Australia’s northern rivers. Untapped resources? Priceless natural heritage?
Research and information needs.

Paper presented at River Symposium, Brisbane, 2–6 September 2002
CM Finlayson, G Lukacs, C Humphrey, G Begg & LEvans
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Abstract

Compared to southern Australia it is generally considered that wetlands in northern Australia are generally ‘intact’ and possibly close to ‘pristine’. With the exception of a few specific areas we accept the comparison, but baulk at making a categorical statement that supports the impression that northern wetlands are in good condition. Without getting into an esoteric debate about concepts we provide an analysis of pressures on northern wetlands and point to major concerns for the future. We do this by assessing the extent of wetland inventory information and recommend that a coordinated approach using standardised protocols and core data is needed to complete the picture and make this available to users. Further, ecological assessment, including structured risk assessment of pressures is urgently needed. This not only provides a considered base for management actions but also for further prioritisation of research effort. We then identify major research topics that need to be addressed.

Our analysis is essentially based on the biophysical features of northern wetlands. These are valuable and in some instances well known and protected. However, in order to conserve and ensure wise use of wetlands we contend that this approach is insufficient. We propose that a strong emphasis be placed on sustainable use of the goods and services that wetlands provide humans. The challenge in doing this is to demonstrate through research activities that the provision of these goods and services is dependent on the maintenance of wetland habitats and their species. The case for doing this is illustrated through a framework relating goods and services to ecosystem components and thence to pressures that could degrade these, including the emerging pressures of globalisation of trade and global climate change, and the research required to understand these sufficiently well to support management responses.
Australia’s northern rivers: untapped resources? priceless natural heritage? research and information needs

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Australia’s northern rivers

- Rivers in northern Australia are priceless and untapped resources
- Information base for rivers is insufficient
- Assessment of major pressures is needed
- Research required on ecological processes and interactions
- Integrated inventory, assessment and monitoring framework required
Major pressures on Northern Australia wetlands

- Proximate drivers
  - Invasive species
  - Hydrologic modification
  - Clearance/drainage
  - Over harvesting
  - Pollution
  - Climate change

- Primary drivers
Primary drivers

- Demographic
- Lifestyle
- Technological
- Social and political
- Economical/Globalisation

Wetland Inventory

- Standardised and updated information set needed
- Ramsar Wetland Convention provides a framework for wetland inventory
Wetland information base - uneven, outdated, lacking

Wetland area (km²) in wet-dry tropics
- Auslig 250k: 89 704
- Digital Chart of the World: 70 078
- Matthews natural wetlands: 35 649
- DISCover land use - IGBP: 4 727
- Directory of Important Wetlands: 30 849
- CSIRO wetland database: 18 539

Framework for wetland inventory

Step
1. State the purpose and objective
2. Review existing knowledge and information
3. Review existing inventory methods
4. Determine the scale and resolution
5. Establish a core or minimum data set
6. Establish a habitat classification
7. Choose an appropriate method
8. Establish a data management system
9. Establish a time schedule and extent of resources
10. Assess the feasibility & cost effectiveness
11. Establish a reporting procedure
12. Establish a review and evaluation process
13. Plan a pilot study
Framework for wetland inventory

- Hierarchical Multiscale
- Map-based GIS
- Core biophysical & management data

Status of wetlands in Northern Australia

- Wetlands in northern Australia are under pressure
- Information base for wetland management is insufficient
- Assessment of major pressures is required
- Research required on ecological processes and interactions
- Integrated framework required
Biophysical data

- Site name (official name of site and catchment)
- Area and boundary (size and variation, range and average values)
- Location (projection system, map coordinates, map centroid, elevation)
- Geomorphic setting (where it occurs within the landscape, linkage with other aquatic habitat, biogeographical region)
- General description (shape, cross-section and plan view)
- Climate – zone and major features
- Soil (structure and colour)
- Water regime (periodicity, extent of flooding, source of surface water and links with groundwater)
- Water chemistry (salinity, pH, colour, transparency, nutrients)
- Biota (vegetation zones and structure, animal populations and distribution, special features including rare/endangered species)

Managerial data

- Landuse – local and in the river basin and/or coastal zone
- Pressures on the wetland – within the wetland and in the river basin and/or coastal zone
- Land tenure and administrative authority – for the wetland critical parts of the river basin and/or coastal zone
- Conservation and management status of the wetland – including legal instruments and social or cultural traditions that impinge on the management of the wetland
- Ecosystem values and benefits (goods and services) derived from the wetland – including products, functions and attributes and, where possible, their worth to humans
- Management plans and monitoring programs – in place and planned within the wetland and in the river basin and/or coastal zone
Wetland Inventory

- Standardised and updated information set needed
- Ramsar Wetland Convention provides a framework for wetland inventory

The Risk Assessment Framework
(modified from van Dam et al. 1999; Ramsar 2000)

Identification of the problem:
(eg site assessment: site-specific information on stressor & environment)

Identification of the effects:
(field assessment: eg bioassays, monitoring, surveys etc.)

Identification of the extent of the problem:
(eg chemical concs, spatial & temporal distribution)

Identification of the risk:
(comparison of effects with the extent using a GIS framework)

Risk management:
Risk reduction
(manage inputs/alter practices)

Monitoring:
(use of early warning and rapid assessment indicators/GIS-based approach)
Hierarchical approach to wetland inventory

Level 1
River basin or island
- Scale (nominal): 1:1 000 000
- Geology; climate; landcover

Level 2
Wetland region
- Scale: 1:250 000
- Location; altitude; area; land systems; climate; hydrology; vegetation

Level 3
Wetland complex
- Scale: 1:50 000
- Location; physico-chemical and biological features; classification; jurisdiction; ecosystem services

Level 4
Wetland habitat
- Location; physico-chemical and biological features (ecological character); land tenure; land use; management issues and threats...

Basic ("Core") dataset stored in Database with GIS Interface
Framework for wetland inventory

- Hierarchical Multiscalar
- Map-based GIS
- Core biophysical & management data
Status of wetlands in Northern Australia

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Status of wetlands in Northern Australia

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Research required and ecological processes

- Provision of Water for environmental benefits
- Prevention of pollution and contamination of wetlands
- Prevention and reduction of salinisation of non-saline wetlands
- Prevention of further drainage and infiltrating of wetlands
- Management of grazing in wetlands
Research required and ecological processes

- Restoration and protection of riparian vegetation
- Prevention and control of invasive species
- Adaptation to and mitigation of climate change and sea-level rise
- Development of rigorous inventory, assessment and monitoring protocols

Integrated framework required

Scale 3

Scale 2

Scale 1

Primary Drivers
- Demographic change
- Economic Change
- Social and Political Change
- Technological change
- Lifestyle and Behavioral change

Wellbeing & Poverty Reduction
- Health and disease
- Environmental Security
- Cultural Security
- Economic Security
- Equity

Proximate Drivers
- Climate change
- Land use & Cover Change
- Factor inputs (e.g., irrigation, fertilizers)
- Pollution
- Harvest
- Nutrient Release
- Species Introductions

Demand

Ecosystems & their Services
- Supporting (Biodiversity and ecosystem processes)
- Provisioning (Food, water, fiber, fuel, other bio products)
- Enriching (Cultural, aesthetic)
Provision of water for environmental benefits

- Ecological responses to variation in flows
- Water requirements for aquatic species
- Techniques for determining water allocations

Prevention of pollution and contamination of wetlands

- Ecological responses to nutrients and pollutants
- Pollution pathways and interactions
- Techniques for rapid and early assessment
- Techniques for rehabilitation of pollutes habitats
Prevention and reduction of salinisation of non saline wetlands

- Ecological responses to salt
- Techniques to lower watertables
- Techniques for rehabilitation of salinised habitats

Prevention of further drainage and in-filling of wetlands

- Techniques for rehabilitation of degraded habitats
Management of grazing in wetlands

- Techniques for rehabilitation of degraded habitats
- Techniques for selective grazing
- Assessment of biodiversity effects of introduced pasture species

Restoration and protection of riparian vegetation

- Ecological links between energy and nutrients pathways
- Techniques for rehabilitation of degraded habitat
Prevention and control of invasive species

- Ecological impacts of invasive species
- Biology of invasive species
- Techniques for effective control
- Early warning and prevention of invasion

Adaptation to and mitigation of climate change and sea-level rise

- Techniques for integrated vulnerability assessment
- Techniques for mitigation of climate change
- Assessment of adaptation options
Development of rigorous inventory, assessment and monitoring

- Protocols for designing projects
- Standardised procedures for collecting, holding and disseminating information
- Early and rapid assessment techniques
- Techniques for assessing condition and trends

Thank you