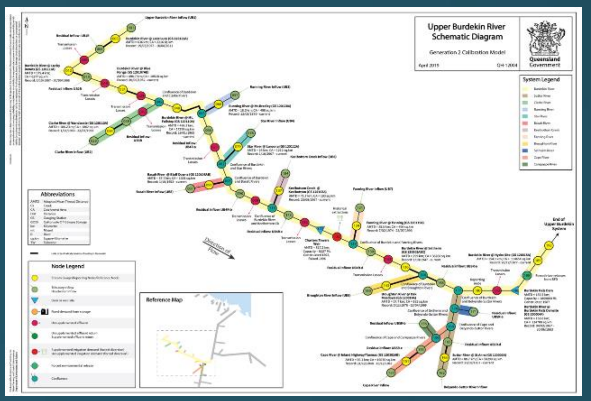
Hydrologic modelling **Ecological modelling** **Climate change modelling**

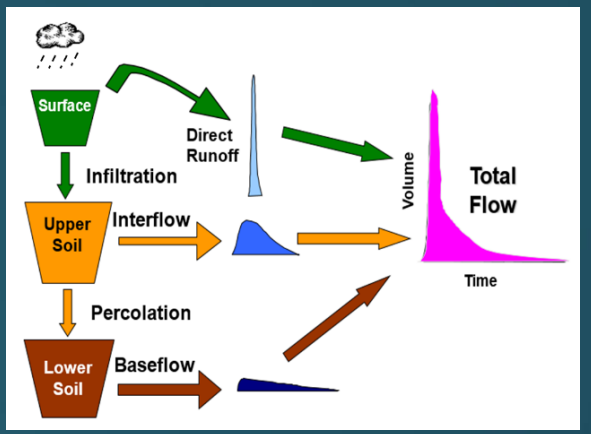
Hydrological modelling for water plans

Hydrological modelling

- State-of-the-art surface water models (Integrated Quantity and Quality Model IQQM, Source Model)
- Ground water models for key areas (e.g. Lower Burdekin, Pioneer, Coastal Burnett)
- Modelling expertise provided by Department of Environment and Science
- Supports policy development and community and stakeholder engagement

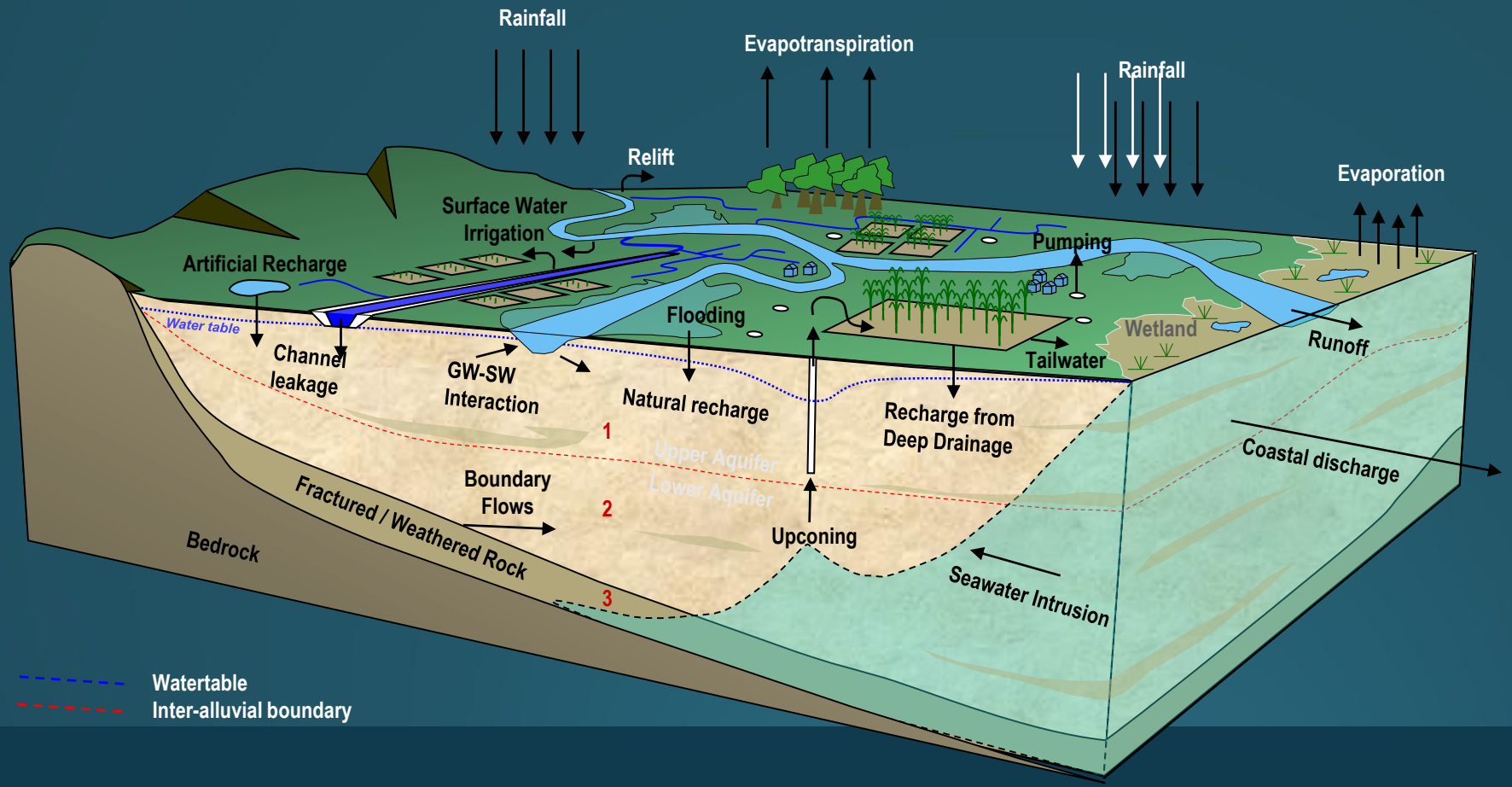






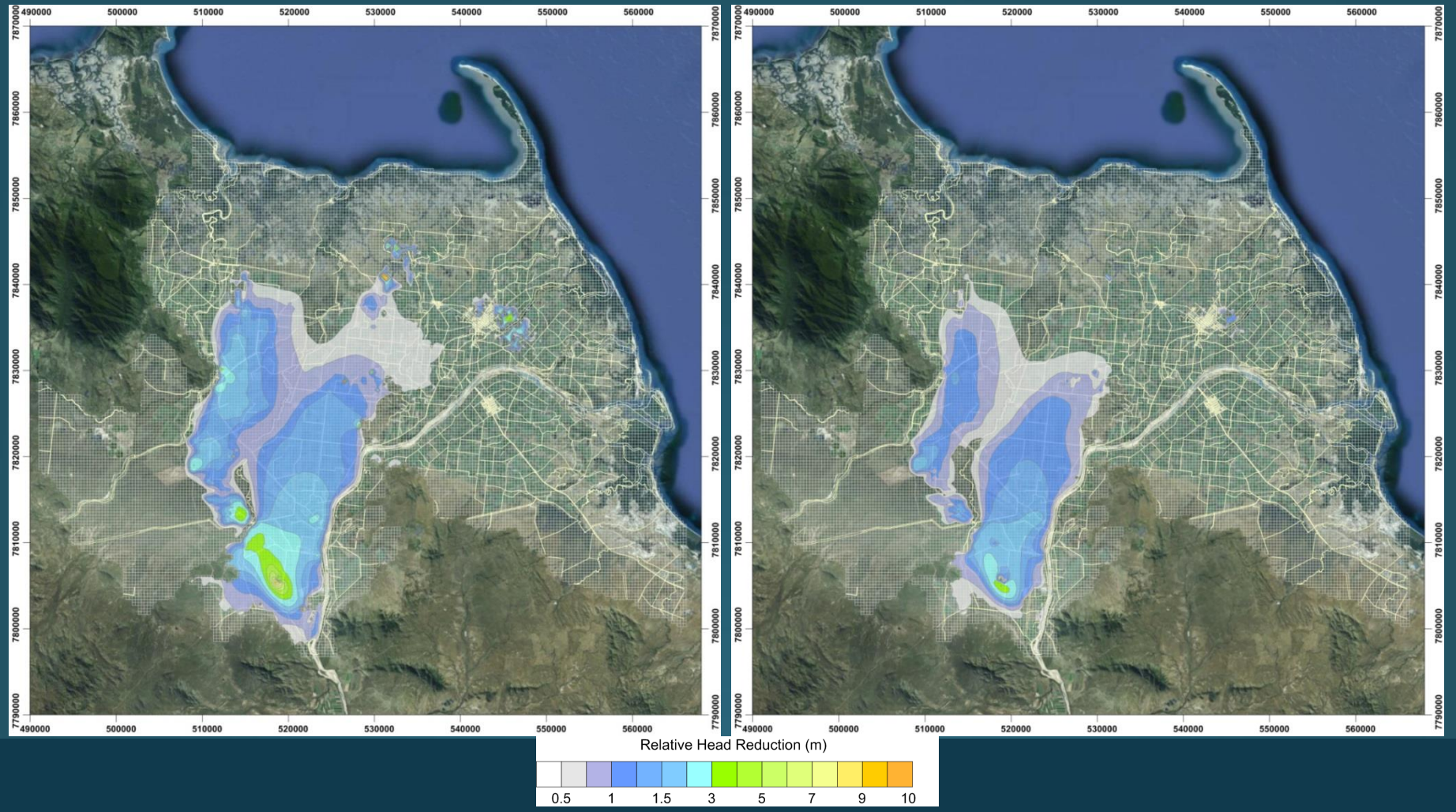
Example 1 – Burdekin Groundwater modelling

Step 1: Conceptualisation of the Lower Burdekin Aquifer
Step 2: Groundwater flow modelling
Step 3: Testing of groundwater management scenarios
Step 4: Communication to stakeholders



Example 1 – Burdekin Groundwater modelling

Modelled water table reduction after 10 years
(maximum and minimum)



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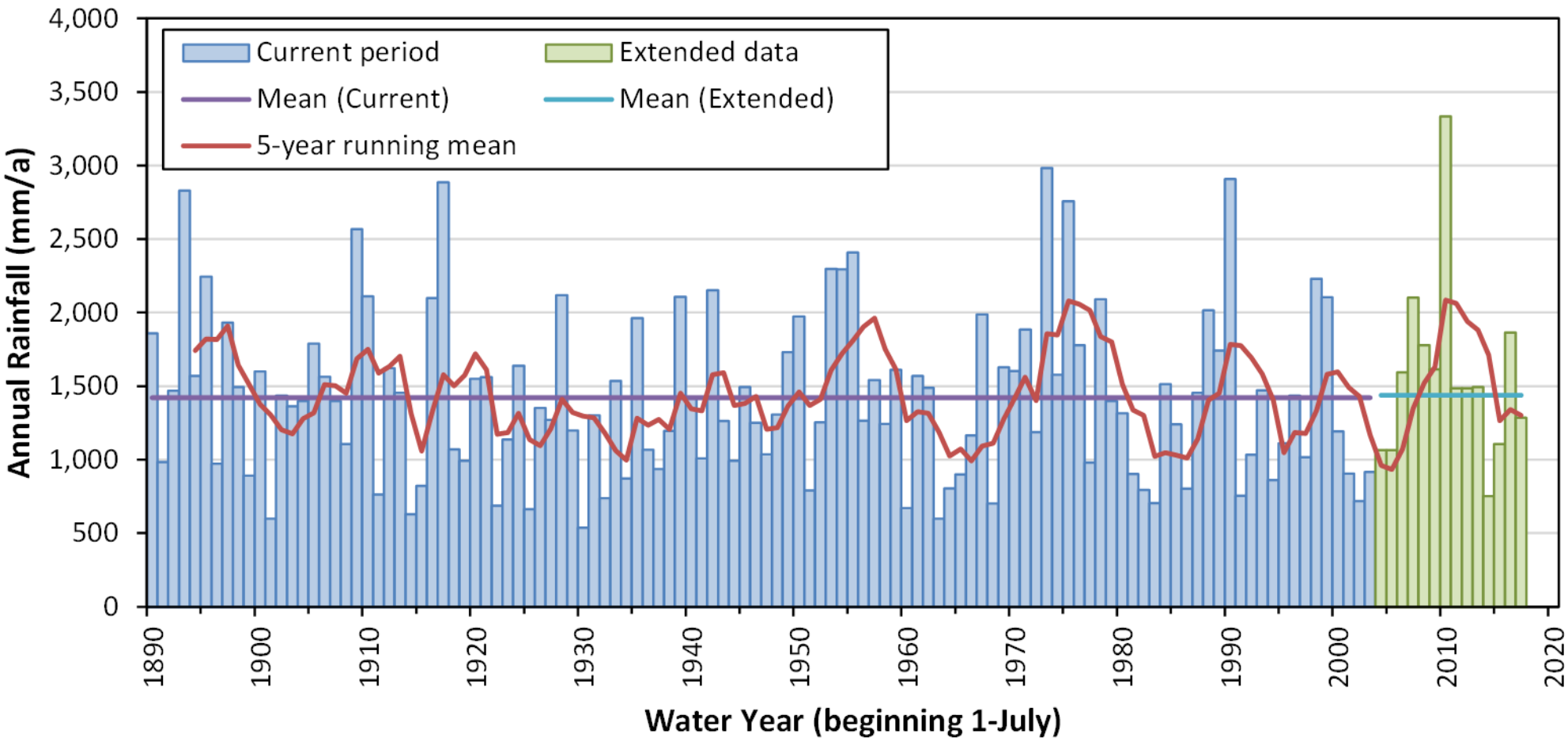
Example 1 – Burdekin Groundwater modelling

Application to policy:

- Model allowed comparison of relative risks for a range of water management scenarios to be compared
- Model informed development of policy options
- Model was an important tool to engage and empower stakeholders in the water management conversation

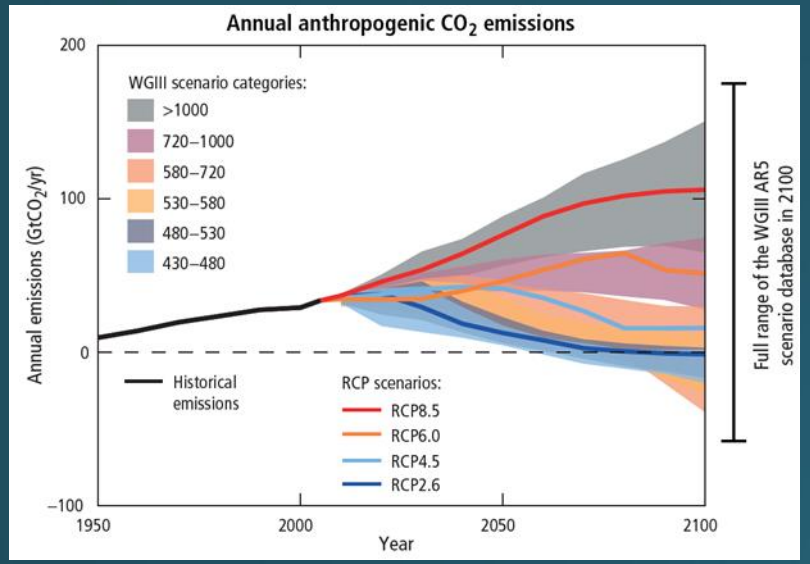
Climate modelling for water plans

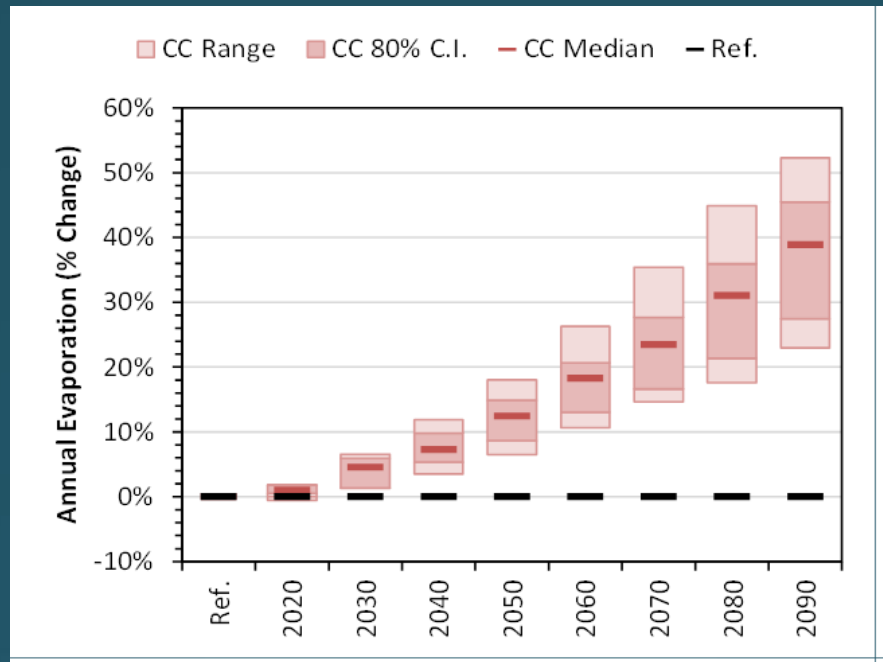
Example 2 – Consideration of recent climate since model was developed

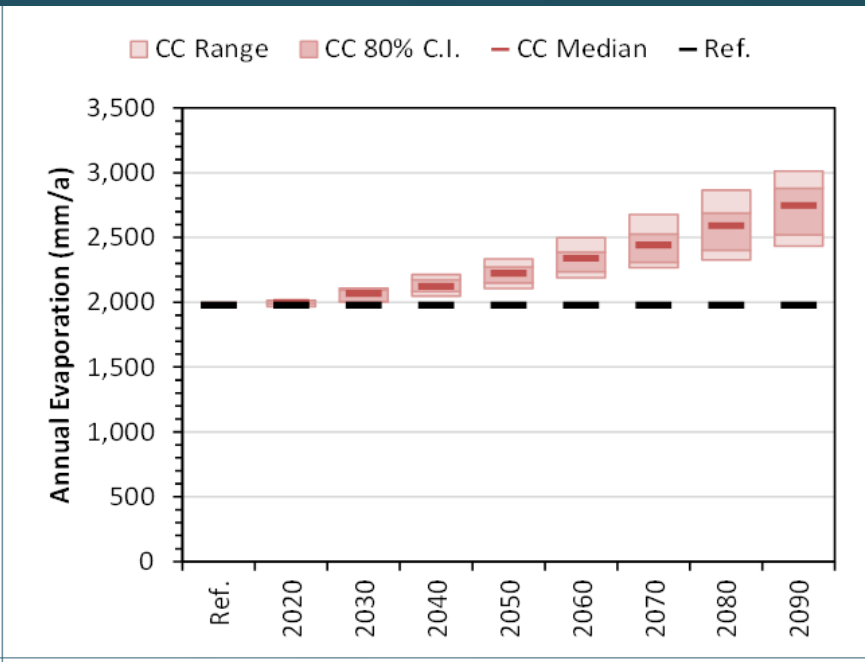


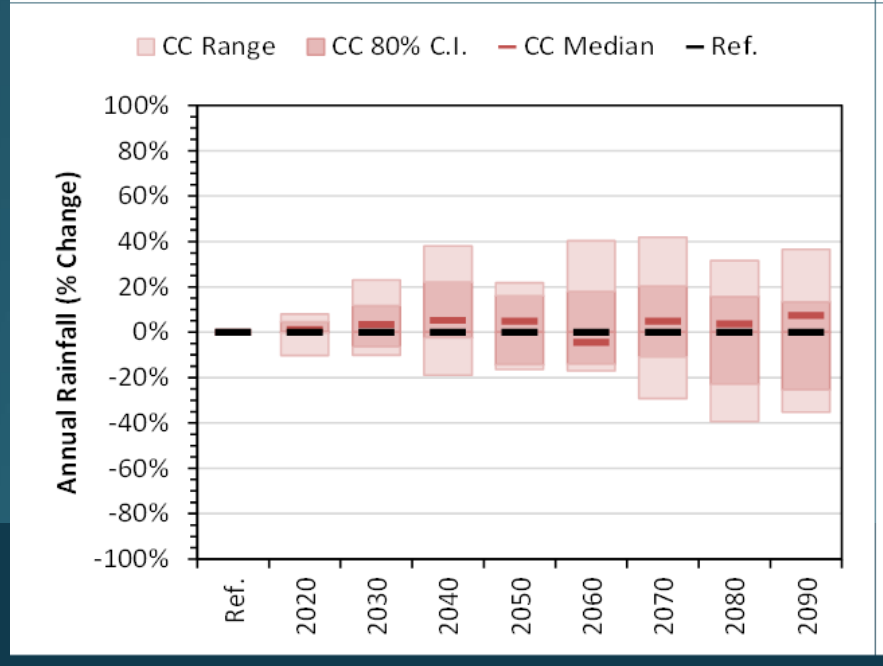
Example 3 – Consideration of climate change projections for 2030-2090

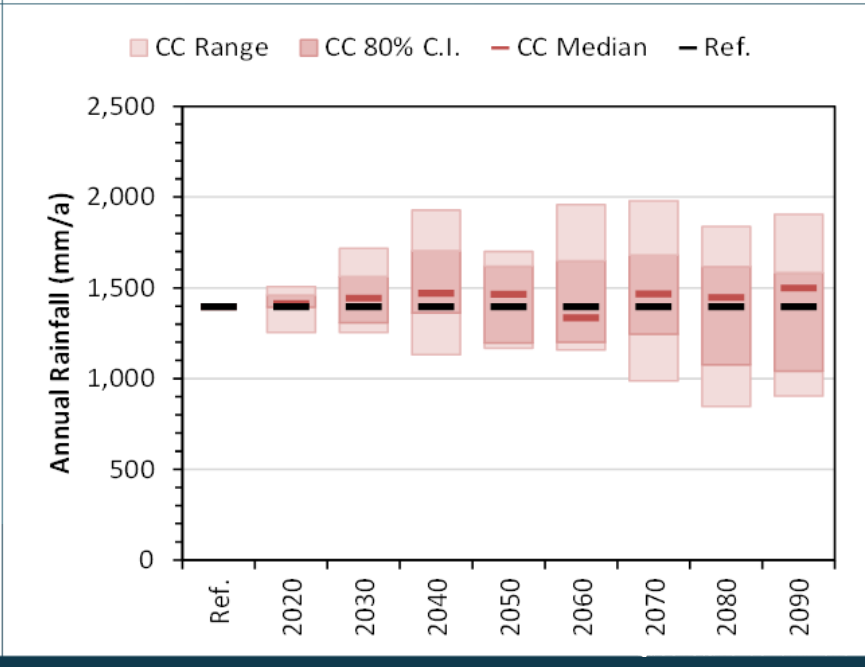
Projected changes in annual **evaporation and rainfall** for RCP 8.5 (Whitsunday)











Ecological modelling for water plans

Ecological modelling

- Science used to inform plan evaluation:
  - Have the outcomes been achieved?
  - Have the strategies been effective?

Monitoring (EFAP) → Ecological Modelling → Plan evaluation

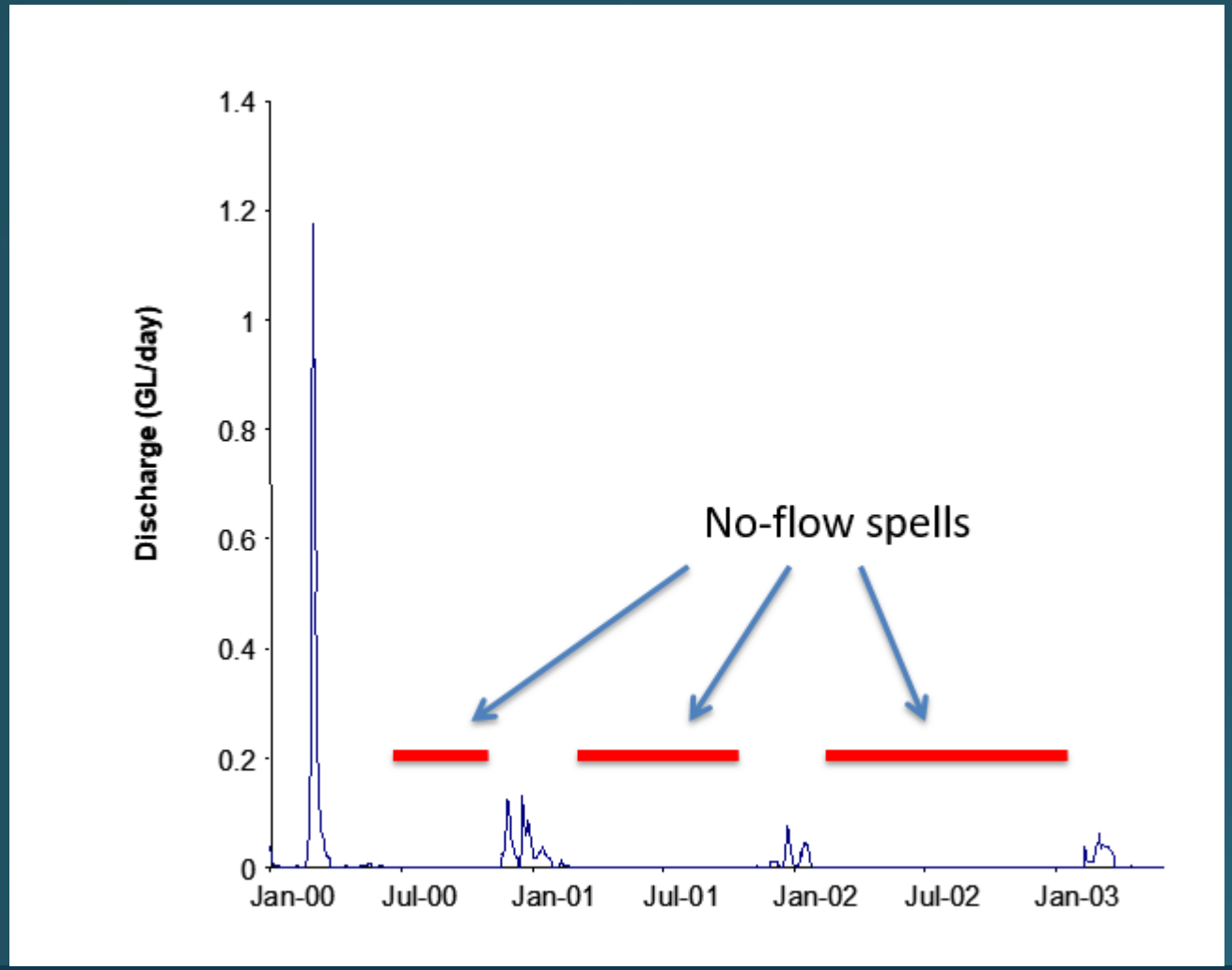
Environmental Flows Assessment Program (EFAP)

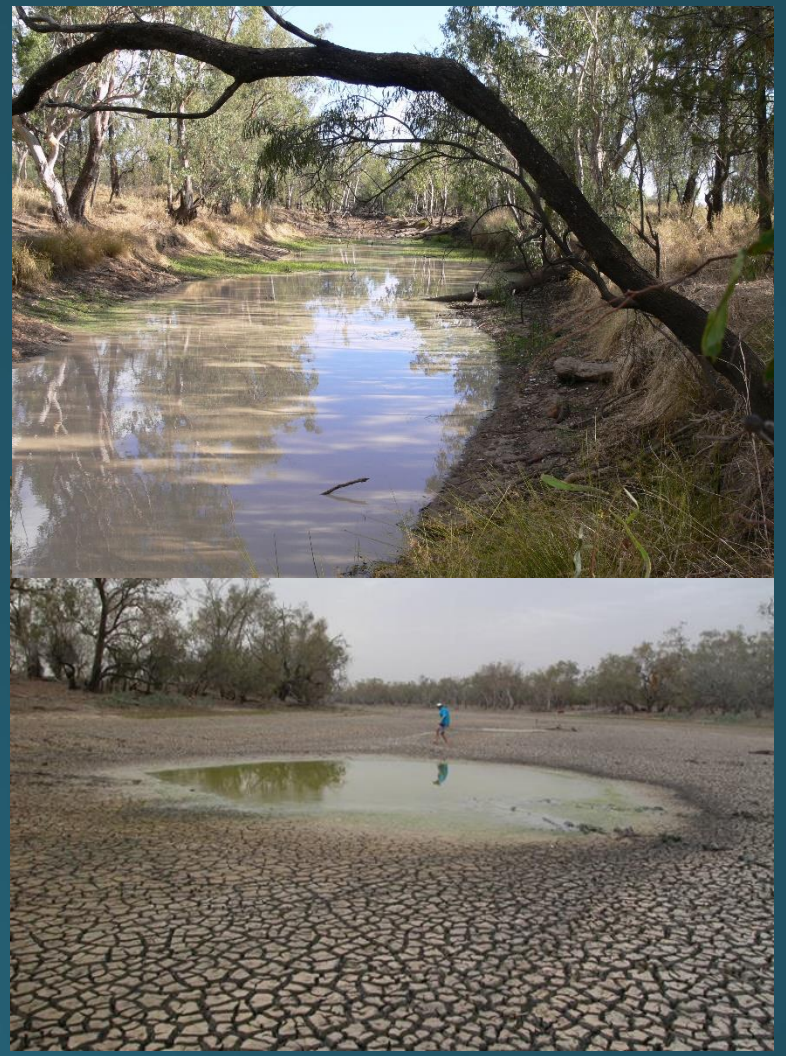
- What flows do ecosystems need?
- Have these flows been provided?
- At what thresholds does risk to ecosystems increase?

Example 4 - Role of refugial waterholes

- Waterholes are a critical source of habitat in dryland rivers
- Support resilience of biota
- Different aspects of hydrology important
  - Persistence of waterhole: length of spells
  - Resilience – connectivity: duration, timing and return interval of flow events
- Both processes vital for population viability
- Requires data collection and modelling

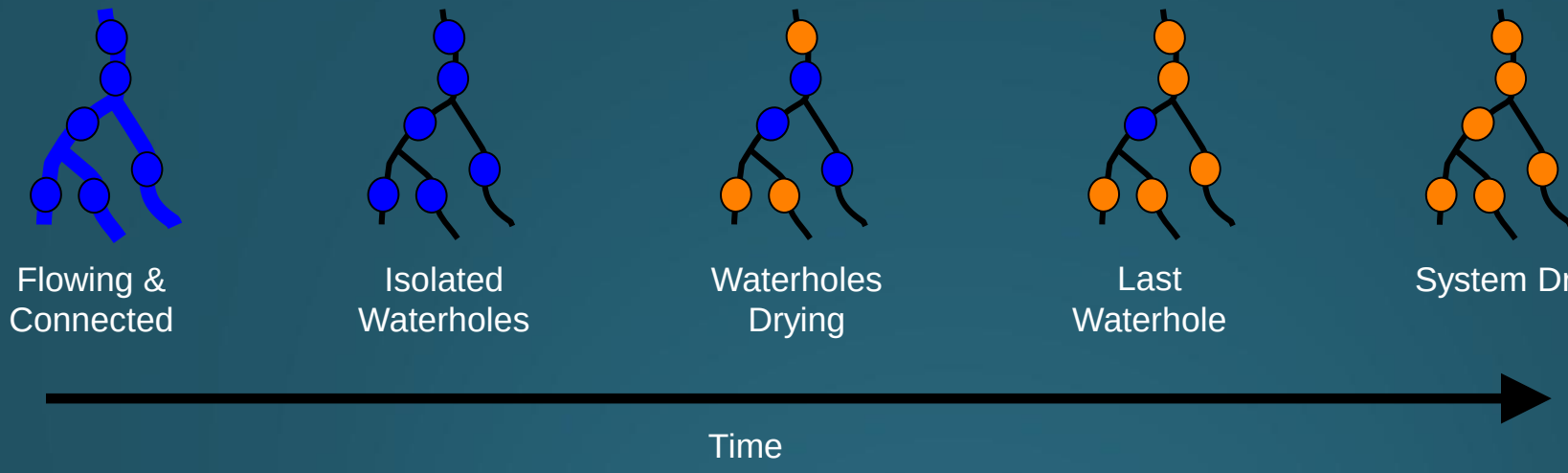
Example 4 - Role of refugial waterholes





Example 4: Modelling persistence of waterholes through time

- How long does a waterhole persist?
- How many waterholes are left in the system?
- How long are the waterholes connected to each other?
- Modelling assists in understanding critical thresholds and risks



Policy application

- Locally relevant minimum drawdown thresholds can be set to maintain waterhole habitat
- Low flow strategies in water plans - to maintain inflows to ensure connectivity between waterholes
- In extreme drought, fish rescue may be considered in some places e.g. Murray Darling Basin

Conclusions

- Good science and data underpins Water Plans
- Hydrological modelling is used extensively
- Better communication of complex technical information to general public is required
- Mature water planning process (20th year)
- Next focus areas:
  - understanding and communicating the water related effects of climate change on water availability
  - understanding cultural flow requirements