A synthesis of knowledge to support the assessment of impacts of water resource development to environmental assets in northern Australia
Primary purpose
To provide information to reduce the uncertainty of investors and regulators
Overview of activity
i.e. What is the issue?

NA White Paper:
• How do you secure water supplies while safeguarding the natural environment?

NAWRA:
• Activity: How will the development of irrigation infrastructure (and changes in land use) potentially impact ecology?
  - What aspects of ecology are important to focus on?
  - What are the potential impacts to environmental assets?
  - How can these impacts be minimised?

• Output: A set of products that can underpin decision making
NAWRA Ecology

The Ecology activity had three major activities:

1. What important environmental assets are there?
   - Species
   - Functional groups
   - Processes
   - Habitats

2. What is their distribution and water requirements?
   - Conceptual models
   - Literature reviews
   - Mapping (earth obs, field)

3. Are they sensitive to potential impacts and flow change?
   - Flow
   - Habitat
   - Timing
   - Inundation

Report 1: Asset Descriptions
Report 2: Asset Analysis
Report 1: Asset Descriptions
How do we define Environmental Assets?

Assets grouped as Marine and Freshwater:

- **Significance**: Ecological, Conservation, Recreation, Commercial, Indigenous/Cultural
- **Water-dependent**: Require flows from a river channel for all or part of their life cycle or to improve condition
- **Representative**: Capture a range of flow requirements for biota, habitats and ecological processes
- **Complete**: Synergies in selection of Assets across the Assessment Regions (few exceptions – NPF, MVF)
- **Distinctive**: Minimise overlap in flow requirements
- **Evidence**: Sufficient evidence to describe relationships with flows
## Freshwater assets:
- 4 Habitat types;
- 3 Functional groups;
- 5 Species that require freshwater for part or all of lifecycle.

### Functional groups:
- Migratory fish
- Stable flow spawning fish
- Turtles and long-necked turtles

### Species of significance:
- Mappie geese
- Barramundi
- Sawfish
- **Whipray**
- River sharks

## Marine assets:
- 4 Habitat types;
- 8 Commercial and conservation species;
- 2 Ecological processes.

### Habitats:
- Mangroves
- Seagrass
- Salt flats
- Coral

### Species of significance:
- Mullet spp.
- Mud crabs
- **Longbats**
- Saltwater crocodiles
- Snubfin dolphin
- Threadfin
- Grunter
- Banana prawns

### Processes:
- Productivity
- Fluvial geomorphology
Example: Asset Maps (Darwin Catchments)

Springs

Floodplain

Vine Forests (Wildman)

Waterholes
Report 2: Asset Analysis
Scenarios of potential change

**Water harvesting**
- System extraction volumes
- Low and high threshold pumping
- Intersected with and without climate change

**Dams**
- Location with operating rules
- Individual and multiple dams
- Intersected with and without climate change
Asset Analysis: A two-tiered approach

**Tier 1:** Flow screening hydrometrics

**Tier 2:** Quantitative analysis – flow requirements

- Inundation analysis
- Statistical analysis

**Habitat suitability: Preference Curves**
Case study: Water harvesting impacts on sawfish

Potential for water harvesting impacts: Cumulative through to the end of catchment
Case study: Dam impact on sawfish

Potential for dam impacts: Greatest downstream of the dam wall
• We have **collated data and knowledge**, to support assessments of impact associated with potential infrastructure development

• This information was used to **support assessments** of potential impacts of new water infrastructure in NA

• **What is needed?**
  - Technical: A process by which this **information can be adopted** and maintained with new data and information, especially at local scales
  - Scientific: A **broader systems view of change**, considering land use changes, invasive species, second order impacts
  - Investment: Some **basic knowledge** of species, habitats and ecosystem function is lacking
  - Decisions: Being **informed about risks and trade-offs** by what information we have today
Synthesis of knowledge to support the assessment of impacts of water resource development to ecological assets in northern Australia: asset descriptions

A technical report to the Australian Government from the CSIRO Northern Australia Water Resource Assessment, part of the National Water Infrastructure Development Fund: Water Resource Assessments.

Access to the Technical Report

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Asset Conceptual Models

Threat:
- Water extraction & regulation
- Change to wet season inundation & flooding
- Change to dry season water persistence
- Salt water intrusion
- Change/ intensification in land use/management
- Invasive species

Driver/Stressor:
- Macrophyte growth reduced
- Changes to breeding cues & nesting success
- Loss of important seasonal habitat

Effect:
- Reduced survival & recruitment
- Reduced population size & changes in distribution/occurrence

Outcomes:
- Changes in hydrology
- Changes in population vital rates
- Changes in habitat areas/quality

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