



*Ensuring the wise use of
Australia's tropical rivers and wetlands*



Benchmarking the attributes of Northern Australia's tropical rivers – The basis for informed management decisions

Tropical Rivers Inventory & Assessment Project (TRIAP)

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**Australian Government
Land & Water Australia**



**Australian Government
Department of the
Environment and Heritage**

Outline

- Background
- Project Aims & Objectives
- Sub-project 1 (Inventory & Mapping)
 - Conceptual overview of integration of river attributes
 - Key base layers – drainage & geomorphology
 - Ecological data & ecological character
 - Data gaps
- Sub-project 2 (Risk assessments)
 - Risk framework
 - Values of, and threats to, the Daly River
 - Qualitative & quantitative risk analyses
- Concluding remarks



Background

- “Australia’s Tropical Rivers” – LWA (2005-2010)
- ~70% of Australia’s freshwater resources are in the north
- Pressure for future water-based industries and devt. in general
- Knowledge and understanding of the tropical catchments is generally fragmented and insufficient?
- Knowledge required to support regional planning and protective management
- Step 1 – Consolidate what we already know



TRIAP – Aim & Objectives

Aim

To better inform natural resource managers and decision-makers about the ecological status of the rivers and wetlands in northern (tropical) Australia

to provide an information base for determining management priorities

Objectives

1. Undertake (collate) a multiple-scale inventory of the habitats and biota of the rivers and wetlands (**Sub-project 1**)
2. Undertake risk assessments of the major pressures on the habitats and biota of the rivers and wetlands (**Sub-project 2**)
3. Develop and test a framework for analysis of the ecosystem services (eg. provision of water for multiple uses), provided by the rivers and wetlands of northern Australia (**Sub-project 3**)

Timeframe

July 04 – Sept 06



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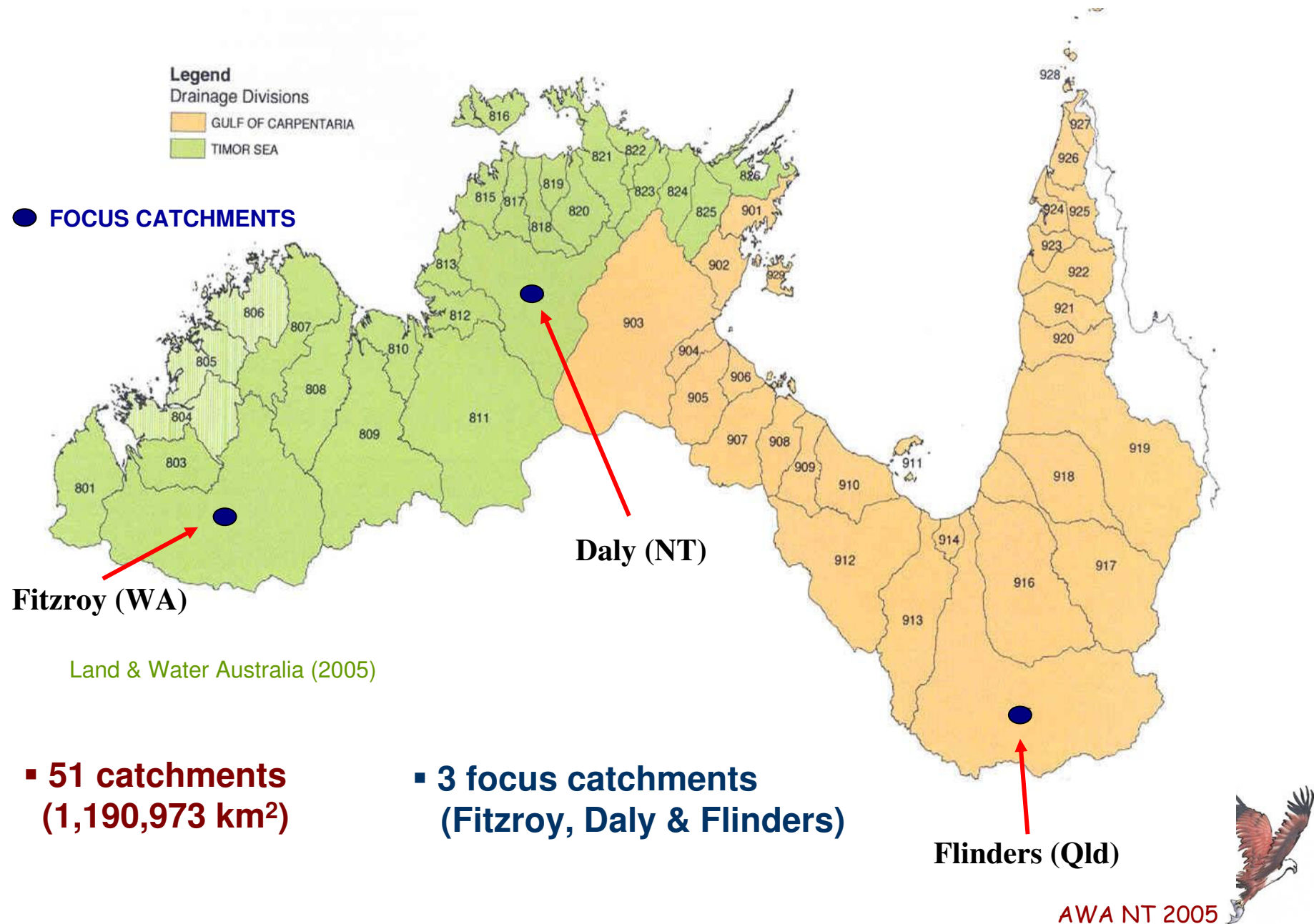
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TRIAP Project Area



Sub-project 1

Inventory of the biological, chemical and physical features of rivers/wetlands (July 04–March 06)

1. Consultation (ongoing)
2. Mapping (hierarchical approach):
 - $\leq 1:250K$ across northern Australia
 - finer scales for focus catchments (1:100K – 1:50K)
3. Collate existing river-reach attribute data and construct GIS
(*drainage, geomorphology, water quality, hydrology, vegetation, birds, fish, invertebrates, reptiles and amphibians*)
4. Determine classification for ecological characterisation of rivers (*what is the status of the northern rivers?*), and determine predictive capability
5. Ground-truthing and sampling regimes for focus catchments (*where identified and necessary*)
6. Identify data gaps



Sub-project 1



GIS LAYER

BIRDS

INVERTEBRATES

FISH

AMPHIBIANS

REPTILES

HYDROLOGY

WATER QUALITY

GEOMORPHOLOGY

VEGETATION

CATCHMENT SCALE
BASE DATA
(DRAINAGE)

Conceptual overview



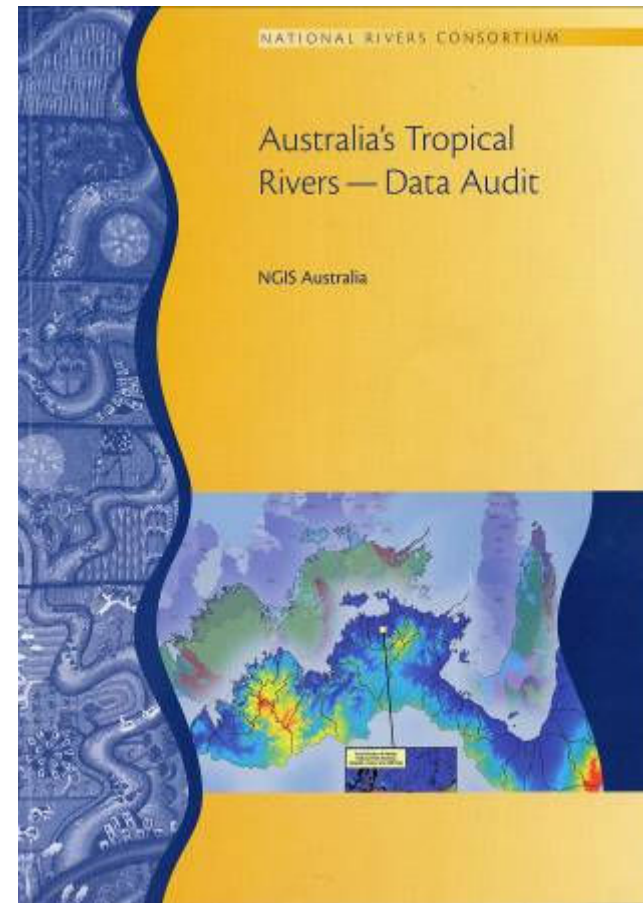
AWA NT 2005

Sub-project 1

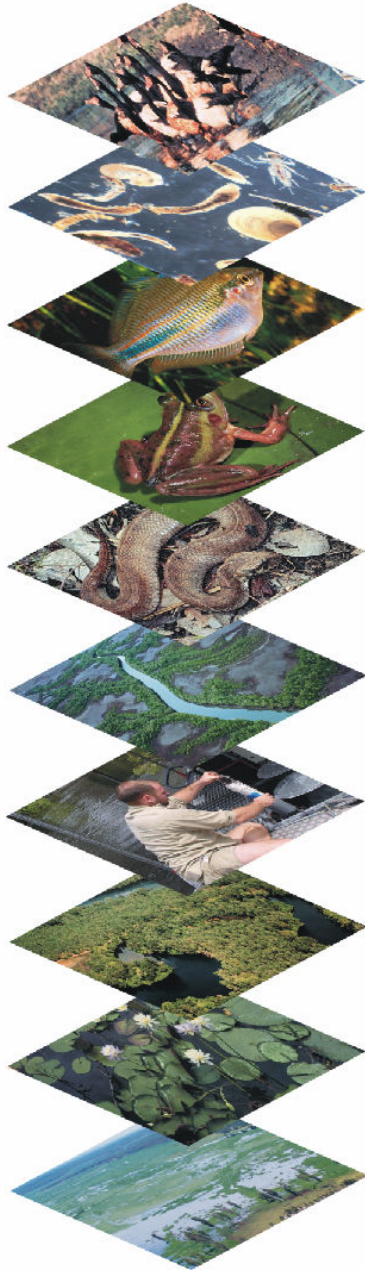
A useful starting point

Tropical Rivers Data Audit (2004)

- Identified extent and nature of data for study area
- Identified some data gaps & requirements
- Incomplete – some existing datasets not listed



Sub-project 1



GIS LAYER

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VEGETATION

CATCHMENT SCALE
BASE DATA
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AWA NT 2005

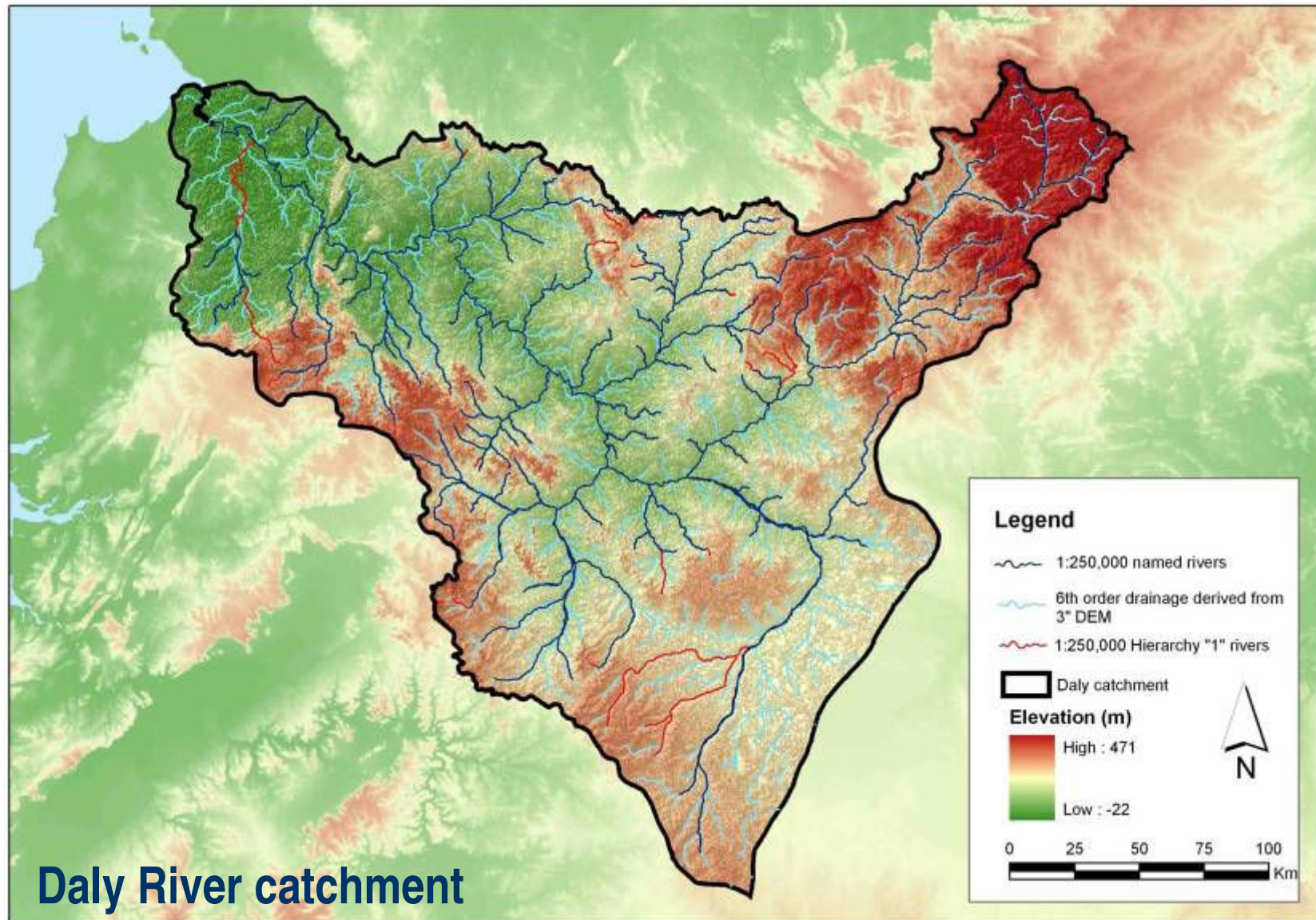
Sub-project 1

	<u>GIS LAYER</u>	<u>DATA SOURCE</u>
	BIRDS	The first “Atlas of Australian Birds” (Blakers et al 1984) “The New Atlas of Australian Birds” (Barrett et al 2003)
	INVERTEBRATES	AusRivAS (Macroinvertebrate data at the family- level) OZCAM Australian Heritage Assessment Tool ANIC digital collection Various other data sets
	FISH	OZCAM Survey data
	AMPHIBIANS	OZCAM PWCNT Database, QLD PWS WildNet, NT Frogs Database
	REPTILES	OZCAM PWCNT Database
	HYDROLOGY	BOM gauging station data DIPE (NT), DNRM & DoE (WA)
	WATER QUALITY	HYDSYS
	GEOMORPHOLOGY	River reach classification developed based on GAR (2004) and Erskine & Saynor (2005)
	VEGETATION	Herbarium databases Various reports and surveys
	CATCHMENT SCALE BASE DATA (DRAINAGE)	GeoScience Australia 1:250K topographic data, 3 sec Digital Elevation Model (DEM)



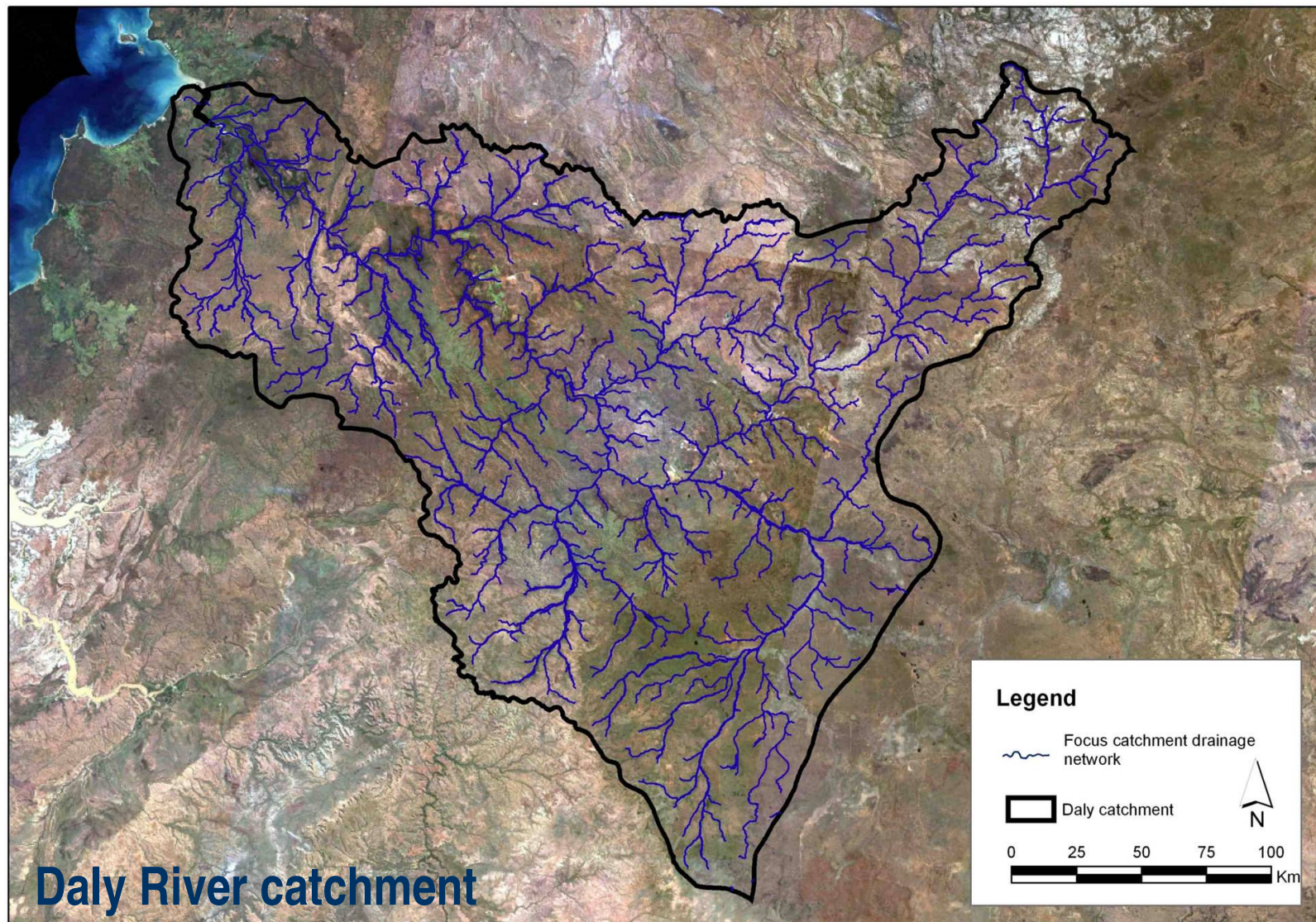
Sub-project 1

Identifying and compiling base drainage data



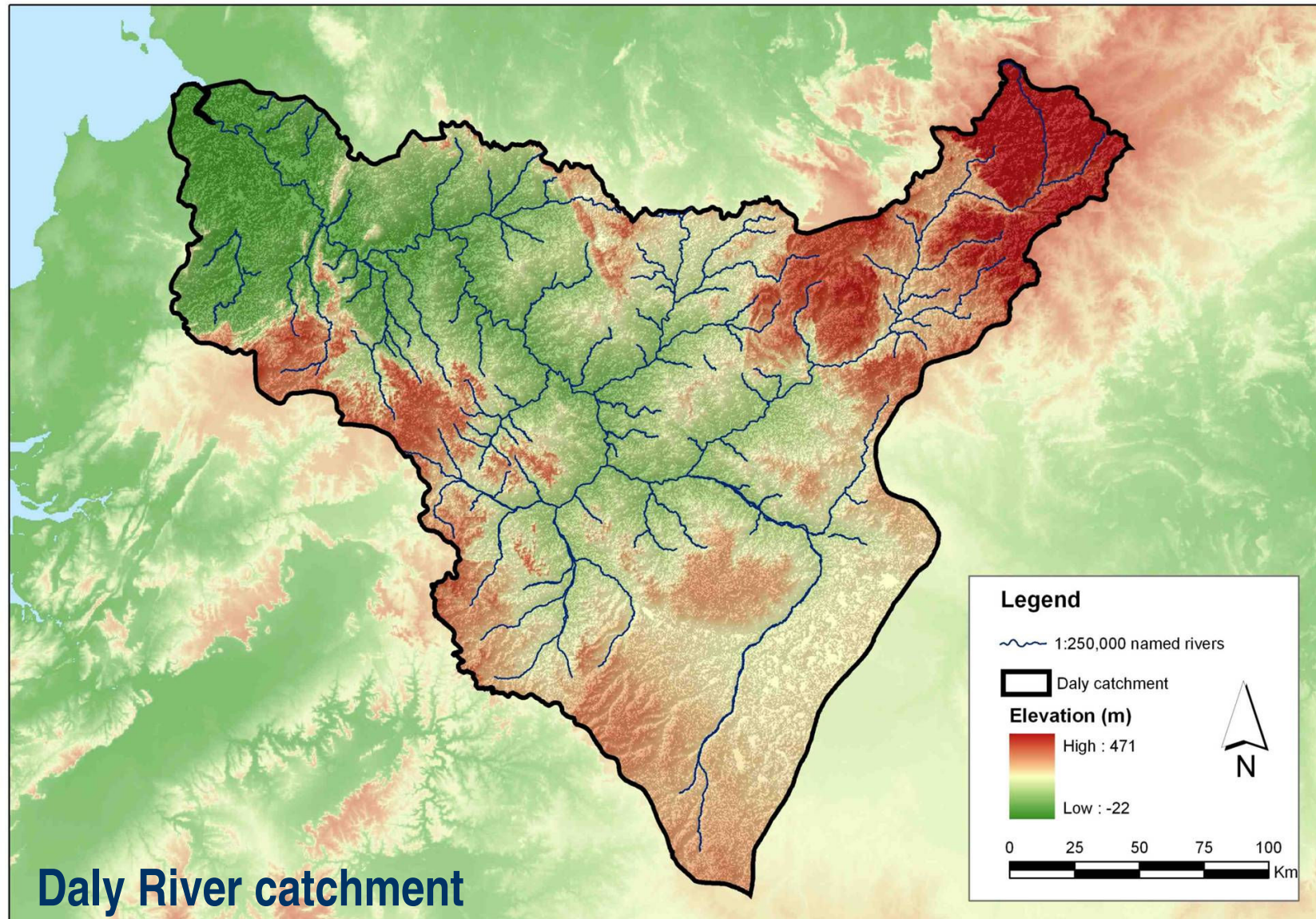
Sub-project 1

Final drainage network for focus catchments



Sub-project 1

Final drainage network at continental (broad) scale



Sub-project 1

Geomorphic river reach classification for the northern rivers

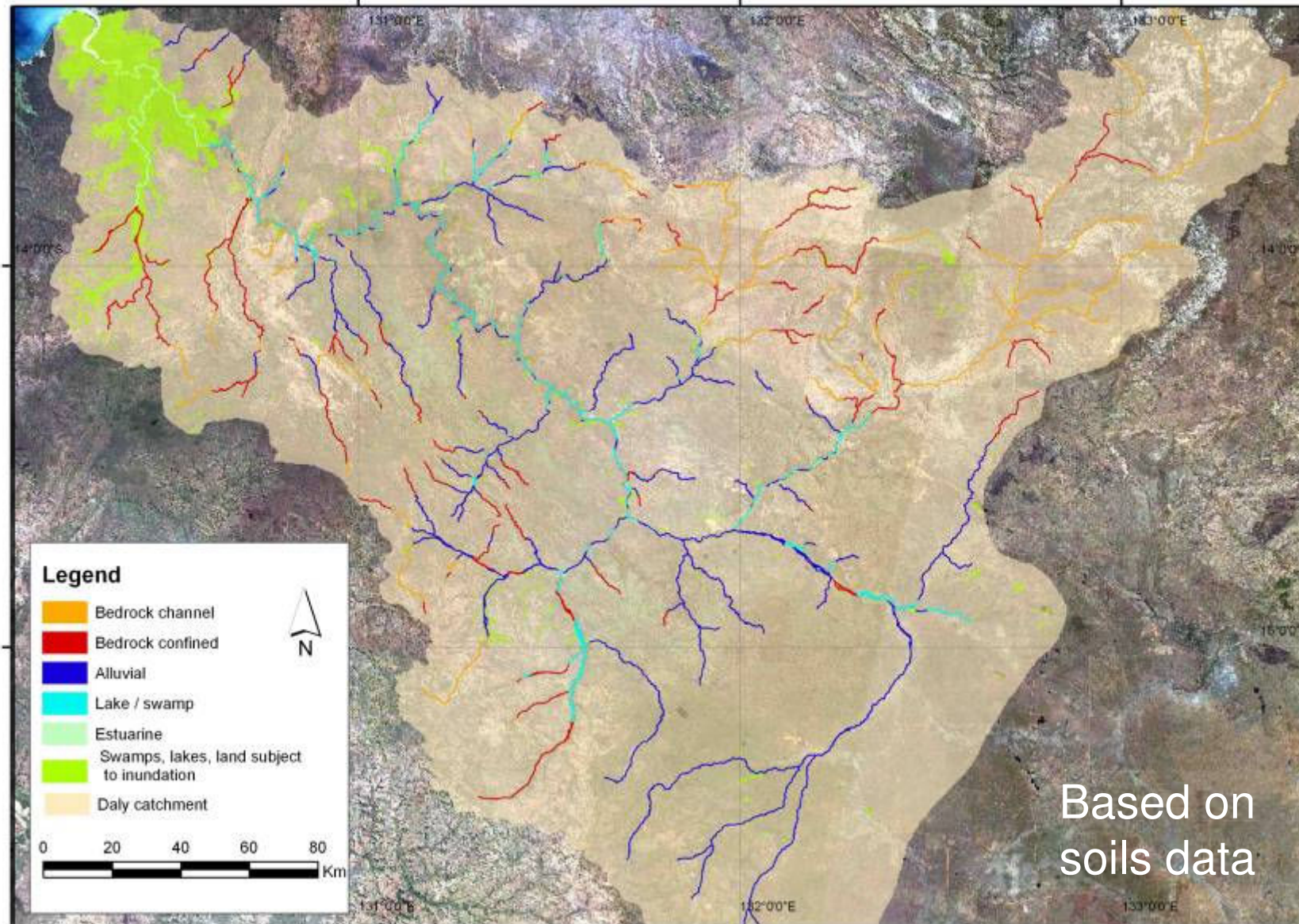
Broad scale classification	Focus-catchment scale classification
Bedrock channel	Bedrock channel
Bedrock confined	Bedrock confined
Alluvial	Low sinuosity
	Meandering
	Floodouts
	Multiple channel
	Wandering channel
Lake/swamp	Non-channelised
	Swamp/waterbody dominated zone
Estuarine	Tidal

Based on GAR (2004) and Erskine & Saynor (2005)



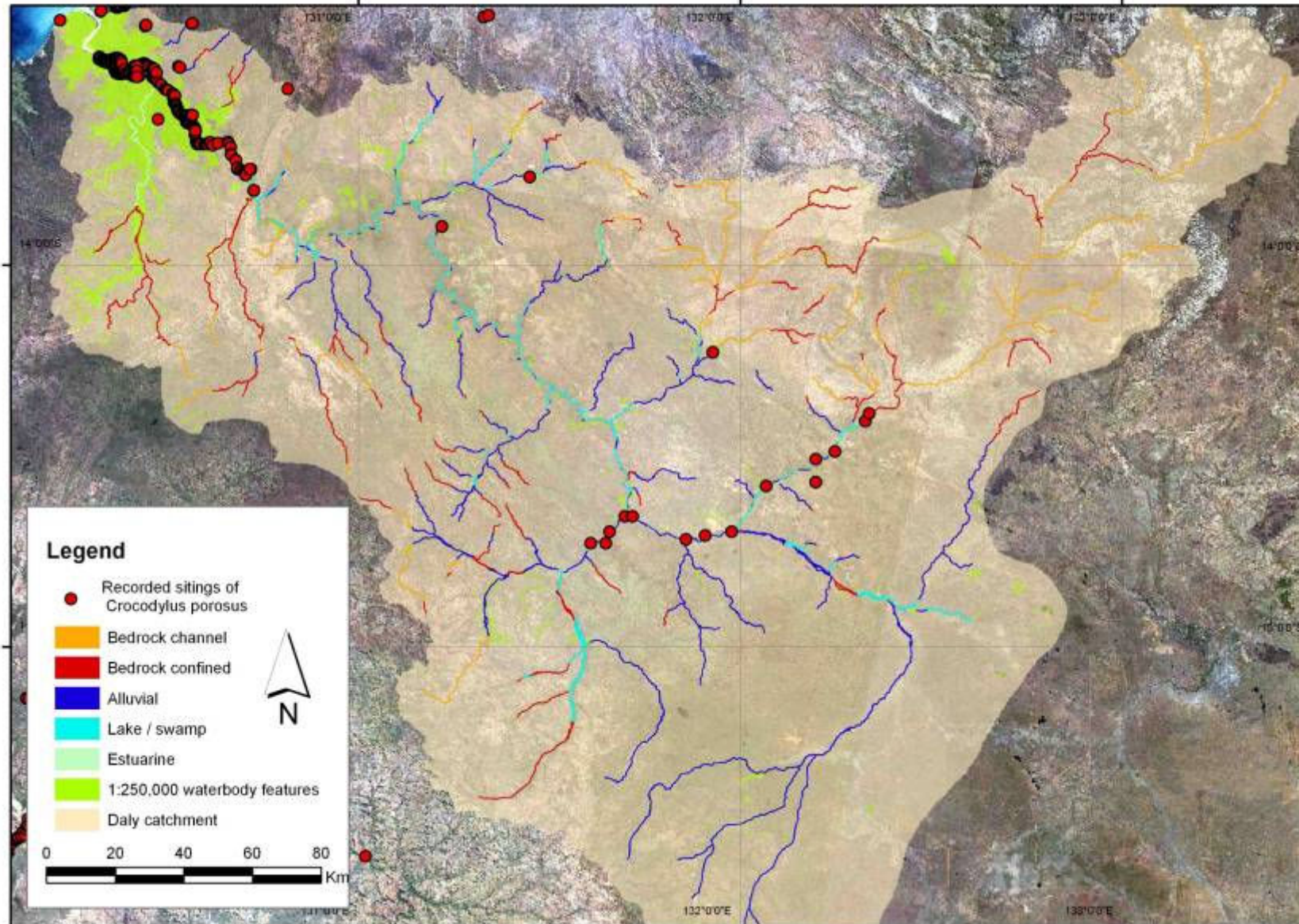
Sub-project 1

Classifying river reaches (broad scale)



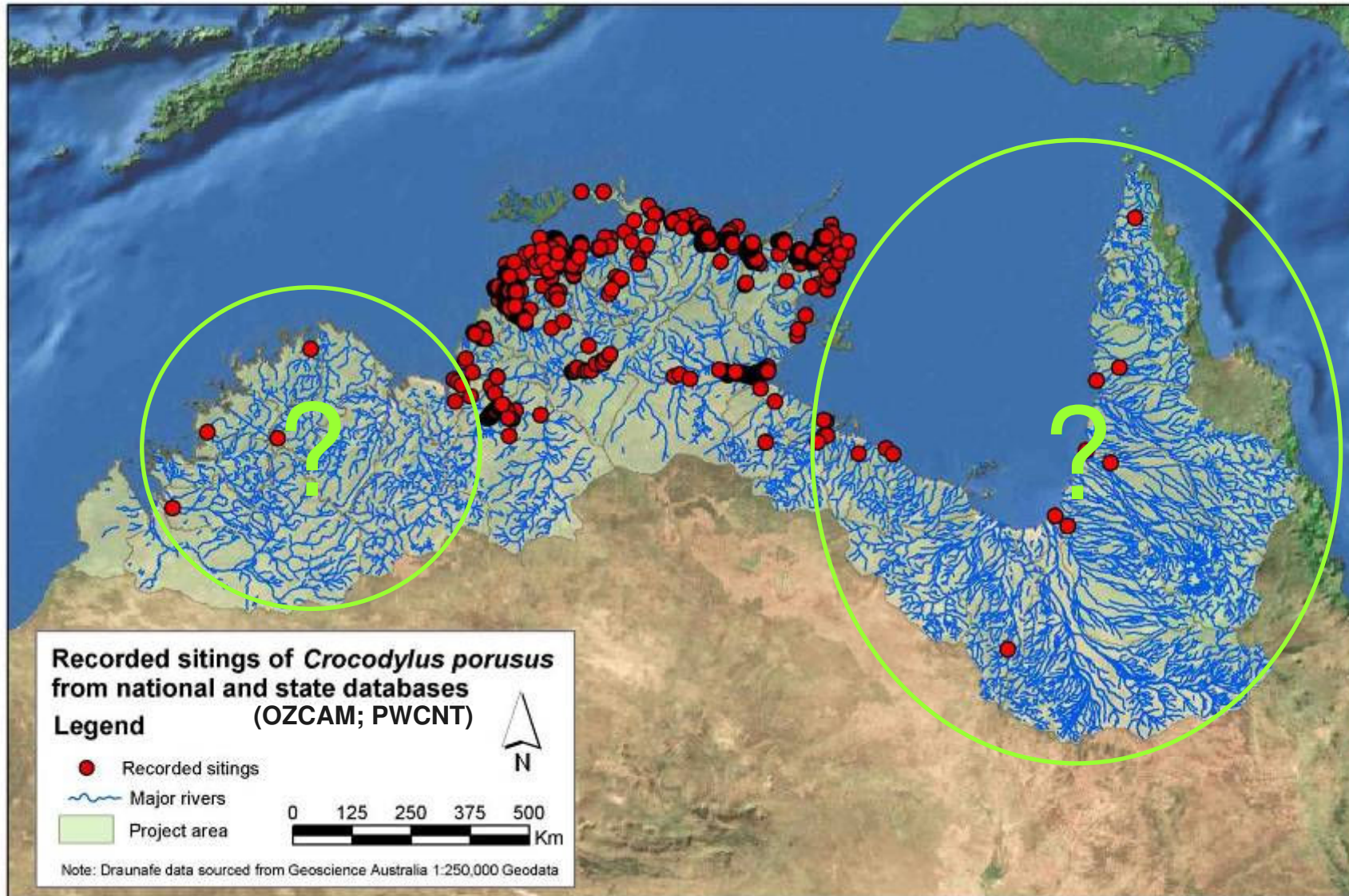
Sub-project 1

The challenge – developing an ecological typology



Sub-project 1

Data gaps – eg. Biology

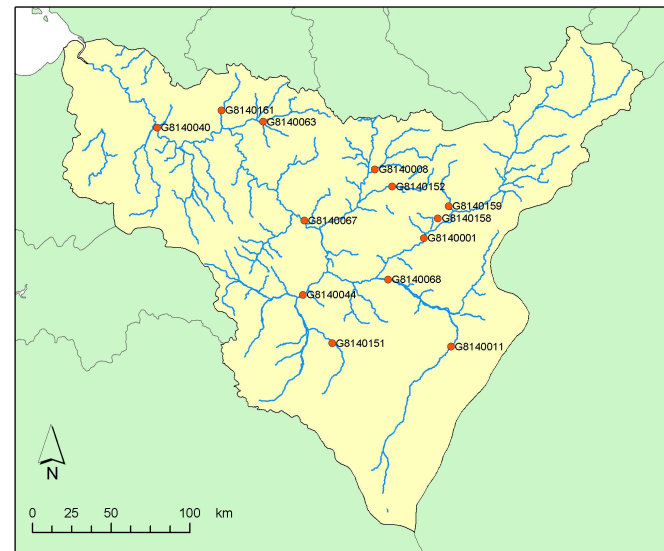
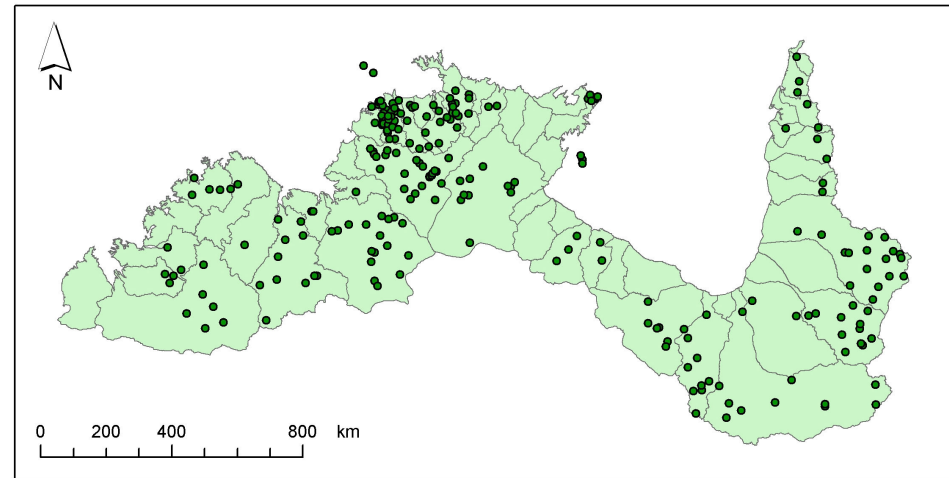


Sub-project 1

Data gaps – eg. Hydrology

- 630 historical and current gauging stations
 - <250 with record >20 y
 - <150 with rating curve to estimate discharge
 - <100 with complete 20+ y record

- Daly River
 - 13 of 70 stations with at least 20 y of complete annual runoff data



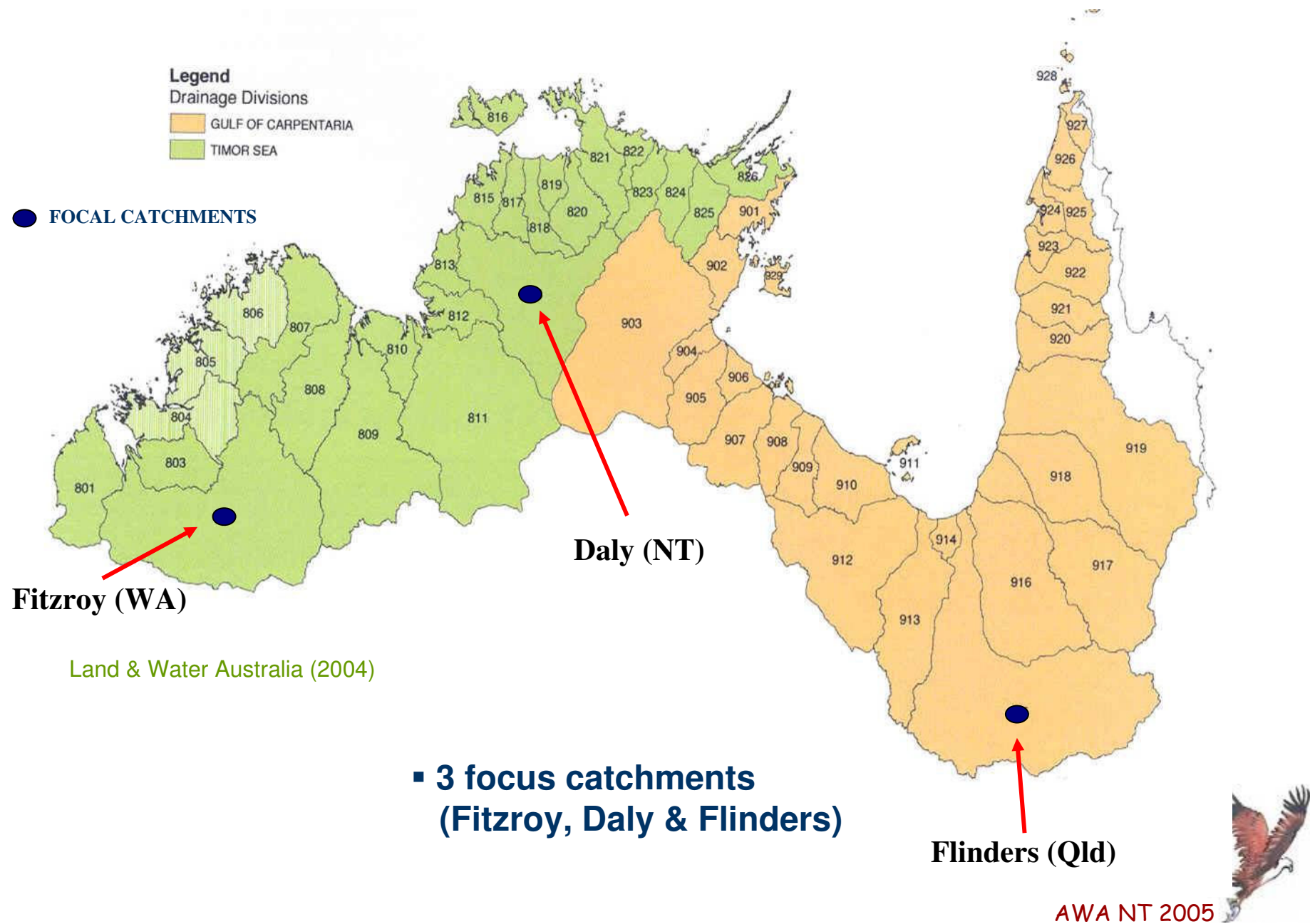
Sub-project 2

Assessment of major pressures on rivers and wetlands (April 05 – Sept 06)

1. Study area-wide overview of threats
2. Focus on selected major catchments and at important sites
3. Collation of information on values and pressures (after consultations with stakeholders) and development of conceptual models
4. Database population and qualitative → quantitative ecological risk assessments (linking to inventory/GIS)
5. Outcome = useful information on priority of threats + knowledge gaps + framework for further risk assessments

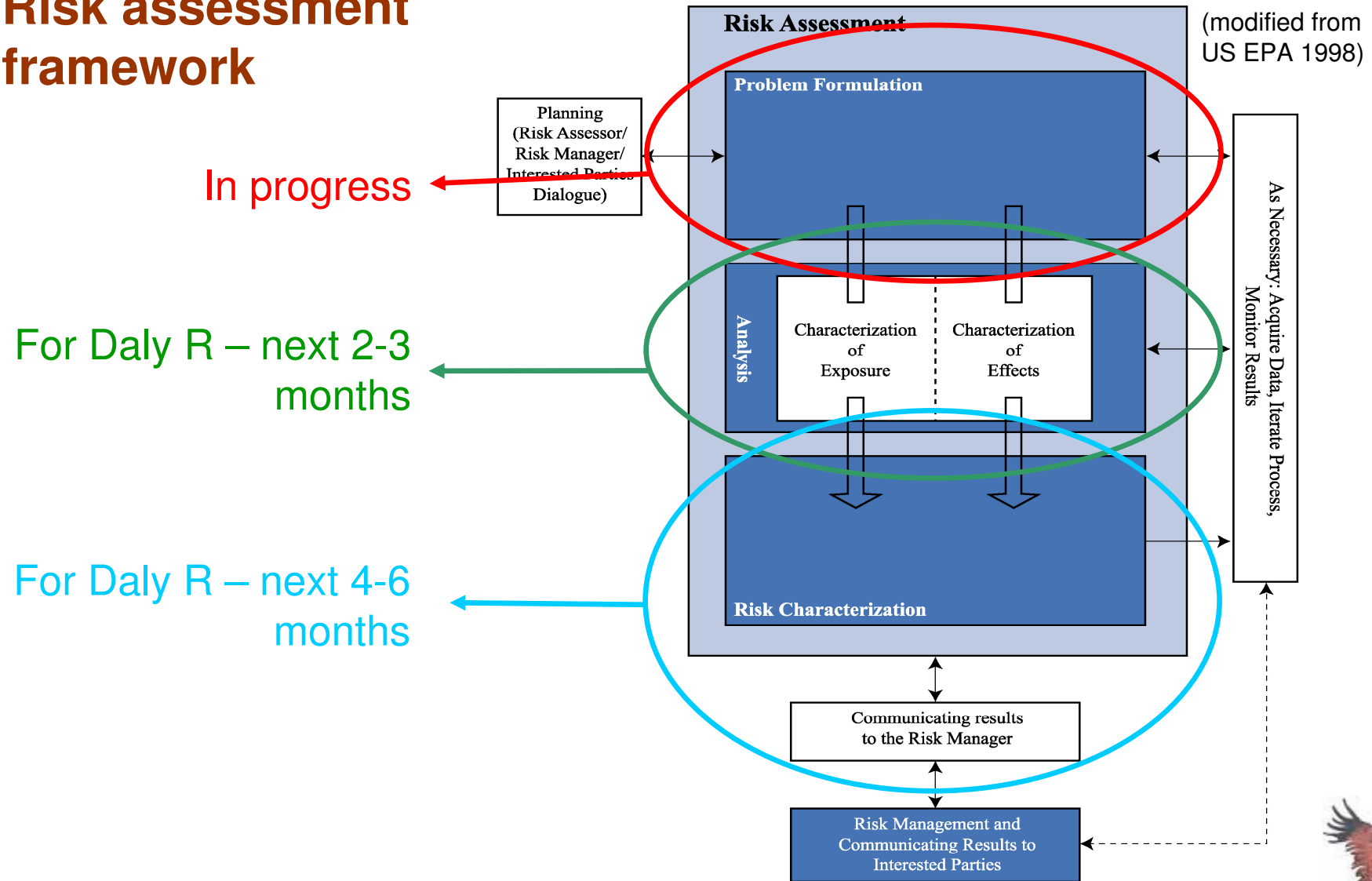


Sub-project 2



Sub-project 2

Risk assessment framework



Sub-project 2

Pressures on, and their threats to, Daly River

Pressure	Threats							
	Groundwater extraction	Surface water extraction	Altered fire regime	Land clearance	Introduce invasive flora	Introduce invasive fauna	Water impoundment	Water quality
Horticulture	✓	✓	✓	✓	✓		✓	✓
Pastoralism	✓	✓	✓	✓	✓	✓		✓
Crop production	✓	✓	✓	✓	✓	✓	✓	✓
Mining	✓	✓	✓	✓			✓	✓
Climate change			✓		✓	✓		
Urban development	✓	✓	✓	✓	✓	✓	✓	✓
Tourism/Recreation					✓	✓		✓
Invasive flora			✓		✓	✓		✓
Invasive fauna					✓	✓		

Information sources: Daly River Community Reference Group Report (2005); Draft Conservation Plan for the Daly Basin Region (2003); Environmental Water Requirements of the Daly River (2004); Aquatic Conservation Values of the Daly River Catchment, Northern Territory; Social Values of the Daly Region (2004); Preliminary Report on Aboriginal perspectives on land-use and water management in the Daly River Region, Northern Territory (2004); Inventory and risk assessment of water dependent ecosystems in the Daly basin, Northern Territory (2001); Integrated Natural Resource Management Plan for the Northern Territory (2005).



Sub-project 2

Values for Daly River aquatic ecosystems

- ***Water-dependent ecosystems***

biodiversity, threatened species, wildlife nurseries, erosion control, sediment retention, water regulation

- ***Water supply***

perennial flow of Daly R, limestone and karst geology, water quality, threatened species

- ***Riparian vegetation***

monsoon vine thickets, erosion control, habitat for wildlife

+ socio-economic & cultural values



Sub-project 2

Preliminary hazard matrix for Daly River

Values	Threats							
	Groundwater extraction	Surface water extraction	Altered fire regime	Land clearance	Invasive flora	Invasive fauna	Water impoundment	Water quality
Water dependent ecosystems								
Biodiversity	✓	✓	✓	✓	✓	✓	✓	✓
Threatened species	✓	✓	✓	✓	✓	✓	✓	✓
Nurseries & refugia	✓	✓		✓	✓		✓	✓
Erosion control / sediment retention	✓	✓	✓	✓	✓	✓	✓	
Water regulation	✓	✓		✓	✓		✓	
Water supply								
Perennial flow of Daly R.	✓	✓						
L'stone & karst geology	✓			✓			✓	
Water quality	✓	✓	✓	✓	✓	✓	✓	✓
Riparian vegetation								
Monsoon vine thickets	✓	✓	✓	✓	✓	✓	✓	✓
Erosion control	✓	✓	✓	✓	✓	✓	✓	✓
Habitat for wildlife	✓	✓	✓	✓	✓	✓	✓	✓

→ Development of conceptual models



Sub-project 2

Risk analysis

➤ Qualitative/semi-quantitative

- Broad scale
- Numerical data inadequate
- Priority setting

Likelihood	Consequences				
	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Almost certain (5)	5	10	15	20	25
Likely (4)	4	8	12	16	20
Possible (3)	3	6	9	12	15
Unlikely (2)	2	4	6	8	10
Rare (1)	1	2	3	4	5

1–4 Low Risk; 5–12 Moderate Risk; 15–25 High Risk

- To be applied at catchment scale
(multiple threats v multiple values)

➤ Quantitative

- Detailed scale
- Numerical data + modelling
- Quantify risk & uncertainty
- To be applied at sub-catchment scale
(2-3 threats v single value)



(From Burgman 2005)



Concluding Remarks

- Australia's northern rivers – under increasing development pressure
 - relatively poorly understood
- TRIAP – Integrating existing biophysical information on northern rivers (GIS, multiple-scale maps)
 - Describing the ecological character and value of the northern rivers (benchmarking for the future)
 - Identifying the key pressures/threats to the northern rivers
 - Towards a framework for assessment of risks of threats to northern rivers
 - Identifying key information/data gaps and associated research priorities
- Ambitious objectives → the challenge ahead
- A starting point only → more dialogue required





Thank you