Australian Government
Geoscience Australia

Geoscience Australia submission to the Senate Select Committee on the Multi-Jurisdictional Management and Execution of the Murray-Darling Basin Plan: Australian Water Resources Information System (AWRIS)

Introduction

Geoscience Australia is pleased to make this submission to the Senate Select Committee on the Multi-Jurisdictional Management and Execution of the Murray Darling Basin Plan: Australian Water Resources Information System (AWRIS).

Geoscience Australia is Australia's national geoscience public sector organisation. We are the nation's trusted source of information on Australia's geology and geography for decisions by government, industry and communities.

Geoscience Australia provides science-based analysis, data and advice on Australia's water resources. In relation to the Murray-Darling Basin, Geoscience Australia provides information on the location of surface water to the Authority. In addition, Geoscience Australia supplies the definition of the extent of the Murray-Darling Basin and associated catchments.

Geoscience Australia will work with the Murray-Darling Basin Authority, the Bureau of Meteorology (BoM) and the New South Wales and Queensland State Governments to deliver the recently announced Enhanced Water Monitoring and Information (EWMI) project (EWMI project press release).

Geoscience Australia partners with, and provides foundational data to, governments in Australia to enable them to better manage Australia's water resources. 'Securing Australia's water resources' and 'Enabling an informed Australia' are two of the six priority impact areas that Geoscience Australia has set in its ten-year Strategic Plan: Strategy 2028. It is across these two impact areas that Geoscience Australia has focussed our submission.

Australian Water Resources Information System (AWRIS)

The AWRIS is a broad umbrella program for all water and climate information delivered by the BoM. It includes surface water, groundwater and climate data, and the geofabric, and is an outcome of the Commonwealth Water Act 2007, which mandated that the BoM analyse, manage and report on Australia's water resources information. To do so, the BoM receives, stores and standardises water and climate data from over 200 agencies across Australia.

Geoscience Australia makes use of the data and services provided by the AWRIS to underpin delivery of its Strategy 2028 Goals. In this submission, Geoscience Australia details how we utilise the components of the AWRIS, what works wells and offers suggestions for datasets and services that could be included or improved. These suggestions come from Geoscience Australia's knowledge and understanding of the availability and limitations of the AWRIS suite of products and services.

Usefulness of AWRIS

The AWRIS is a central source of information for Australia's water data. This makes it easy to discover and access water data from both state, territory and federal jurisdictions in one place in a consistent format, limiting the need to search for and source information from separate websites.

In many instances, data provided through the AWRIS is available as self-service downloads, allowing immediate access to the required data. The freely available data provided by the AWRIS has enabled its quick use and uptake. The open-source nature of the data means that it can be used for pilot studies, which have resulted in the development of new workflows and analyses in Geoscience Australia. The continued provision of free and open water data is an important consideration for our work within Geoscience Australia. Of particular importance are historical datasets and model outputs provided in spatial formats, as they can be easily combined with Geoscience Australia's datasets. Increasing the scope and range of freely available data provided would enable further innovation and uptake.

The documentation on the AWRIS webpages is excellent, with information sheets, reports and web page content all providing the required background information, detail and technical information, as well as user-friendly documentation to utilise the data and information provided by this service. The Application Programming Interfaces (API) are also well documented (e.g., the Geofabric API), facilitating their uptake without needing to contact the BoM for assistance. When Geoscience Australia has required additional assistance from the BoM, they have consistently been responsive and able to resolve issues quickly.

The provision of APIs for accessing BoM data (such as the Water Data Online API) has facilitated fast and easy integration of BoM stream gauge data with datasets held within Geoscience Australia.

Australian Hydrological Geospatial Fabric (Geofabric)

The Geofabric represents an Australia-wide source of basic water geography, including stream networks, waterbodies and catchments. This dataset has an important role in Australia's hydrological data combining state-level data into a nationally consistent dataset.

In late 2008 Geoscience Australia, in partnership with the BoM, commenced the development of the Australian Hydrological Geospatial Fabric ("the Geofabric") to support the Bureau's responsibilities for water accounting and resource assessment under the Water Act (2007). In June 2017, this partnership concluded with the delivery from Geoscience Australia to the BoM of the final version of supplied surface water networks, drainage divisions and sub catchments.

The Geofabric provides a significant contribution to Geoscience Australia's capability to secure Australia's water resources as it allows the mapping and monitoring of Australian waterbodies and is an integral part of water resource assessments. The Geofabric is an essential source of information that is used to supplement the work Geoscience Australia does identifying and characterising water from satellite imagery.

In Australian Government Initiatives such as the Exploring for the Future and Geological and Bioregional Assessment programs, the Geofabric has been used for mapping the locations of streams in relation to shallow aquifers and springs in case study areas in Queensland. This has enabled potential surface water-groundwater connectivity relationships to be determined. Integrating the stream networks with remote sensing analysis has enabled perennial streams to be identified, which is particularly useful for ungauged streams.

What works well

The Geofabric is an enduring, fundamental water dataset and a world leader for understanding how water moves in the landscape. When combined with additional datasets such as those developed by Digital Earth Australia it allows for near real-time monitoring of water across Australia.

Suggestions for improvement of AWRIS

It would be very valuable to link the Geofabric with the National Aquifer Framework to provide a seamless water data infrastructure from the surface to the subsurface. This will allow users to explicitly understand the shared water resource.

At the time it was developed, the Geofabric utilised the most current data available from each contributing State/Territory water agency. The digital elevation model used to derive catchment surface data was captured in 2000. There are currently no plans to nationally update this data, meaning its utility will reduce as the data ages and becomes less representative of current conditions.

Water Data Online

The Water Data Online portal combines stream gauge data from the BoM and state governments across Australia into a single system that includes an API. Geoscience Australia uses the Water Data Online API to integrate stream gauge data with satellite observations to better understand the spatial footprint of flooding events across Australia.

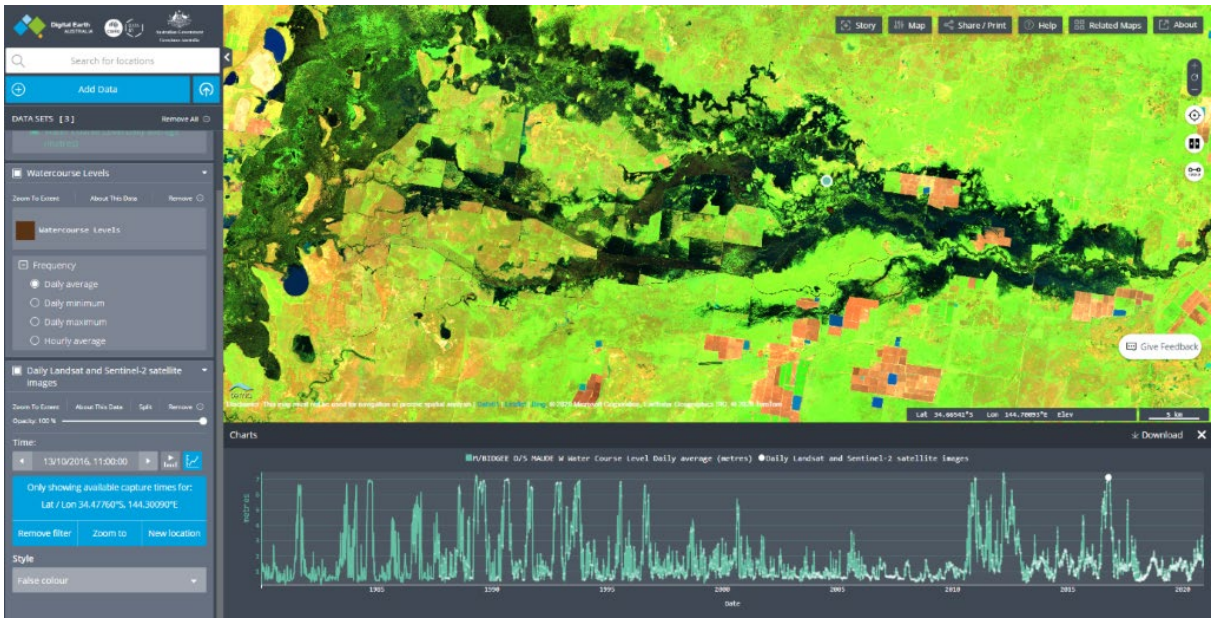
Access to the Water Data Online API facilitates the easy integration of these datasets and enables Geoscience Australia to develop workflows to evaluate historical floodplain inundation. This work has been undertaken in conjunction with stakeholders across government and industry.

What works well

Water Data Online enables ready access to historical stream gauge data which is useful for determining the flow characteristics of streams. In the absence of groundwater monitoring bores in many parts of Australia, high quality historical stream gauge data is sometimes the only source of information to understand potential groundwater-surface water interactions. Statistical analysis of high-quality stream gauge data enables indices such as baseflow and other low-flow metrics to be calculated. These metrics can help to inform whether the streams are perennial or ephemeral and the degree of connection with groundwater, which can guide management of surface water and groundwater resources.

Suggestions for improvement of AWRIS

The ability to access Water Data Online datasets via an API has enabled the integration of data from the BoM into Geoscience Australia data access capabilities. For example, linking the stream gauges to the archive of satellite imagery allows users to rapidly identify images that correspond to high flow events, or periods of prolonged drought (see the example below for the Murrumbidgee).



However some limitations in the API have constrained its usefulness. Improvements in metadata provided by the API, such as currency of stream gauge (i.e. is it still active?), date of first observation/duration of record in years or duration of longest gap in records would facilitate easier use of the datasets. These metadata are necessary to programmatically define data quality and identify gaps and inconsistencies. Additionally, increased stability in the availability and format of the API are vital for enabling uptake of the API itself, as well as downstream products that rely on it.

Hydrologic Reference Stations

The Hydrologic Reference Stations (HRS) are a subset of the stream gauge data that have additional quality control and standardisation by the BoM. These represent high quality stream gauge datasets that can be used for characterising streams and analysing groundwater-surface water interaction with greater certainty.

What works well

The data available in the HRS is an invaluable tool to understand long-term trends in surface water data across Australia. It enables all users to understand how water levels have changed due to land use and climate change across large parts of Australia.

The HRS data is delivered in an accessible web service with many useful tools available to analyse trends.

The reference stations are useful for programmatic analyses, since they provide standardised inputs that will not break input dataset assumptions.

Suggestions for improvement of AWRIS

The existing HRS have been extensively utilised due to the additional quality assurance/quality control processes and data standardisation. The inclusion of additional gauges in the HRS network would be invaluable for characterising streams and understanding groundwater-surface water interaction.

National Groundwater Information System (NGIS)

Geoscience Australia regularly accesses groundwater data from the NGIS when developing new projects and providing expert advice on groundwater-related issues. In recent years, Geoscience Australia has collaborated with the BoM in linking many of Geoscience Australia's groundwater datasets and visualisations to the BoM's Groundwater Information website. Geoscience Australia plans to continue this work with the BoM over the next four years as part of implementing the Australian Government's Exploring for the Future program to improve the National Aquifer Framework in the NGIS. This will greatly improve the effectiveness of the NGIS as a data resource.

What works well

The NGIS provides groundwater data in a consistent and standard format across Australia, accessible from a central location. This means that the NGIS data can be used to easily work in cross-jurisdictional areas and across Australia. In addition, the NGIS captures historical groundwater where available, so long-term groundwater level and quality data trends can be easily accessed and visualised across Australia.

Suggestions for improvement of AWRIS

At present, the data delivered by the NGIS is via the Groundwater Explorer or as a data download. While this is very useful, the addition of an API to allow live integration of the borehole information into a spatial format would ensure that data used in a project is always the most up to date version and would decrease versioning problems.

Groundwater Dependent Ecosystems Atlas

Groundwater Dependent Ecosystems (GDE) include springs and many rivers, wetlands and vegetation communities and is the only national dataset of its type in Australia. Knowing where GDEs are in the landscape and how they are related to sub-surface aquifers is vital to sustainably manage groundwater resources and the ecosystems that rely on them.

The GDE Atlas is a national dataset that helps to inform groundwater planning and management in Australia. It contains information on three different types of GDEs including aquatic, terrestrial and subterranean along with a range of additional datasets such as the location of bores, irrigation areas and geomorphology.

What works well

Integrating the GDE Atlas with aquifer boundaries and remote sensing information has been useful for identifying potential source aquifers for GDEs. The GDE Atlas forms an important baseline dataset that can be improved upon as new information becomes available. Integrated products have also proved to be an important communication tool for landholders/State authorities to understand the location of GDEs and the potential connection with water sources.

Suggestions for improvement of AWRIS

At present the data delivered in the GDE Atlas is via a standalone website or as a data download. While this is very useful, the addition of an API to allow live integration of GDE information into a spatial format would

ensure that data used in a project is always the most up to date version and would decrease versioning problems.

Climate Data Online

Climate Data Online allows access to climate data from the BoM for both active and inactive weather stations. It is an invaluable and easy to use tool to allow access to the vast archive of BoM climate data.

In Geoscience Australia, rainfall data in key locations is routinely downloaded to aid in the analysis of groundwater and surface water monitoring data. By combining these datasets, we are able to understand groundwater processes and facilitate improved management of groundwater resources.

What works well

The information in Climate Data Online is easily accessible via a search by location. Active and inactive weather stations are shown along with the distance from the search site and the length of the climate record. Users are then able to either generate a range of statistics or download the data.

Suggestions for improvement of AWRIS

Rainfall grids

At present, gridded rainfall data is not made available through the AWRIS and this represents a gap in the available information.

Accessibility of data

The Climate Data Online portal provides access to and data downloads for basic weather parameters from Australian weather stations. The full historical set of available observations at each weather station are not available via this portal and must be requested from the BoM. Measurements such as pan evaporation are important for water balance calculations and would supplement available AWRIS datasets. Additionally, the lack of bulk data access impedes large-scale statistical analysis of datasets, which would be useful for research and downstream product development.

Conclusion

The AWRIS consists of a suite of water-related and climate data that are freely available to a range of stakeholders, including the Australian public, in an accessible and consistent format. The data is of high quality and used by Geoscience Australia to deliver our work programs in line with our strategic goals. In this submission we have suggested improvements in the accessibility of data to enable further integration with Geoscience Australia datasets, and thereby to improve the efficacy of the AWRIS.