Spatially Enabled MDBA

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- Murray–Darling Basin Authority (MDBA) Overview
- Spatial Information Program
  - Information interests
  - Strategic connections
  - Spatial governance
  - Best practice approach
- Spatial Enablement
- Current and Future Priorities
- Future Directions and Challenges
The MDBA
Functions & responsibilities

(a) Prepare a comprehensive plan for the integration and sustainable management of water resources in the Murray-Darling Basin for adoption by the Minister (Basin Plan)
(b) Develop a water rights information service
(c) Measure and monitor water resources
(d) Gather information and undertake research
(e) Undertake former MDBC functions
The MDBA Outcome statement

• “Equitable and sustainable use of the Murray-Darling Basin by government and the community, including through development and implementation of a Basin Plan, operation of the River Murray System, shared natural resource management programs, research, information and advice.”
• **Basin Plan**: Prepare, implement, monitor and enforce the Basin Plan, and undertake activities relevant to jurisdictional water resource plans, for the sustainable management of water resources in the Basin.

• **River Murray**: Manage, operate and sustain the River Murray assets to deliver states’ shares of water and environmental outcomes in the River Murray system.

• **Natural Resource Management**: Develop and implement strategies for the protection and enhancement of the Basin’s shared water and other natural resources.

Water Act 2007 & MDBA Corporate Plan 2011-2014: ‘… Develop a Basin-wide information strategy to integrate existing data holdings and information systems, including a new water rights information service’
The Murray-Darling Basin

- Directly supports 3 million people
- Feeds approximately 20 million people
- Significant environmental values
- 14% of Australia
- Australia’s three longest rivers
- 39% Australia’s farmers
- Exports earn $9 bil/year
- 65% Australia’s irrigated agriculture
- 39% Australia’s agricultural production ($15bn)
Ramsar Wetlands - Australia’s international obligations, 16 in MDB

- ~30,000 wetlands
- 6.3 million ha
- 98% floodplains
- ~3% protected

<table>
<thead>
<tr>
<th>Ramsar Ref</th>
<th>Ramsar Wetland</th>
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<tbody>
<tr>
<td>14</td>
<td>Barmah Forest</td>
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<tr>
<td>15</td>
<td>Gunbower Forest</td>
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<tr>
<td>16</td>
<td>Hattah-Kulkyne Lakes</td>
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<td>17</td>
<td>Kerang Wetlands</td>
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<td>22</td>
<td>Lake Albacutya</td>
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<td>25</td>
<td>The Coorong, and Lakes Alexandrina and Albert Wetland</td>
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<td>28</td>
<td>The Macquarie Marshes</td>
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<tr>
<td>29</td>
<td>Riverland including Chowilla Floodplain System</td>
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<td>43</td>
<td>Currawinya Lakes (Currawinya National Park)</td>
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<td>45</td>
<td>Ginini Flats Wetland Complex</td>
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<td>50</td>
<td>Gwydir Wetlands: Gingham and Lower Gwydir (Big Leather) Watercourses</td>
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<tr>
<td>53</td>
<td>Narran Lake Nature Reserve</td>
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<td>62</td>
<td>Fivebough and Tuckerbil Swamps</td>
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<td>Banrock Station Wetland Complex</td>
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<td>64</td>
<td>NSW Central Murray State Forests</td>
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<tr>
<td>65</td>
<td>Paroo River Wetlands</td>
</tr>
</tbody>
</table>

Ramsar wetlands - Australia’s international obligations, 16 in MDB

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Spatial Information

- MDBA has a history of compiling and using spatial information
- Millions of dollars invested in spatial data
- Opportunities for improved systems and approaches, including working in partnership with state and Commonwealth agencies
Vision and Mission

Spatial Vision

Guide MDBA to become a spatially enabled agency to perform management of the shared water and other natural resources of the Murray-Darling Basin most effectively.

Spatial Mission

The coordination, collection, storage, processing, analysis and interpretation of spatial information to meet MDBA’s objectives.
Spatial Information Functions

• Manage and coordinate the Authority’s spatial information requirements, assets and deliverables
• Design and implement the spatial information infrastructure
• Provide a spatial platform that supports a wide range of program activities
• Promote discoverability and access to spatial information internally and externally
• Ensure consistency with inter-agency spatial data initiatives and processes
• Strategic partnerships and technical advice
Key Drivers

- MDBA Mandate
- MDBA Enterprise Information Strategy
- Proposed Basin Plan
- NRM and RM Programs
- Supported by NRI Unit
- Wetland health condition
- River and floodplain condition
- Flood extent and history
- Algal blooms and water quality
- Water accounting
- Hydrological and ecosystem modeling
- Socio-economic analysis
- Groundwater assessments & modeling
- Surface and ground water
- Spatial data analysis and mapping
- Basin spatial data acquisition (satellite, airborne, ground-based, other), management, access and custodianship
- Web-based delivery
Best Practice Approach

- Best-industry practices in information management
  - consolidation and standardisation,
  - easy public visibility,
  - discoverability, availability, accessibility,
  - good governance, stewardship and custodial responsibilities,
  - licensing and co-investment, long term capacity and capability building, and strategic information coordination with partner agencies to maximise opportunities while minimising transaction costs.

- Applying holistic frameworks such as the APS 200 principles and spatial data infrastructures (SDI) governance arrangements to deliver enduring solutions
Spatial Governance

Spatial Information Advisory Committee (SIAC)

Commonwealth Agencies
- Dept. of Environment (SEWPac)
- Geoscience Australia (GA)
- Department of Resources, Energy and Tourism (DRET)
- Bureau of Meteorology (BOM)

State Jurisdictional Agencies
- NSW Government (OEH & LPI)
- VIC Government (DSE)
- SA Government (DENR & DFW)
- QLD Government (DERM)
- ACT Government (DECEW)

Other Organisations
- CRC SI
- PSMA
- Academic institutions with relevant expertise

Advice to

MDBA Spatial Information & Remote Sensing Unit (currently NRI)

NRMC
MDBA Executives
Partnerships

• **Memoranda of Understanding (MoUs) with Federal partners** –
  – SEWPaC
  – Geoscience Australia (GA)
  – ABS, BoM, …

• **MoUs with the State agencies**
  • NSW Government (OEH & LPI)
  • VIC Government (DSE)
  • SA Government (DENR & DFW)
  • QLD Government (DERM)
  • ACT Government (DECCEW)

• **Current collaboration with research organisations, e.g.**
  – Cooperative Research Centre for Spatial Information (CRC SI)
  – Academic institutions with relevant expertise
Ground for Partnership

GA-MDBA Strategic Alliance

Expertise

- Risk Analysis (e.g. MDBA provides MDB specific risk model inputs to GA Risk Assessment Models). GA provides expertise in National Risk Assessment
- Hydrological Modelling – MDBA staff have expertise in hydrological modelling programs such as BigMod and Hydstra
- Staff Development (e.g. joint training programs, staff exchange)
- Expertise in Corporate Record Management (TRM), HR, ESS, Standards and Information and Personal Security Systems

Data

- GA’s National Topographic Data – GA provides nationally consistent topographic datasets for mapping
- Sharing of Remote Sensing Data and Imagery – GA has extensive Remote Sensing holdings at small scales, MDBA holds larger scale remote sensing imagery in specific areas
- Sharing of Water Resources Data (e.g. Hydro GeoFabric)
- MDBA holds significant datasets such as the SRA’s Ecological Health of Rivers, Water Quality Monitoring Program Data, etc.

Infrastructure

- Data Service Functions – GA has the capacity to provide data server functions for MDBA providing seamless common access to data for both agencies
- ICT Hardware – Sharing of ICT Hardware may provide savings to both agencies
- Software Applications – Software applications have been developed by GA that may be shared with MDBA (e.g. 3D Visualisation Software)
- MDBA Information Infrastructure Project: The MDBA Information Infrastructure Project will provide easy access to a range of data relevant to the MDBA. Subject to the ongoing investment
Spatial Enablement – Example 1

http://banksia.mdbc.local/TestMDBABasinMaps/MDBABASIN.html

**MDBA Basin Map**

- **Navigation tools**
- **Overview map**
- **Search result**
- **Map legend**
- **Table of contents listing available layers**
# MDBA Basin Map System

![MDBA Basin Map System](image)

## MDBA Basin Map User Guide

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Software requirements</td>
<td>Internet Explorer</td>
</tr>
<tr>
<td>Database requirements</td>
<td>SDE Database</td>
</tr>
<tr>
<td>Live or static data accessibility</td>
<td>Live and only within MDBA</td>
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<tr>
<td>GIS skills requirements</td>
<td>No GIS skills required</td>
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</table>

### User Interface

The Murray–Darling Basin Authority’s “Basin Map” is an online and interactive mapping tool that publishes the MDBA’s Basin Plan spatial data. It connects to map services stored in the MDBA ArcGIS server as well as other online maps services, and is accessible only internally in the MDBA through a specified URL.
MDBA Basin Map System

Data Download
MDBA Web Mapping Architecture

Current System Configuration

- NRI ArcServer Spatial Data Server (Maculosa)
- SQL Microsoft Server (Mdlamprey)
- Internet Server System (Microsoft IIS)
- GIS Users
- Web Map Users
- Firewall / Proxy Server
- External Web Servers
During 2009–10, the MDBA’s key environmental assets (KEA) project produced an interim solution for water-dependent ecosystems information to meet the immediate business requirements. KEA has used a compilation of existing national and jurisdictional information to identify water-dependent ecosystems that fulfil one of the least five criteria for water-dependent ecosystem assets.

DEWHA-MDBA are jointly developing a comprehensive water-dependent ecosystem database “Environmental Assets Database (EAD)” that aims: to optimise ecological outcomes at key locations and allow coordination and reporting of this process.

- Design of the Environmental Asset Database (EAD) system was completed in FY 2011 (Stage 1)
- Implementation of the EAD management system is being completed (Stage 2)
- Conducted several technical workshops and user validation and testing
The EAD link to the partly developed database as it currently stands is http://ead-as.geometryit.com:8080/EAD/app/default/login
### Surface Water Hydrology

**Water Source:**

**Flow Geomorphology:**

**Flow Data:** No references defined

### Ground Water Hydrology

**Depth to groundwater table:**

**Characteristics of groundwater expression:**

**Source aquifer characteristics:**

**Dependency of groundwater interaction:**

### Water Use Objectives

<table>
<thead>
<tr>
<th>Water Use Objectives</th>
<th>Extreme Dry</th>
<th>Dry</th>
<th>Median</th>
<th>Wet</th>
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<tbody>
<tr>
<td>Watering objectives</td>
<td></td>
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<tr>
<td>Volumes of water</td>
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<tr>
<td>required/flow magnitude</td>
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<tr>
<td>Seasonality/timing</td>
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<tr>
<td>Assets affected</td>
<td>Manage Affected Assets</td>
<td>Manage Affected Assets</td>
<td>Manage Affected Assets</td>
<td>Manage Affected Assets</td>
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Water Quality monitoring using Remote Sensing - Example 3

- Algal bloom warnings etc.
- Cost effective use of public good satellites
- Field sampling with various state agencies
- Building capacity for Basin-wide / continental Water Quality Warning System
Terrain and hydrological modelling support - Example 4:
Queensland & Victoria Floods 2011

Flood mapping using radar & optical - Example 6

CSK2 Waterbody (Intensity)

- Waterbody: 21 January 2011 19:29 AEDT
- Waterbody: 18 September 2010 18:46 AEDT
- Waterbody: Both 21 Jan 2011 and 18 Sept 2010

Product CSK (c) ASI [2011] distributed by e-GEOS. Processed by the Geodesy and Earth Observing Systems Group, UNSW School of Surveying and Spatial Information Systems. Supported by UNSW, MDBA, LPMA and CRCSD.
Stakeholders Support - Example 7

- Developed a new team to handle GIS requests
- Completed ≈1300 mapping requests and delivered ≈450 cartographic products for MDBA projects
- Responded to ≈380 mapping requests from external customers
- Maintained the ‘Water in storages — Whole of Basin’ webpage, which currently receives around 500 views a week
Mapping Products to Proposed Basin Plan Guide
1. Continued to improveMDBA management, access and publication of spatial information
2. Various data type & format received from MDAB programs

3. ≈270 spatial data products were populated into this system; ArcSDE Oracle is now recognised as a core component of the Authority’s enterprise information management and delivery function
Existing conditions

- Problems:
  - Incomplete datasets
  - Poor attribute relationships
- Effects:
  - Difficult to develop basin wide thematic maps and information
  - Unable to perform complex query
Conceptual model

First attempt to provide relationships to the datasets
Logical data model
The Natural Resources Information (NRI) Unit requires users to lodge all spatial information and mapping requests via GIS Job Requests on Billabong. Jobs will only be actioned on receipt of this form. If your specifications vary, you will need to resubmit your request. This system allows us to prioritise jobs and better provide service to all program areas.
Current and Future Priorities

- Support MDBA program areas
- Web delivery of MDBA information and data
- Evapotranspiration and FPH
- Basin-wide 3D visualisation
- Spatial data standards and quality assurance
- Water body mapping
- Remote sensing water quality
Future Directions and Challenges

- Implementing agreed MoUs and partnerships
- Data and knowledge sharing through partnerships
- Basin-wide spatial data acquisition, management, access and custodianship
- Integration of multiple geospatial, hydrological, ecological, socio-economical, water, climate, environmental and models across multi-state government jurisdictions
Acknowledgements

We wish to thank our MDBA colleagues for their assistance and sharing the contents of this presentation.