

Establishing the environmental water requirements for the Daly River, NT

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Rivers in northern Australia

“Constitute one of the last remaining **free flowing and relatively un-impacted** river networks in the world”

- Highly productive and diverse ecosystems
- Significant social, cultural and economic value



Increasing pressure & demand on water resources

- Expanding agriculture, mining & population



Urgent need to understand environmental water requirements



What is Environmental Water / Flows?

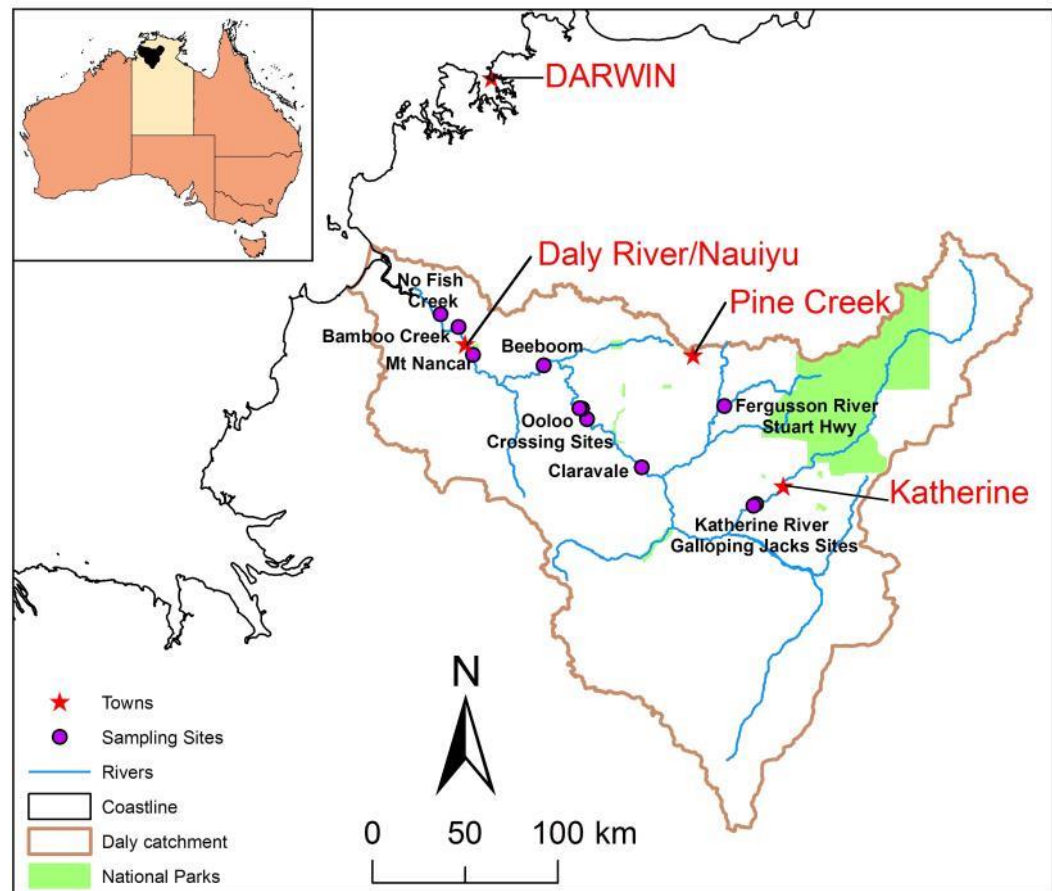


“Aims to restore and protect the quantity, timing and quality of water flows required to sustain freshwater and estuarine ecosystems ...”

(Brisbane Declaration 2007, Arthington et al. 2010, King et al 2015)

Daly River

- Perennial, largely free flowing
 - Groundwater extraction, (dry season)
- High biodiversity values
 - 2 threatened elasmobranchs (sawfish, whipray)
 - 98 fish species in freshwaters (no non-native)
 - 8 turtle species
- High social & cultural values
 - Barramundi fishing
 - Significant places, customs
 - Aquatic resources significant component of food (Jackson et al. 2012).



- Environmental water
 - Currently good levels of protection
 - But need more information, to be able to manage increasing development sustainably

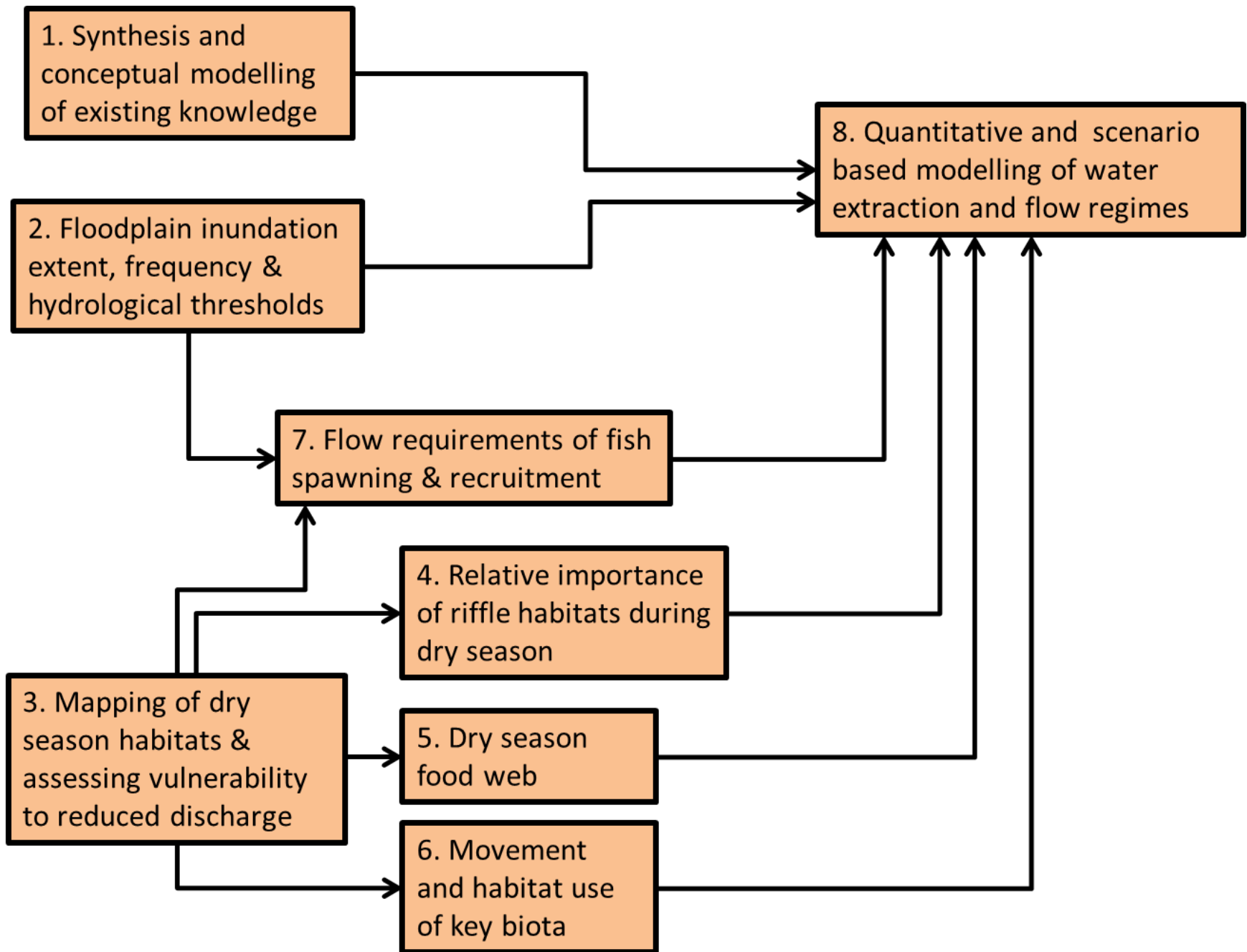
This Project: Environmental water in the Daly River

Will collate existing, and develop new knowledge on critical flow-ecology relationships in Daly River

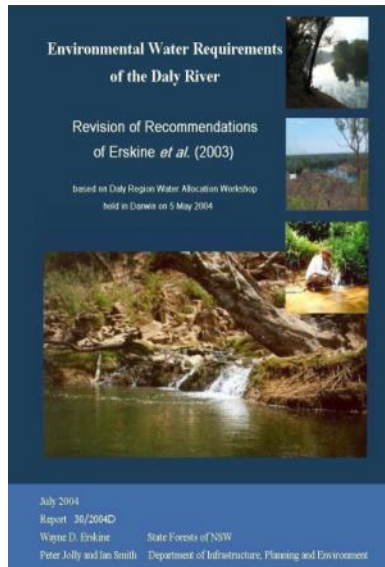
Aims to provide risk-based water scenario models for key environmental assets

Started in Sept 2016 – 2019

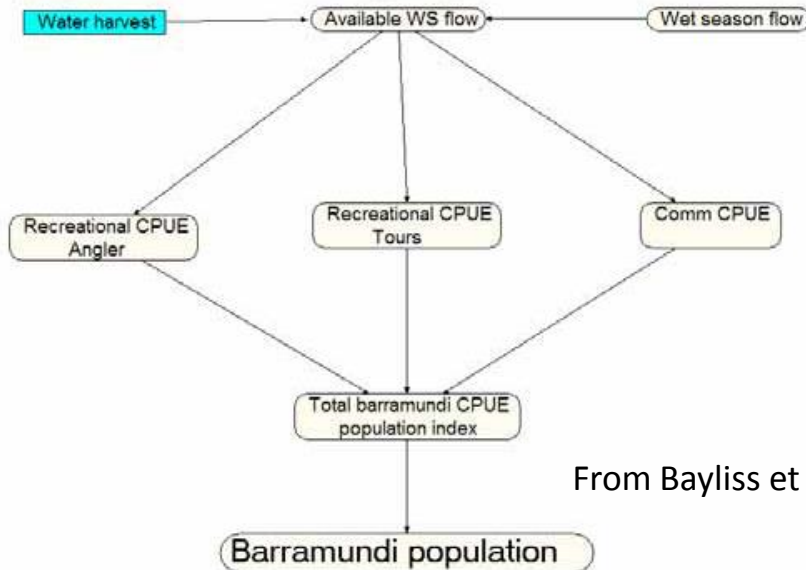




1. Collate & Review Existing Knowledge



- Previous studies e.g. Erskine et al (2003), TRaCK & NERP programs
- Look at available datasets & analyse (e.g. Daly fish data)
- **Develop conceptual models of key assets**



From Bayliss et al 2008



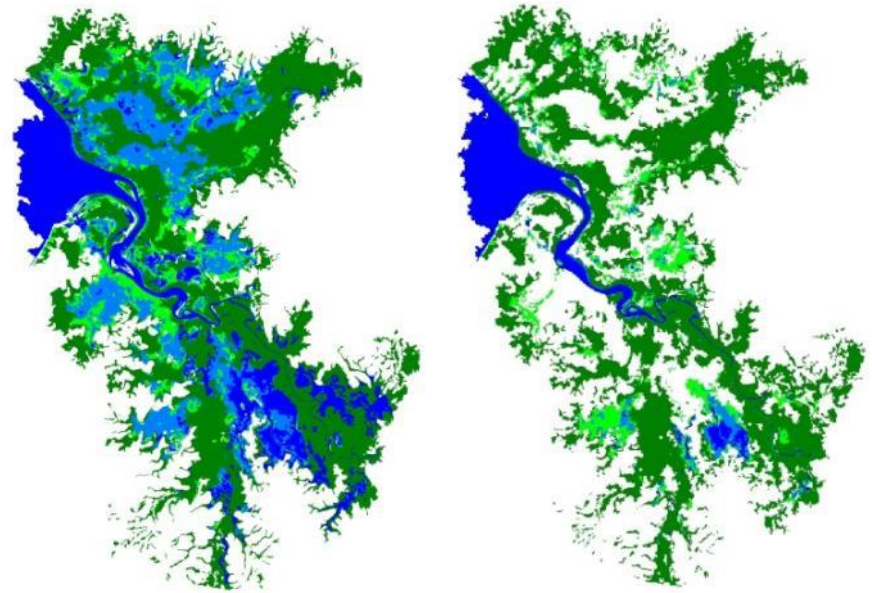
2. Determine floodplain inundation extent, frequency and hydrological thresholds

- Use remote sensing to determine:
 - floodplain extent during different strength wet seasons,
 - threshold floodplain connection between river and floodplain

Link outcomes to ecological data (e.g. barramundi and magpie geese numbers)



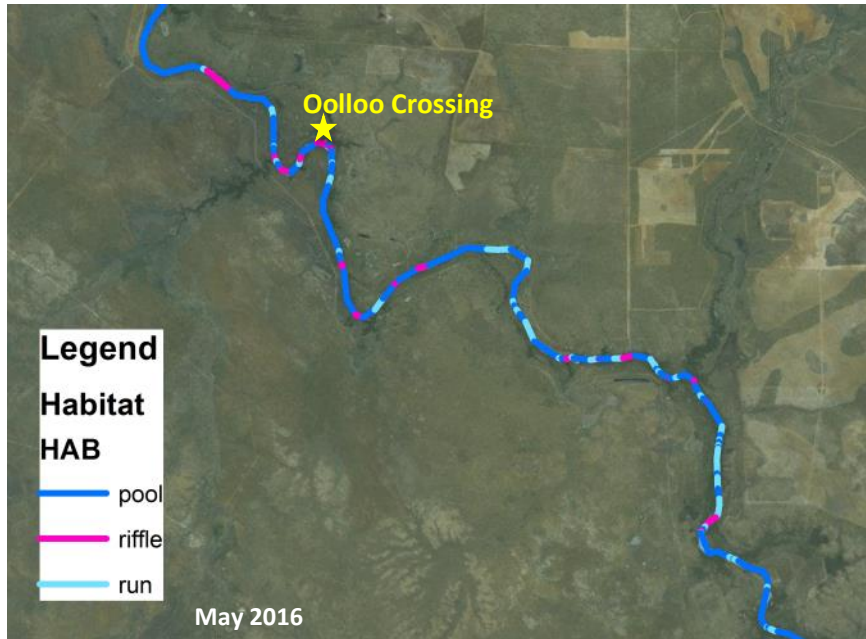
Magpie geese.
Photo: Mike Lawes



March 09

June 09

3. Mapping dry season riverine habitats



- Establish longitudinal distribution & extent of key dry season habitats
 - pool-run-riffle, barriers, pig-nosed turtle nesting beaches, Vallisneria beds
 - Katherine-Mt Nancarrow reach
- Construct fine-scale hydrodynamic model for key reaches
- **Link outcomes to hydrological (discharge) & ecological data**

4. Assess relative importance of riffle habitats for fish and macroinvertebrates

- Riffle habitats
 - vulnerable to drying out at reduced water levels
- Thought to be:
 - nursery habitat for juvenile Sooty and Butler's grunters
- habitat for some macroinvertebrates

(Pusey et al. 2004, Chan et al. 2012)

- Review and analyse existing Daly River specific datasets



Distinctive riffle habitat (Gallopings Jacks Katherine River)



Juvenile sooty grunter



Cherabin

5. Determine dry season food web



Different instream food sources (Oolloo crossing, Daly River)

- Wet season thought drive instream productivity
- Specific in-channel habitats may provide critical food sources during dry season
- Describe the early & late dry season food webs
 - Does food web change through dry season?
 - Is it linked to habitat types? (e.g. riffles, pools)
- Tissue samples of key food web components, analyse C:N

6. Movement & habitat use of pig-nosed turtle & sooty grunter

- Both species previously highlighted as potentially vulnerable to reduced flows:
 - Barriers to movement
 - Access to critical habitats
- Acoustic and radio-telemetry
- Broad and reach scale

At different discharges:

1. Describe movement patterns
2. Determine key habitat use
3. Identify any dry season barriers



Pig-nosed turtle, Daly River



Sooty grunter, Daly River

7. Spawning & recruitment patterns of fish

- Little known about breeding biology of northern Aust fish, wet season thought to be critical
- Preliminary work (2013) suggested ~20 species breeding in dry season
- PhD study (Kyle Tyler)
- Sample eggs, larvae and juveniles throughout catchment
- Determine influence of flow on timing & success of breeding



Male mouth almighty
mouthbrooding eggs



Juvenile Freshwater Longtom



Larval
Flyspecked hardyhead

8. Flow-ecology models exploring water scenarios

- Use new and previously derived flow-ecology relationships
- Generate more complex models to explore the effect of different water scenarios on key ecological assets
- Water scenarios: realistic dry and wet season potential flow alteration scenarios



- Outcomes to help inform policy, stakeholders and wider community of ecological risk of water extractions
- Informed trade-off decisions about development and environment needs



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National Environmental Science Programme

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