

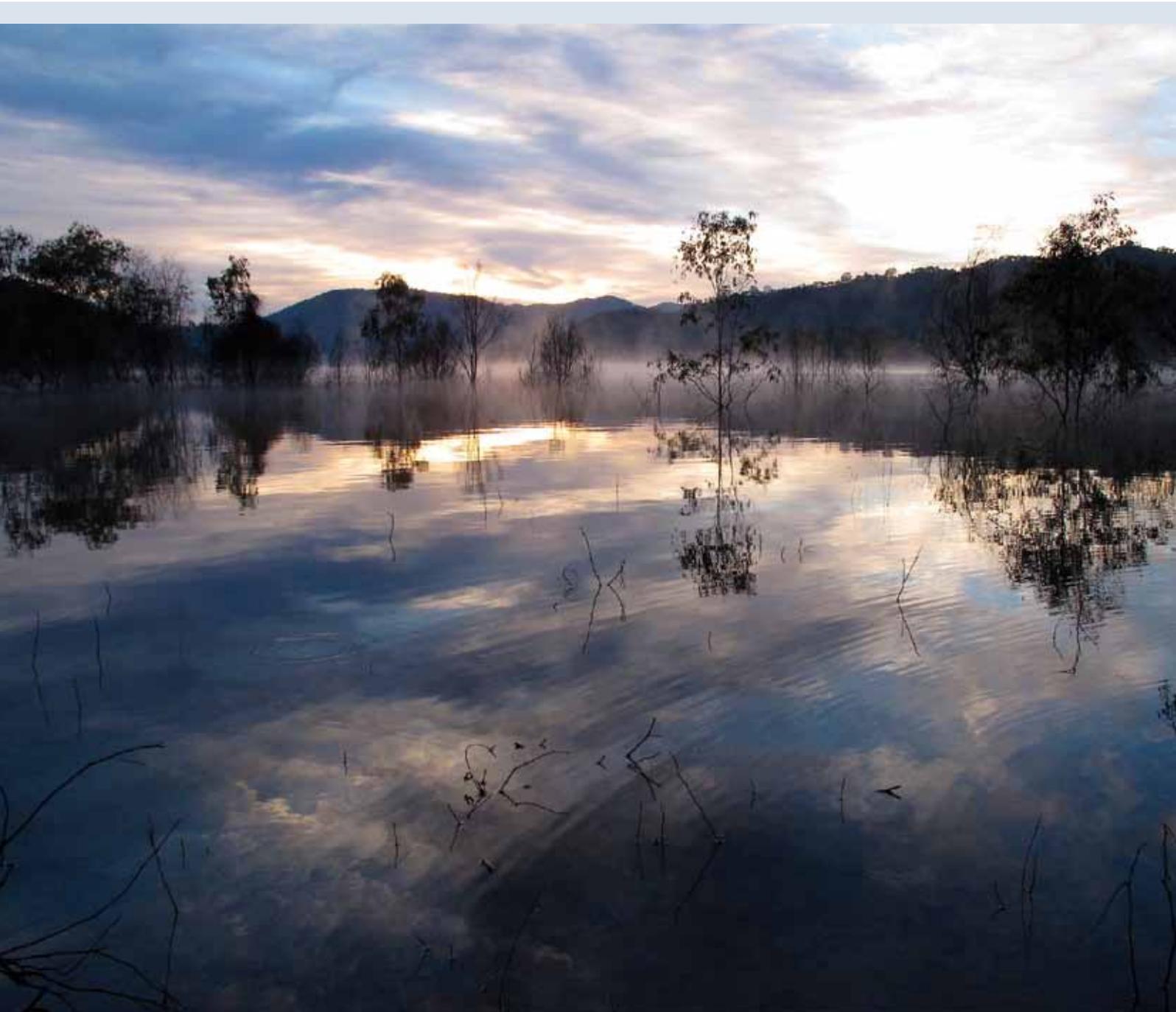


**Australian Government**  
**Bureau of Meteorology**

# Improving Water Information Program

## Progress Report

Advances in water information made by the Bureau of Meteorology in 2012



Improving Water Information Program Progress Report:  
Advances in water information made by the Bureau of Meteorology in 2012.

ISBN: 978 0 642 70622 5

Published by the Bureau of Meteorology  
GPO Box 1289  
Melbourne VIC 3001  
Tel: (03) 9669 4000  
Fax: (03) 9669 4699  
www.bom.gov.au

With the exception of logos, this report is licensed under the Creative Commons Australia Attribution 3.0 Licence.



The terms and conditions of the licence are at: <http://creativecommons.org/licenses/by/3.0/au/>

© Commonwealth of Australia (Bureau of Meteorology) 2012

**Photography credits**

Front cover: Lake Eildon. Photograph courtesy of Luke Shelley.

Inside: Lynton Crabb, Neil Duncan, Mark Jenkin, Steve Keough, David Kleinert, Nigel Millett, Alison Pouliot, Luke Shelley, Sandra Volk.

Photo of Cataract Dam: TVU Pty Ltd © Sydney Catchment Authority.

Back cover: Bendigo Creek. Photograph courtesy of North Central Catchment Management Authority.

# Contents

---

Introduction.....	2
Improving water information .....	4
Program objectives.....	5
1. Sharing data.....	6
2. Setting standards .....	8
3. Building systems .....	10
4. Data warehousing.....	12
5. Improving observations.....	14
6. Publishing information.....	16
7. Assessing water resources.....	18
8. Accounting for water.....	20
9. Forecasting flows.....	22
10. Research and development.....	24
Stakeholder consultation .....	26
Communication.....	30

# Introduction

This year the Bureau of Meteorology reached the half-way mark in the implementation of the ten-year Improving Water Information Program. There is certainly a sense of achievement with the work done to date as we continue to expand the suite of water information products and services available to citizens.



This report describes the progress we have made in the last year delivering on our new statutory obligations under the Commonwealth *Water Act 2007*.

The first Australian Water Accounting Standard was published; the culmination of five years of preparatory work. Water accounting merges the disciplines of hydrology and financial accounting, and development of this standard is a major step in enabling nationally consistent water resources reporting.

The second National Water Account was published, providing a detailed insight into the management of Australia's water resources at the national and regional scale. This account reveals the impact of two consecutive La Niña years on water resources in the eastern States, and the continuing pressure on water resources in the southwest of Western Australia.

The Hydrologic Reference Stations product was commissioned, providing data and trend analyses for 221 high-quality streamflow monitoring sites located across the nation. All of the sites included are relatively unimpaired by river regulation and land use change and are thus ideal for examining the impacts of climate variability and change on streamflow.

The Bureau's Seasonal Streamflow Forecasting Service has grown from 36 to 50 forecast locations and is evolving, as intended, into a national service. More forecast locations are scheduled to be added to the service in the year ahead.

As part of our role in developing national standards, the Bureau continued to contribute to the development of an international standard water data transfer format. The Water ML 2.0 Part 1 Time Series Encoding Standard was published in September 2012. The work will shape the future development of the Water Data Transfer Format, the Australian standard for sharing water information.

'The advances we have made, and the many more products and services under development, are equipping Australians to better manage our precious water resources.'

An online inventory of Australian ecosystems that depend on groundwater for their well-being is now available. The Atlas of Groundwater Dependent Ecosystems is an interactive website that will inform the planning, management and impact assessment of groundwater use.

The National Climate and Water Information Briefings, held monthly in Canberra, continue to inform decision-makers in the water sector. The consistently high participation rate at these briefings reflects the value they provide to a range of sectors.

Behind the scenes, a significant component of the Bureau's computing infrastructure was moved from Canberra into a new data centre near Melbourne. The transfer of 27 host servers, 250 terabytes of storage and 400 terabytes of shared network storage was a major project. The move was part of a broader plan to cater for the organisation's growing data management needs and to improve our disaster recovery capability.

Our achievements in 2012 were greatly aided by the effective partnerships we have developed with jurisdictions, data providers, researchers and end users of our water information products and services. I would particularly like to thank members of the

Jurisdictional Reference Group on Water Information, the National Water Accounting Committee, and the large group of CSIRO researchers involved in the Water Information Research and Development Alliance.

It is a great pleasure to report on the progress being forged in the Improving Water Information Program. The advances we have made, and the many more products and services under development, are equipping Australians to better manage our precious water resources.

**Dr Rob Vertessy**

Director of Meteorology and CEO



Left: Devilbend Reservoir, Mornington Peninsula. Right: Lake Bellfield near Halls Gap, Grampians National Park.

# Improving water information

The Australian Government's Improving Water Information Program is a key component of the nation's water reform agenda. Led by the Bureau of Meteorology, and supported by water agencies across Australia, it complements the other key elements of the Water for the Future Program, such as infrastructure investments, water market reforms and the purchase of water rights for the environment.

As intended, a comprehensive, reliable and up-to-date picture of Australia's water resources is emerging as the program reaches its half-way mark. The Bureau continues to develop its mission to ensure Australia is better equipped to manage water scarcity, water quality and flood risk through ready access to high-quality water information at the national level.

## The journey so far

The Improving Water Information Program is contributing to:

- improving the availability and understanding of the water information that underpins water policies and management decisions
- public disclosure of water entitlements, allocations, trades and use
- improved water availability forecasts, leading to greater certainty in water resources management and operations
- improved design flood estimation, enabling safer and more cost efficient infrastructure design
- improved community understanding of water resources management.



Left: Acting Deputy Director (Climate and Water), Dr Dasarath Jayasuriya, launching the Australian Water Accounting Standard 1 at the 15<sup>th</sup> International Riversymposium. Right: Bureau staff at the spatial@gov conference.

# Program objectives

The Improving Water Information Program began in July 2007, funded initially as a ten-year initiative. The program has entailed recruiting and developing specialist staff, procuring and commissioning IT hardware and software, establishing new offices, and building productive stakeholder relationships. Having established strong foundations, our effort is now invested in building water information systems, harmonising diverse data sets and analysing them for hydrologic insights.

**The Improving Water Information Program has a number of objectives, including those listed below.**

1. Establish enduring national water data sharing and licensing arrangements.
2. Develop and disseminate national water information standards.
3. Build and maintain the Australian Water Resources Information System to underpin all of the Bureau's water information products and services.
4. Collate, standardise and archive water data collected by over 200 organisations named in the schedules to the Water Regulations 2008.
5. Support water data collecting organisations to improve the coverage, currency and accuracy of water data collected around Australia and to enable its ready transmission to the Bureau.
6. Provide the Australian public with free online access to reliable water information.
7. Analyse trends in water availability and quality across the nation, and convey this information to the public via Australian Water Resources Assessments.
8. Publicly disclose water entitlements, allocations, trades and take for all major urban and rural water supply systems in an annual National Water Account.
9. Provide effective and reliable streamflow forecasting services for high priority water supply systems.
10. Enhance the science and technology base of the Bureau's water information products and services by supporting strategic research and development.

## Answering water information questions

The water information products and services developed by the Bureau have national reach and are readily available to the public. They enable answers to the questions below.

- How much water is available today, and how does that compare with the past?
- Who is entitled to use water, how much can they use and under what constraints?
- How much water is being traded?
- How much water is being allocated to the environment?
- How is the rate and pattern of water use changing?
- How is the quantity and quality of water in our rivers and aquifers changing?
- How much water is being lost to evaporation and leakage?
- What are the hydrologic impacts of land management changes and climate change?

# 1. Sharing data

**Objective:** Establish enduring national water data sharing and licensing arrangements.

**About this objective:** For a national water information service to succeed it is vital to first establish national data sharing and licensing arrangements. With more than 200 organisations collecting a piece of the national water information puzzle, coordination, and cooperation is critical. For these to be robust and enduring, a national leader with a legislative mandate is required.

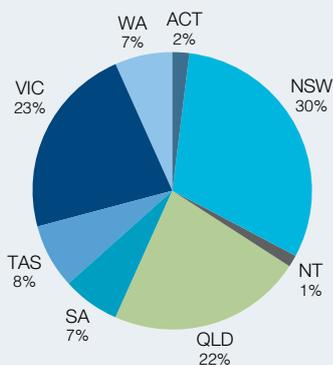
The *Water Act 2007* came into effect in March 2008. Part 7 of the Act empowers the Bureau to collect and publish water information. This legislation mandates that water information is shared freely as a public resource.

The Water Regulations 2008 came into effect in July 2008. They define who must give specified water information to the Bureau, and the time and format in which it must be supplied. The Regulations individually name over 200 persons (organisations) required to give the Bureau specific water information that is in their possession, custody or control.

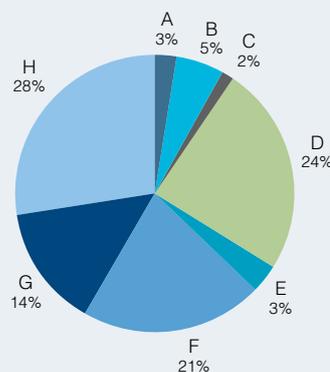
## 2012 achievements

- Amendments to the Water Regulations took effect in July 2012, following consultation with stakeholders and affected parties through the Jurisdictional Reference Group on Water Information, or via correspondence. This was a significant change that required data providers to give more information about the data itself—metadata—and contextual information to help the Bureau interpret the data it receives and make it more useful to more people. The Bureau's Regulations Online tool was updated to reflect the

Water Regulations organisations by State/Territory



Water Regulations organisations by category



- A – Lead water agencies
- B – Other State/Commonwealth agencies
- C – Hydroelectricity generators
- D – Major storage owners or operators
- E – Rural water utilities
- F – Urban water utilities
- G – Catchment management authorities and others
- H – Flood forecasting and warning water information providers

Note: Organisations can be listed in one or more categories in the regulations.

'Amendments to the Water Regulations require agencies to provide more information about the water data itself. This is the bedrock for all third-party water information transactions. There is now certainty about the obligations of data providers and the Bureau.'

BRENDAN MORAN, MANAGER STANDARDS AND REGULATIONS, BUREAU OF METEOROLOGY

amendments, allowing data providers to view a tailored report about their new obligations. Support tools, explanatory material and online information were prepared to help organisations comply with the new requirements.

- The means by which data providers inform the Bureau about regional water restrictions was improved with the development of an online water restrictions data entry and update portal. In addition, a system for capturing information about water restrictions from the websites of source utilities was developed. Both systems will support the development of a water restrictions dashboard, a product providing the general community with information about water restrictions across Australia.
- Some of the first historic water data was sent to the Bureau from the New South Wales Office of Water using the new Water Data Transfer Format, making it easier for the Bureau to use and share this information. The transfer took the volume of information held in the data warehouse to more than a billion observations, helping to build a more comprehensive picture of Australia's water resources over time, and will provide a context by which current trends can be compared.

- A total of 16 organisations provided the Bureau with additional information on water markets and water trades. The Bureau delivered the information to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities in a more effective, efficient way that allowed the department to develop reporting products on the National Water Market website. This site includes information such as the number of water entitlements traded.



Centralised information on water restrictions, water markets and water trades is available through online portals.

## 2. Setting standards

**Objective:** Develop and disseminate national water information standards.

**About this objective:** Australia's water information will be improved by standardising data collection and reporting regimes. The Bureau is working closely with water agencies, researchers and expert panels to develop a range of national standards that will harmonise water data collection, analysis and reporting across the nation. Under the *Water Act 2007*, a function of the Bureau is to issue water information standards, including water accounting standards. To date, the standards released by the Bureau have been done so on a voluntary-adoption basis.

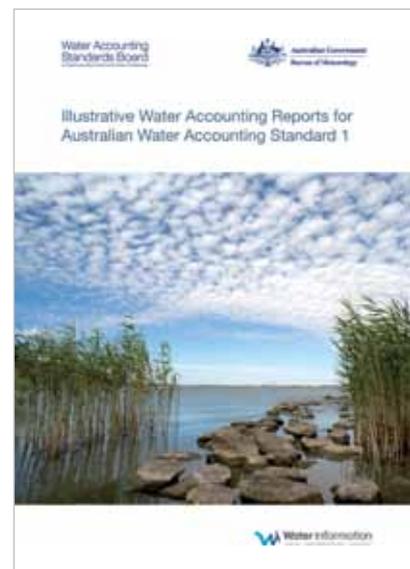
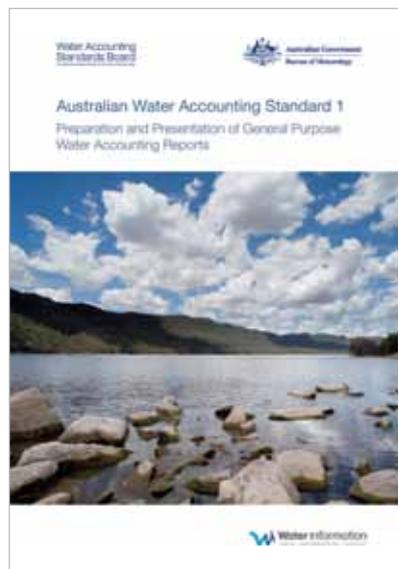
### 2012 achievements

- The Australian Water Accounting Standard 1, for the preparation and presentation of general purpose water accounting reports, was launched at the 15th International Riversymposium in Melbourne in October 2012. The release of this standard was the culmination of more than five years of work, which included pilot programs in every State and Territory, engagement activities, and the consideration of extensive stakeholder comments.
- An exposure draft of the *Australian Water Accounting Standard 2: Assurance Engagements on General Purpose Water Accounting Reports*, which was developed by the Water Accounting Standards Board and the Australian Government's Auditing and Assurance Standards Board, was released for comment in December 2012. This standard seeks to enhance the quality and consistency of assurance engagements and reporting on general purpose water accounting reports.
- The Water Information Standards Business Forum fostered the development of, and built consensus on, water information standards, guidelines, best practice and related guidance documents. The forum, chaired by the Bureau, comprised representatives of government and private sector water data providers and met six-monthly. One of the main achievements of the forum in 2012 was the development of three draft standards for acoustic Doppler current profilers and seven draft standards for general hydrometrics to improve the quality and consistency of data received by the Bureau. Comments on the draft standards were collected through the Australian Hydrographers Association and jurisdictional workshops. Work is progressing to finalise these standards by mid-2013.
- A database of national and international water information standards was compiled, in partnership with the Water Information Standards Business Forum. The central, searchable database is accessible to water agencies through a government-sharing website and enables standards across jurisdictions and organisations to be compared. It identifies inconsistencies, gaps where standards are required, and the context when new standards are proposed.
- Work continued on the Water Data Transfer Format, an Australian standard format for water data exchange. The standard was extended (to version 1.0.2) to encompass metadata and water markets data. The Bureau worked with six agencies to upgrade their data export systems to the new format, which is used for data such as water in store and historical observations. Five major commercial water data management systems now support the standard. Bureau systems were also upgraded to accommodate version 1.0.2 of the standard.

'The release of the Australian Water Accounting Standard 1 — the first of its type in the world — is a landmark in the development of water accounting as a discipline and Australia's broader water reform agenda.'

SEAN HANLEY, MANAGER WATER ACCOUNTING STANDARDS DEVELOPMENT, BUREAU OF METEOROLOGY

- The Water Information Research and Development Alliance between the Bureau and CSIRO continued to provide significant input to the development of an international standard water data transfer format. The work is coordinated by the Hydrology Domain Working Group of the Open Geospatial Consortium, an international water standards group of which the Bureau is a technical committee member. The Water ML 2.0 Part 1 Time Series Encoding Standard was approved in June 2012 and published in September by the consortium.
- A set of ten nationally consistent definitions for urban water terms was agreed with the National Water Commission, the parties to the National Water Initiative, the Water Services Association of Australia, and urban water industry representatives. The definitions, which are included in the *Australian Water Information Dictionary*, provide clear and meaningful descriptions of terms such as potable water, non-potable water, raw water, stormwater, recycled water and desalinated water. Agreed terminology is a pre-requisite for consistent and meaningful water reporting and analysis.
- A set of nationally consistent definitions for hydro-geologic units was developed for the National Aquifer Framework. This framework harmonises the naming and description of hydro-geologic units where, for instance, they cross State boundaries and are associated with as many as four different names. The Great Artesian Basin and its many hydro-geologic units that traverse three States and a Territory is one such example. Another is the Narrabri Formation, near-surface sedimentary deposits that extend north across Queensland's Darling floodplain with aquifers connected to the Darling River.



The Australian Water Accounting Standard 1 was published and launched in October 2012.

## 3. Building systems

**Objective:** Build and maintain the Australian Water Resources Information System (AWRIS) to underpin the Bureau's water information products and services.

**About this objective:** The Bureau is building AWRIS to receive, ingest and standardise water data gathered from around the nation, and to deliver a range of water information products and services.

### 2012 achievements

- The Australian Water Resources Information System (AWRIS) continued to provide a consistent national view of water in storage, water allocations and trades, and water entitlements. The water storage and water markets information products were enhanced with changes to user interfaces as well as improvements to performance and stability of the underlying data management and analysis systems.
- Changes to AWRIS in 2012 support better workflow management and tracking for the preparation of the National Water Account, the inclusion of additional information on water storages and water markets, and new products such as the Water Restrictions

Online tool and the Environmental Information Explorer. It was also improved to enable ingestion of data in the Water Data Transfer Format, allowing agencies to deliver records in this single, standard format.

- The AWRIS data warehouse and a Time Series Data Management System were integrated, allowing water data gathered in irregular time series to be made available in regular time series. This was applied to data such as water storage levels and streamflows.
- The migration of the flood warning data collection system to the new IT platform was completed across all regions throughout Australia. This provides more robust and better-supported infrastructure that improves the availability of data.
- Version 2.1 of the Australian Hydrological Geospatial Fabric (Geofabric) was released. This is a comprehensive, map-based view of Australia's water features that includes the relationships between streams, water bodies, catchments and aquifers. Version 2.1 includes high-quality streamflow monitoring points, a simplified node-link network, topographic drainage and river regions, and new and updated tutorials on how to use the Geofabric. The Geofabric products were translated into an open standards format that allows easier online access. The International Commission for Hydrology recognised as best practice the hydrological features model that underpins the Geofabric conceptual model. The Geofabric was also a finalist in Australia's 2012 Excellence in eGovernment Awards.



Elizabeth McDonald, Geofabric Project Manager, accepts the Excellence in eGovernment Award finalist commendation from ACT Senator the Hon. Kate Lundy.



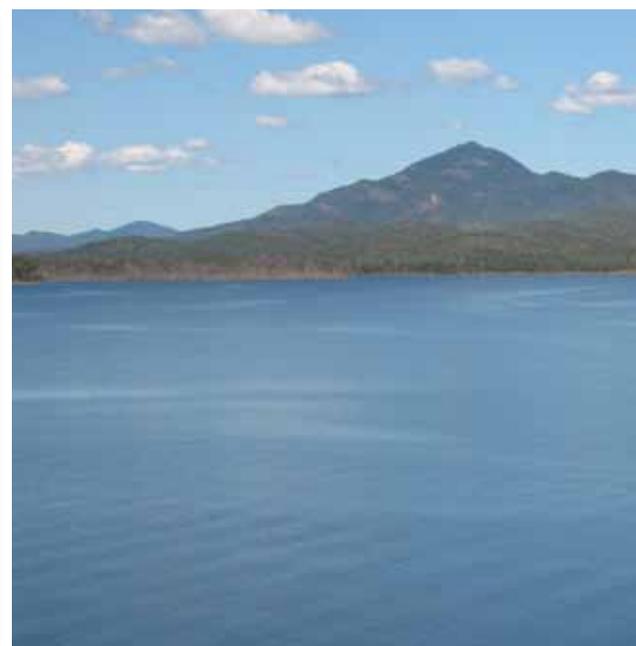
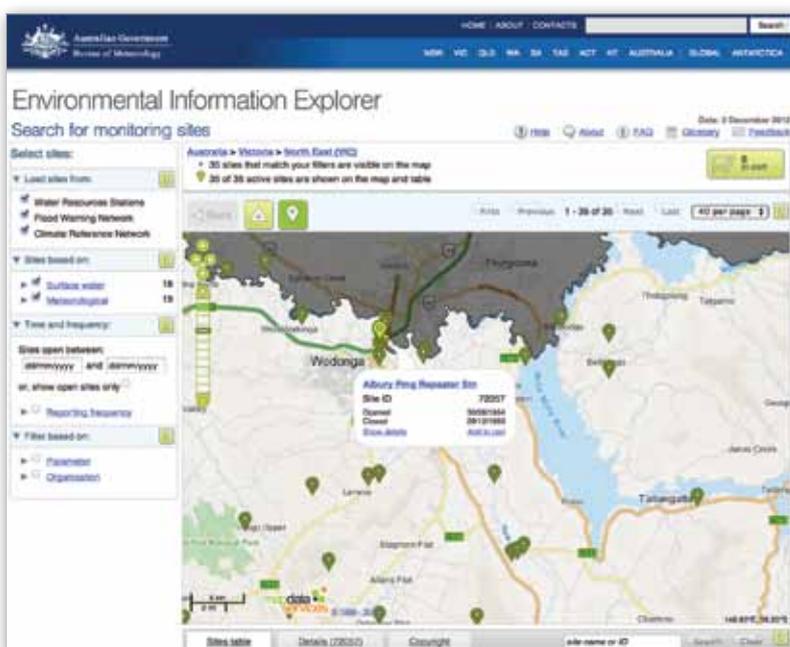
## 4. Data warehousing

**Objective:** Collate, standardise and archive water data gathered by the more than 200 organisations currently listed in the schedules to the Water Regulations 2008.

**About this objective:** The *Water Act 2007* empowers the Bureau to collect water data from around the nation and to make this freely available to the public. For data to flow to the Bureau and out to the public, we must negotiate and monitor data supply agreements, develop data management procedures and assemble teams to curate the information we store.

### 2012 achievements

- Nearly 19 million water data files or more than a billion observations have been sent by more than 200 agencies to the Bureau since the Water Regulations 2008 came into effect on 1 July 2008. The Bureau now receives more than 18,000 water data files a day. The water data encompasses 75 variables across ten data categories that include stream flow, groundwater, climate, water storages, entitlements, allocations, trades and restrictions.
- Information about water monitoring stations across Australia was made accessible with the release of the Environmental Information Explorer. The map-based website can interrogate the water data warehouse for information such as the station location, its operators and owners, its instruments such as stream gauges and climate stations, and the type of observations collected.



Left: Environmental Information Explorer, released in 2012.

Right: Data from Lake Awoonga in Queensland was added to the Water Storage product in 2012.

'Australia is now better informed on the volume of water held in store with the inclusion of new storages to the Bureau dataset this year.'

PAUL SHEAHAN, MANAGER WATER DATA, BUREAU OF METEOROLOGY

- The number of water storages listed in the online Water Storage product increased from 269 to 285 in 2012 after new information was provided by the North East Region Water Corporation, the Toowoomba Regional Council, the Gladstone Area Water Board, the Gosford City Council, the Cairns Regional Council and the Rockhampton Regional Council. The Water Storage web page received over 370,000 page views in 2012, almost double the number received in 2011. There were a further 8,700 downloads of the Water Storage iPhone app in 2012, taking the total number of downloads to over 37,000.
- Work continues on a project to receive and store historical and current water data from all lead water agencies in the new Water Data Transfer Format. Five major commercial water data management systems now support the standard format.



Cataract Dam, part of Sydney's water supply system, features in the Water Storage product.

## 5. Improving observations

**Objective:** Support water data collecting organisations to improve their hydrologic observing networks and information systems to enhance the quality of primary water information available to the Bureau.

**About this objective:** Under the Water Regulations 2008, more than 200 water data providers are required to provide specified water information to the Bureau. The Australian Government's \$80 million Modernisation and Extension of Hydrologic Monitoring Systems Program (M&E Program), administered by the Bureau, has equipped data providers with resources to update monitoring systems and improve data quality and delivery to the Bureau.

### 2012 achievements

- The fifth and final round of funding in the Modernisation and Extension of Hydrologic Monitoring Systems Program was completed in 2012. In total, \$78.1 million was allocated to 463 projects over five years. The program has played a significant role in modernising streamflow, groundwater and water storage monitoring networks throughout Australia, and improving the transfer of data to the Bureau. The investment arrested declines in the quality and coverage of hydrologic monitoring networks, and has significantly enhanced data sharing.
- The Bureau continued to receive extensive real-time water data following the rollout of telemetry systems at more than 600 monitoring sites.

The investment through the modernisation program has been designed to lower the cost of data acquisition, reduce the duration of system outages, and provide valuable new data for water managers and the public.

- The purchase of 145 acoustic Doppler current profiling meters through the modernisation program has improved the currency and accuracy of water data measurements across Australia, particularly in flood situations. The accuracy of streamflow measurements has been enhanced, the occupational health and safety risks associated with measuring high streamflows reduced, and the accuracy of estimated downstream water volumes improved, particular during significant floods.

### Overview of funding allocated through the M&E Program from 2007–12

Round	Year	Projects funded	Organisations funded	Total funding awarded
1	2007–08	55	20	\$8,336,237
2	2008–09	132	50	\$19,861,071
3	2009–10	118	46	\$19,897,126
4	2010–11	92	36	\$19,999,273
5	2011–12	66	27	\$10,000,000
<b>TOTAL</b>		<b>463</b>		<b>\$78,093,707</b>

'The Modernisation and Extension of Hydrologic Monitoring Systems program has provided a major boost to organisations that measure water resources, bringing a high proportion of Australia's monitoring and data management technologies up to the next level.'

LINTON JOHNSTON, STANDARDS AND REGULATIONS, BUREAU OF METEOROLOGY

## Upgrading frontline water monitoring services

Victoria was one of the first States to take advantage of the opportunity to update water monitoring programs and assets through the Modernisation and Extension of Hydrologic Monitoring Systems Program, managed by the Bureau since 2007.

Almost a third of Victoria's water monitoring network—more than 200 sites—was upgraded, including critical front-line telemetry and flood monitoring instrumentation.

This resulted in improved instrument reliability, better on-site and operator safety, and greater accuracy, certainty and availability of data, including real-time data. The new electronic technologies have also allowed internet connectivity, electronic storage of data, and user-friendly access to the data.

Overall, the upgrades have enhanced user confidence in the data, helped reduce the impacts of flooding, and reduced operating costs.

One of the last upgrades to be completed in Victoria was of the Hydrologic Services Differential Pressure Sensor and Leupold and Stevens chart recorder on the Loddon River at Newstead.

The robust and reliable pressure sensor had been in service on the river since 1986, and the chart recorder from about the late 1950s.

The aged analogue instruments were removed from the Loddon River station at Newstead in the presence of representatives of the Regional Water Monitoring Partnership and Thiess Environmental Services.

These groups played important roles operating the analogue instruments, and will continue to be involved with the new digital technology.



Aged water monitoring equipment (left) has been upgraded (right) through the Bureau's Modernisation and Extension of Hydrologic Monitoring Systems Program.

## 6. Publishing information

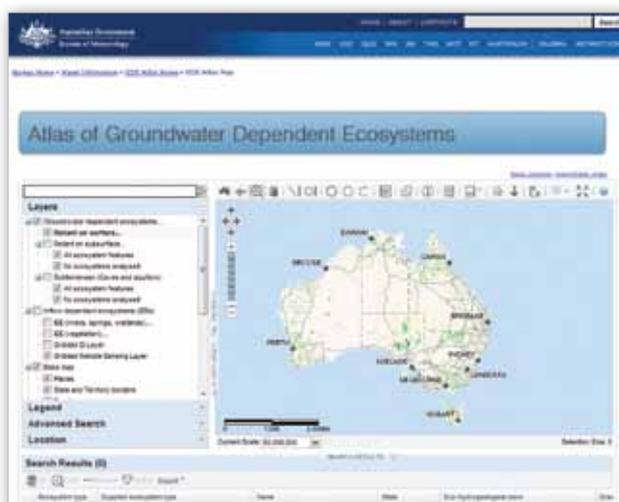
**Objective:** Provide the Australian public with free online access to reliable water information that is readily understood.

**About this objective:** The Bureau is striving to make most of Australia's water information freely and publicly accessible, and to package it in a way that maximises its utility. This will not only assist water managers and policymakers to do their jobs more effectively, it will help to satisfy the needs of water-dependent businesses, farmers, industry, educators and the general community.

### 2012 achievements

- The Atlas of Groundwater Dependent Ecosystems was published on the Bureau's website in September 2012. The atlas details ecosystems that will be significantly changed or degraded if groundwater availability is altered beyond its normal range of fluctuation. The site received over 12,000 page views from September–December 2012.
- The compilation of revised information on the intensity, frequency and duration of rainfall in Australia was completed and will be released in February 2013. This data is used by engineers and hydrologists when designing infrastructure such as gutters, pipes, culverts, stormwater drains, bridges and flood levees. This latest revision, the first in 25 years, utilises much more rainfall data (including information from agencies named in the Water Regulations 2008) and adopts more modern statistical methods than previously used. The revision is part of the review of *Australian Rainfall and Runoff: A Guide to Flood Estimation*, published by Engineers Australia.

- An agreement was signed and work was started on mapping and publishing the location and capacity of major desalination and water recycling plants throughout Australia. The partners in the Climate-Resilient Water Sources project are the Bureau, the Australian Water Recycling Centre of Excellence, the National Centre of Excellence in Desalination, and CSIRO.



'The Groundwater Dependent Ecosystems Atlas represents the first national standardised dataset that describes and locates groundwater-dependent ecosystems.'

TONY BOSTON, BRANCH HEAD, CLIMATE AND WATER DATA, BUREAU OF METEOROLOGY

## Groundwater ecosystems featured in new atlas

An inventory of Australian ecosystems that depend on groundwater for their well-being was launched in Canberra in September 2012 by the Parliamentary Secretary for Sustainability and Urban Water, Senator the Hon. Don Farrell.

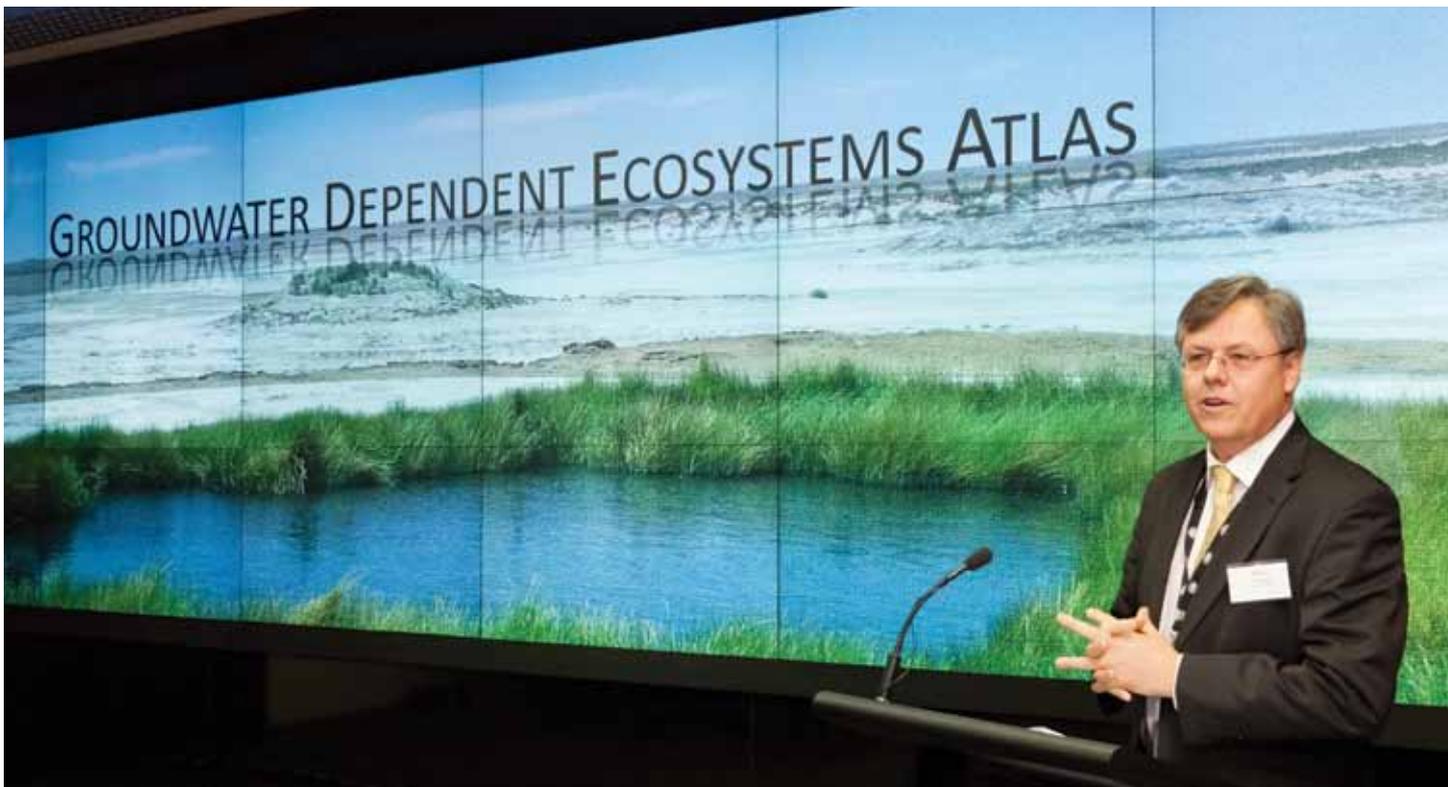
The Atlas of Groundwater Dependent Ecosystems is an interactive site hosted by the Bureau that will help planners and decision-makers balance the need to protect groundwater sources and their dependent ecosystems, and the need for the extraction of groundwater for agricultural, industrial or household uses.

At the launch, Director of Meteorology, Dr Rob Vertessy described the atlas as drawing together 'a rich font of information' from State and Territory

water agencies. 'The States contributed a huge amount of information,' he said, 'drawing on the skills of a legion of water and environmental managers with deep expertise in groundwater hydrology and ecosystems.'

The atlas was recognised for excellence in the 'Spatial Enablement' category of the 8<sup>th</sup> Annual Victorian Spatial Excellence Awards, announced in August 2012.

It was developed in partnership with the National Water Commission and CSIRO, with input from each State and Territory.



Director of Meteorology, Dr Rob Vertessy, at the launch of the Groundwater Dependent Ecosystem Atlas in September 2012.

## 7. Assessing water resources

**Objective:** Analyse trends in water availability and quality across the nation and convey this information to the public via Australian Water Resources Assessments.

**About this objective:** Australian Water Resources Assessments will be periodically published by the Bureau to describe changes in the availability, condition and use of our nation's water resources. The assessments require detailed climatologic and hydrologic analyses to be undertaken on 14 hydrologic regions spanning the continent.

### 2012 achievements

- The data behind all the plots, maps and tables in the Bureau's first (2010) Australian Water Resources Assessment was published online and made available for download in March 2012. The assessment was first published online in November 2011.
- The number of page views of the online 2010 assessment rose steadily to 1000 views a month over its first four months and has remained at that level since. To date, more than 4600 pages of the assessment have been downloaded as pdf-format files, and more than 1100 data files have been downloaded.
- A survey of users of the 2010 assessment was conducted in May 2012. In broad terms, respondents said the assessment achieved its goals of providing general water information, encouraging a better understanding of water resources, and assessing the management of water resources. Most users indicated the assessment's analyses of trends and spatial patterns were useful and comprehensive. The survey also indicated that reporting of surface water quality could be improved. There was strong support for the style of the document and for regular reporting.
- Work is well underway on the 2012 Australian Water Resources Assessment, which will report on the period July 2011 to June 2012. This report will be published in mid-2013.
- Technical effort was directed at automating analyses and recalibrating the landscape water balance model that underpins the Australian Water Resources Assessment. Extensions to the analysis of water quality were evaluated, improved contextual data was assembled, and ways of improving the assessment's web interface were evaluated.
- Version 1.5.0 of the Australian Water Resources Assessment modelling system was transferred to the Bureau this year. The modelling system, developed by CSIRO under the aegis of the Water Information Research and Development Alliance, simulates water processes including surface runoff to streams after rain and evapotranspiration. The modelled estimates of water volumes are used in the National Water Account and the Australian Water Resources Assessment. The installation and running of the model on the Bureau's computers was a significant step in moving from a research model at CSIRO to an operational model in the Bureau. The aim is to run the model once a fortnight, providing regular updates on water balance changes across the Australian continent.

'The Australian Water Resources Assessment report greatly assists the assessment of current water management practices, particularly the impact on sustainability. It is valued for its national coverage, comprehensiveness, and analysis.'

DR AMGAD ELMAHDI, MANAGER WATER RESOURCES ASSESSMENT, BUREAU OF METEOROLOGY

## Assessing the nation's water resources

The Australian Water Resources Assessment is a regular report on Australia's fresh water resources in the context of the long-term hydrologic record, as required by the *Water Act 2007*. It gives an insight into water availability, conditions and use.

The assessments use the best available data, models and analyses, underpinned by a water balance framework. They are independent, scientifically robust analyses of changes in water availability, quality and use over time scales of months to decades.

The first assessment was published in November 2011 on the Bureau website and has since received over 15,000 page views. The second assessment is scheduled for publication in mid-2013.

The assessments include a national overview, plus chapters on 13 regions as defined by drainage division boundaries. The technical supplement provides details on data selection, analysis and the water balance modelling techniques used to prepare the report. The level of peer review and acceptance of the data in the assessment is also noted.

The assessments are publicly available online and help all Australians—particularly policymakers and planners—understand the state of the nation's water resources and the impact of past and present water management practices.



Lake Eildon, a large storage on the Goulburn River in Victoria that features in the Australian Water Resources Assessment.

## 8. Accounting for water

**Objective:** Publicly disclose water entitlements, allocations, trades and take for all major urban and rural water supply systems in an annual National Water Account.

**About this objective:** As competition for water resources intensifies, it is more important than ever to account for how water is managed across Australia in a transparent and rigorous way. Water accounting is the systematic process of identifying, recognising, quantifying, reporting and assuring information about water, the rights or other claims to water, and obligations against that water.

The *Water Act 2007* requires the Director of Meteorology to annually publish a National Water Account. The account aims to inform water resources planning, water market design and regulation, investment decisions, environmental management, and community dialogue about the management of water. Over time, it is expected that the National Water Account will form the knowledge base upon which to build policies and management decisions that enhance the integrity of the water entitlement system.



Two waterways within the Murray–Darling Basin: Gulpa Creek in southern New South Wales and Kangaroo Creek in central Victoria.

'Surveys of National Water Account users have found they generally have a positive view of the product. The quality of information, standardised approach to reporting, use of diagrams and graphics, and the inclusion of climate summaries are of most value.'

DR GRACE MITCHELL, MANAGER WATER INFORMATION SERVICES, BUREAU OF METEOROLOGY

## 2012 achievements

- The National Water Account 2011, a comprehensive web-based report on nationally significant managed water systems, was published this year. It features water accounting reports for eight regions: Adelaide, Canberra, Melbourne, the Murray–Darling Basin, the Ord, Perth, South East Queensland and Sydney. The National Water Account was first published in 2011 and is an annual publication for the year from 1 July to 30 June.
- The National Water Account 2010 received almost 27,000 page views in 2012, while the 2011 account received 7,600 page views from July–December 2012.
- Cooperative arrangements with more than 30 water agencies around the nation aided the production of the 2011 account. The close involvement of these agencies enhances the quality and credibility of the report.
- A companion guide to the National Water Account was published in 2012, written to give technical users a better understanding of the concepts underpinning the preparation of the account.
- The Bureau partnered with the Northern Territory Department of Natural Resources, Environment, the Arts and Sport to investigate the feasibility of including the Daly–Roper region in the third National Water Account, the 2012 account.

## Murray–Darling Basin region water account at a glance

Rainfall in the Murray–Darling Basin in 2010–11 was generally well above average, even reaching record falls in some areas. As a result, river flow increased throughout the basin and floods occurred in several reaches.

River flow across the South Australian border was about 15,100,000 ML, the highest since 1975–76. The Lower Lakes returned to their full supply level and water flowed into the Southern Ocean for the first time since 2006.

By year's end, the volume of water in the basin's major storages reached about 19,200,000 ML (83 per cent full) compared with 7,500,000 ML (32 per cent full) at the beginning of the year.

Irrigators took the opportunity to expand their activities, and water abstraction from both surface water and groundwater resources increased to 6,400,000 ML. This was a 20 per cent increase from the previous year.

Reliance on groundwater extraction fell to about 370,000 ML for the year, down 57 per cent compared with 2009–10, due to wet soil profiles.

The volume of water allocation traded during the year reached 2,700,000 ML, 1,000,000 ML more than the previous year.



## 9. Forecasting flows

**Objective:** Provide effective and reliable streamflow forecasting services for high priority water supply systems.

**About this objective:** Greater demand for timely and accurate water availability forecasts has prompted the Bureau to expand its services to include continuous short-term streamflow and seasonal streamflow forecasts. The Bureau's seasonal and short-term streamflow forecasting services are expected to be valuable tools in the operational management of water. They will provide timely information for managing water allocations, cropping strategies, water demand, the purchase of environmental water, water trading and drought.

### 2012 achievements

- The Seasonal Streamflow Forecasting Service was expanded from 36 to 50 locations in eastern Australia this year, including sites in Queensland, New South Wales, the Australian Capital Territory and Victoria. The service—three-month probabilistic forecasts of streamflows—was officially launched in December 2010 and initially focussed on the southern Murray–Darling Basin.
- The accuracy of the forecasts over the past 12 months was better than historical or climatology-based forecasts. The forecasts of either low, near median or high streamflows (tercile forecasts) were correct 35 to 70 per cent of the time across all sites. Forecasts based on the historical record would, on average, be correct 33 per cent of the time.



A flooded Terrick Terrick National Park, northern Victoria.

'The hydrological reference station web portal is a significant initiative and an important milestone in making available high-quality streamflow data to the scientific community. The portal will complement the Bureau's high-quality climate station network.'

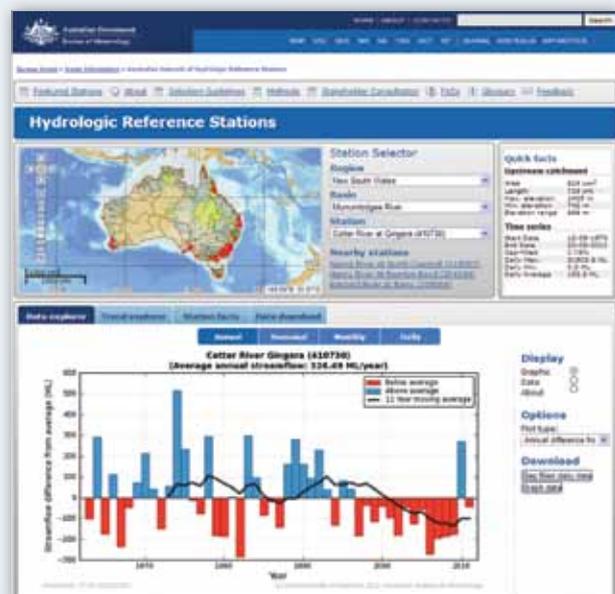
TOM MCMAHON, EMERITUS PROFESSOR, THE UNIVERSITY OF MELBOURNE

- Valuable suggestions on how to improve the service were received during discussions with some key stakeholders, and were further investigated. The process of gauging user satisfaction, service standards and adoption revealed that the level of satisfaction with the service was very high overall. The Seasonal Streamflow Forecasting Service web page had more than 130,000 page views in 2012.
- The statistical modelling system used to produce seasonal streamflow forecasts was upgraded with the inclusion of a dynamic monthly water balance model. The addition is expected to improve forecast accuracy for a number of locations. In parallel with this work, a dynamic modelling approach began to be developed, which uses catchment hydrology models of rainfall runoff and rainfall forecasts from the Bureau's Predictive Ocean and Atmosphere Model for Australia. Work continued on merging the current statistical and planned dynamical approaches to seasonal streamflow forecasting. Forecasts produced using this combined method are expected to be more accurate—significantly for some sites—and are scheduled for release next year.
- A probabilistic short-term (up to ten days ahead) streamflow forecasting service was successfully piloted at three sites in the Ovens Valley, Victoria, using the Short-term Water Information Forecasting Tool (SWIFT). The service promises to help improve the management of reservoirs and environmental water reserves, and to provide longer lead times for decision-makers when there is the potential for flooding.
- The piloting of the short-term streamflow forecasting service was expanded to include ten catchments across all hydro-climate regions and jurisdictions. The catchments included the Ord River (northeast Western Australia), the Stanley River (Queensland) and the South Esk River (Tasmania).

## Hydrologic Reference Stations for tracking climate-driven streamflow changes

A web portal for 221 hydrologic reference stations was launched in December 2012. All of the stations are well-maintained river gauges, with long-running, high-quality streamflow records. They are located in catchments with minimal river regulation and land-use change, and traverse all hydro-climatic regions of Australia. They are thus particularly well suited to assessing the impacts of climate variability and change on streamflow.

Stakeholders were consulted in assessing and ranking the stations. The expected users of the dataset include the international research community, State government agencies, water utilities and the general public. The stations will be used in assessing the effects of climate variability and change, and for calibrating hydrologic models used in short-term and seasonal streamflow forecasting and climate change impact studies.



# 10. Research and development

**Objective:** Enhance the science and technology base of the Bureau's water information products and services by supporting strategic research and development.

**About this objective:** The Bureau invests in research and development to ensure that its new water information role is supported by the best available science and technology. We invest primarily through our water information alliance with CSIRO, the Water Information Research and Development Alliance. Other important research and development collaborations are with eWater, the Centre for Australian Weather and Climate Research (CAWCR), and the universities of Adelaide, Newcastle and Melbourne.

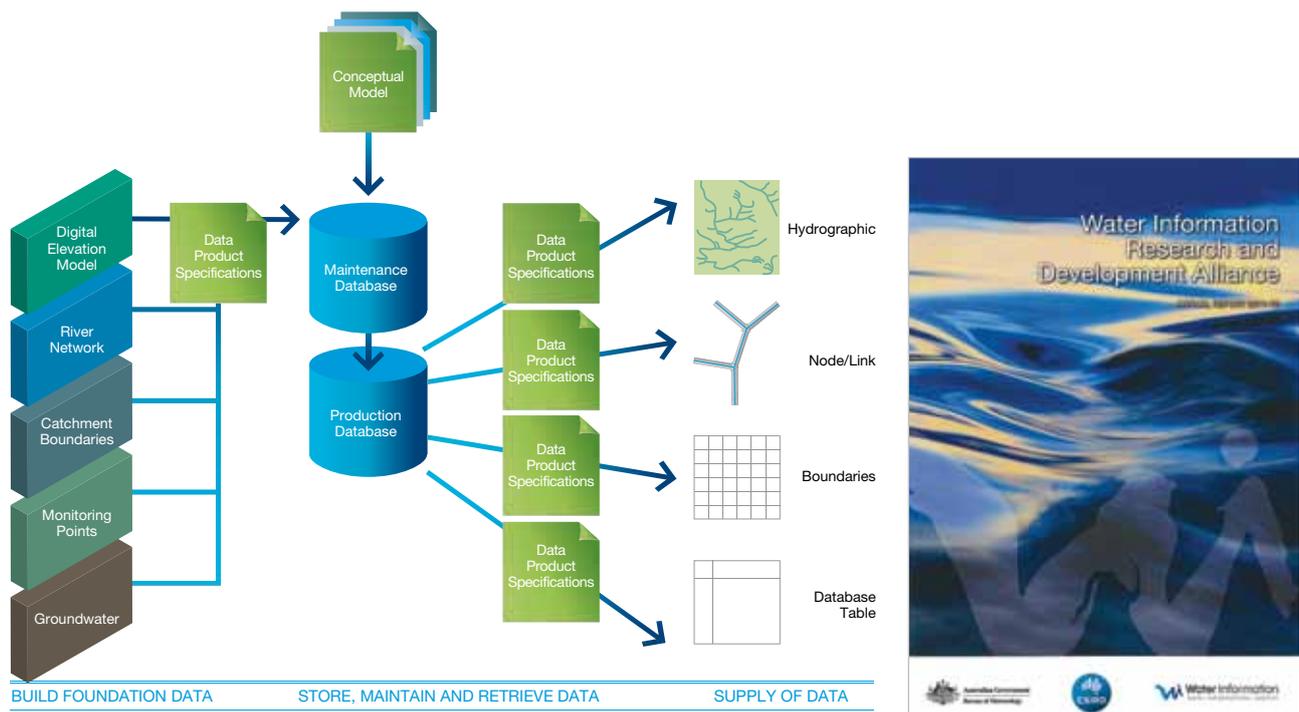
## 2012 achievements

- The Water Information Research and Development Alliance (WIRADA) informatics team played a significant role in the development of the international water data standard WaterML 2.0: Part 1—Time Series under the auspices of the Open Geospatial Consortium. Adoption of the standard internationally will improve water data interoperability around the world. The new standard will also guide development of the second version of Australia's standard Water Data Transfer Format.
- Significant progress was made to further develop the Australian Hydrological Geospatial Fabric (Geofabric). Complex hydrological patterns were simplified into a node-link network of rivers and streams and incorporated into the core product. Geofabric production tasks and the creation of data documentation were automated to facilitate rapid iterations and testing within the Bureau.
- An open-source tool to aid data sharing via the internet—Geoserver—was extended to enable delivery of time-series data in the international water data standard WaterML 2.0. The tool's efficacy was demonstrated by the Bureau's delivery of high-quality streamflow data on a test server, and climate and marine time-series data.
- Version 1.5.0 of the Australian Water Resources Assessment modelling system was transferred to the Bureau this year. This includes improved process representation compared to the model version used last year. It also includes a new calibration tool and data assimilation scheme, which will improve the accuracy of the model.
- Testing of the Short-term Water Information Forecasting Tools (SWIFT) was undertaken in 11 catchments. SWIFT is central to the planned delivery of 10-day (short-term) streamflow forecasts, which will include the range of likely and most likely streamflows. The forecasts are designed to assist river and reservoir managers, irrigators and flood forecasters.
- The model used to produce seasonal streamflow forecasts—the Bayesian Joint Probability model—was further improved, enabling its application to a larger number of forecast locations.
- A complementary seasonal streamflow forecasting system, based on a dynamic modelling approach, was developed and is being tested. This entailed modifying the methods for downscaling rainfall forecasts from the Bureau's POAMA model, and developing an advanced model-calibration and uncertainty analysis method known as the Bayesian Total Error Analysis framework for seasonal streamflow forecasts.

'WaterML 2.0 is the first public, open source, global standard for the exchange of water information through the internet. It is critical for linking local, regional, national and global water information sources into connected water information networks.'

DR DAVID MAIDMENT, CENTER FOR RESEARCH IN WATER RESOURCES, UNIVERSITY OF TEXAS

- A technique for merging the probabilistic forecasts of multiple global climate models was developed. The technique was used to merge statistical and dynamical forecasts of rainfall, and significantly improved rainfall forecast accuracy. The technique was also used with rainfall forecasts from the Bureau's POAMA model and other international dynamic global climate models, with promising results.
- Three research projects aimed at improving rainfall forecasts began this year through the Centre for Australian Weather and Climate Research. The projects focussed on creating a single reference point for users on the production and presentation of rainfall forecasts, improvements in modelling cloud processes and convection, and extending rainfall forecasts out to 30 days with improved accuracy. These developments will help to improve the accuracy of the various hydrologic forecasting systems operated by the Bureau.
- The *WIRADA Annual Report 2011–12* was published in November 2012, highlighting a number of achievements. WIRADA is now in its fifth and final year of operation. The Bureau and CSIRO are negotiating a three-year extension to the agreement.



Left: Geofabric conceptual architecture showing data work flows. Right: WIRADA Annual Report 2011–12.

# Stakeholder consultation

## Jurisdictional Reference Group on Water Information

The Jurisdictional Reference Group on Water Information (JRGWI) is the primary vehicle for coordinating the Bureau's water information activities with those of the States and Territories. JRGWI comprises representatives of the lead water agencies in each jurisdiction and delegates from some major water utilities. It provides a forum for members to articulate water information priorities in their jurisdictions and provide feedback to the Bureau on its various water information products and services.

### Membership in 2012

- **Ray Boyton**, Office of Water, New South Wales
- **Ben Bruce**, Department for Water, South Australia
- **Greg Carson**, Hydro Tasmania, Tasmania
- **Stewart Chapman**, Department of the Environment, Climate Change, Energy and Water, Australian Capital Territory
- **Tino Galati**, Water Corporation, Western Australia
- **Ian Lancaster**, Department of Natural Resources, Environment, the Arts and Sport, Northern Territory
- **Lawrence Lingam**, Murray–Darling Basin Authority
- **Greg Long**, Department of Environment and Resource Management, Queensland
- **Fraser MacLeod**, Murray–Darling Basin Authority
- **Paul Pendlebury**, Office of Water, New South Wales
- **Martin Read**, Department of Primary Industries, Parks, Water and Environment, Tasmania
- **Bruce Rhodes**, Melbourne Water, Victoria
- **Patrick Seares**, Department of Water, Western Australia
- **Adrian Spall**, Department of Sustainability and Environment, Victoria
- **Damien Venema**, SA Water, South Australia

### Meetings held in 2012

- JRGWI-11, 17–19 April 2012
- JRGWI-12, 21–22 November 2012

## National Water Account Committee

National Water Account Committee provides strategic advice on all aspects of the National Water Account, guides the collaborative development of the account, and provides advice on alignment to user needs.

### Membership in 2012

- **Louise Minty** (Chair), Bureau of Meteorology
- **Ben Allen**, Australian Bureau of Statistics
- **Clarke Ballard**, Irrigation Australia
- **Stewart Chapman**, Department of the Environment, Climate Change, Energy and Water, Australian Capital Territory
- **Tanja Cvijanovic**, Department of Sustainability, Environment, Water, Population and Communities
- **Matt Darcey**, Department of Natural Resources, Environment, the Arts and Sport, Northern Territory
- **Penny Fiddes**, National Water Commission
- **Peter Gee**, Water Services Association of Australia
- **Karin Geraghty**, Department for Water, South Australia
- **Fraser MacLeod**, Murray–Darling Basin Authority
- **David Nicholls**, Department of Primary Industries, Parks, Water and Environment, Tasmania
- **Paul Pendlebury**, Office of Water, New South Wales
- **Lindsay Preece**, Department of Water, Western Australia
- **Adrian Spall**, Department of Sustainability and Environment, Victoria
- **Lloyd Taylor**, Department of Natural Resources and Mines, Queensland

### Meetings held in 2012

- Meeting 13, 8 March 2012
- Meeting 14, 20 June 2012
- Meeting 15, 31 October 2012

## Standards Business Forum

The Standards Business Forum brings key water industry representatives together with the Bureau to inform the development of water information standards.

### Membership in 2012

- **Brendan Moran** (Chair), Bureau of Meteorology
- **Kirsten Adams**, Bureau of Meteorology
- **Jacquie Bellhouse**, Water Corporation, Western Australia
- **Tony Bernadi**, Department of Primary Industries, New South Wales
- **Chris Body**, Office of Spatial Data Policy, Department of Resources, Energy and Tourism
- **Tony Boston**, Bureau of Meteorology
- **Ray Boyton**, Office of Water, New South Wales
- **Stephen Buckland**, Hydro Tasmania/Entura
- **Jeff Chamberlain**, Department of Primary Industries, Parks, Water and Environment, Tasmania
- **Mic Clayton**, Snowy Hydro, New South Wales
- **Ed Couriel**, Manly Hydraulics Lab, New South Wales
- **Nigel Dears**, Environment and Sustainable Development Directorate, Australian Capital Territory
- **Bruce Forgan**, Bureau of Meteorology
- **Brad Fuller**, Water Corporation, Western Australia
- **Tino Galati**, Water Corporation, Western Australia
- **Karin Geraghty**, Department for Water, South Australia
- **Gamini Gunatillake**, Murray–Darling Basin Authority
- **Luigi Incani**, Water Corporation, Western Australia
- **Linton Johnston**, Bureau of Meteorology
- **David Lemon**, CSIRO
- **Liz Marchant**, Australia New Zealand Land Information Council
- **Brett Miller**, Department of Sustainability and Environment, Victoria
- **John Patten**, Department of Water, Western Australia
- **Nina Polaschek**, Department of Natural Resources and Mines, Queensland
- **Tony Polchleb**, Sydney Water, New South Wales
- **Kema Ranatunga**, Bureau of Meteorology
- **Mark Randall**, Department of Natural Resources and Mines, Queensland
- **Paul Rasmussen**, Melbourne Water, Victoria
- **Grant Robinson**, Office of Water, New South Wales
- **Paul Sheahan**, Bureau of Meteorology

- **Bill Steen**, Kisters/Australian Hydrographers Association
- **Robert Thompson**, Bureau of Meteorology
- **Gavin Walker**, Bureau of Meteorology
- **Daniel Wagenaar**, Department of Natural Resources, Environment, the Arts and Sport, Northern Territory
- **Jane Warne**, Bureau of Meteorology

### Meetings held in 2012

- 17 September 2012, Canberra

### Flood warning consultative committees

In each State, flood warning consultative committees meet regularly on a three to six-month time frame. These committees comprise representatives of key stakeholders such as emergency managers, water authorities, local government and catchment management authorities. Meetings cover a broad spectrum of items ranging from network issues to service needs. In the Northern Territory, a similar group is called the Flood Warning Working Group.

### Meetings held in 2012

- Queensland: 1 March, 25 June, 23 November 2012
- Western Australia: 6 June, 1 November 2012
- South Australia: 14 March 2012
- Tasmania: 25 May, 9 November 2012
- New South Wales: 29 August 2012
- Victoria: 16 February, 3 October 2012
- Northern Territory: 27 February 2012

### National Flood Risk Advisory Group

The need for a national forum on flood risk management was first formally identified in 2004 following a national flood risk management workshop at Mt Macedon, Victoria. The inaugural meeting of the National Flood Risk Advisory Group (NFRAG) was held at Geoscience Australia in Canberra in November 2005. The group was made a sub-committee of the then Australian Emergency Management Committee (AEMC) when it became clear that there should be a conduit to that committee. The Secretariat role for NFRAG is provided by the Australian Government, through Geoscience Australia and the Bureau of Meteorology.

## > STAKEHOLDER CONSULTATION

NFRAG works to strengthen the nation's resilience to floods by providing strategic leadership and advice on best practice for flood risk management. It does this by bringing together representatives from each jurisdiction actively involved in flood risk management with other key stakeholders. Together they progress issues to improve the resilience of the Australian community to flooding. NFRAG became a reference group of the National Emergency Management Committee in 2010 under the new arrangements, when the AEMC ceased to exist.

### Membership in 2012

- **Rick Bretnall**, Department of Water, Western Australia
- **Roger Brewster**, Department of State Development, Infrastructure and Planning, Queensland
- **Stephen Dredge**, Queensland Reconstruction Authority
- **Mike Edwards**, Department of Sustainability and Environment, Victoria
- **Allan Ezzy**, Australian Local Government Association
- **Tony Graham**, ACT Emergency Services
- **John Handmer**, RMIT University
- **Andrew Lea**, Tasmanian State Emergency Service
- **Duncan McLuckie**, Office of Environment and Heritage, New South Wales
- **Miriam Middelmann-Fernandes**, Geoscience Australia
- **Dean Misso**, Department of State Development, Infrastructure and Planning, Queensland
- **Brendan Nelson**, Reconstruction Authority, Queensland
- **Jeff Perkins**, Bureau of Meteorology
- **Lam Pham**, Australian Building Codes Board
- **Ed Pikusa**, Risk Assessment Measurement and Mitigation sub-committee of the Australia New Zealand Emergency Management Council.
- **Jay O'Toole**, Department for Environment, Water and Natural Resources, South Australia
- **Lakshman Rajaratnam**, Department of Natural Resources, Environment, the Arts and Sports, Northern Territory

- **Soori Sooriyakumaran**, Bureau of Meteorology
- **Karl Sullivan**, Insurance Council of Australia
- **Neil Thomas**, Attorney-General's Department
- **Caroline Walker**, The Treasury

### Meetings held in 2012

- 12 February 2012
- 3 August 2012 (teleconference)
- 5 October 2012

### National Groundwater Information System Steering Committee

The National Groundwater Information System (NGIS) Steering Committee provides advice on developing and implementing the national groundwater information initiative. This includes endorsing the NGIS work plan and budget, and periodically evaluating project progress against the work plan. The committee is supported by a NGIS Technical Committee.

### NGIS Steering Committee membership in 2012

- **Tony Boston** (co-Chair), Bureau of Meteorology
- **Matt Kendall** (co-Chair), National Water Commission
- **Adam Sincock** (alternative: **Murray Radcliffe**), National Water Commission
- **Alys Wall** (alternative: **Brendan Moran**), Bureau of Meteorology
- **Carl Daamen** (alternative: **Dovey Dee**), Bureau of Meteorology
- **Jane Coram** (alternative: **Ross Brodie**), Geoscience Australia
- **Peter Baker**, Department of Sustainability, Environment, Water, Population and Communities
- **Chris McAuley**, Department of Sustainability and Environment, Victoria.
- **Barry Croke**, Australian National University
- **Michelle McCue** (alternative: **Lexie Johnson**), National Water Commission

### Meetings held in 2012

- 20 June 2012
- 17 September 2012
- 4 December 2012

## Expert panels

### The Water Accounting Standards Board

The Water Accounting Standards Board is an independent advisory board to the Bureau. The board works with the water industry to develop consistent standards for water accounting.

**Members:** Mike Smith (Chair), W Peter Day, Denis Flett, Professor Jayne Godfrey

The board has entered into a collaborative arrangement with the Auditing and Assurance Standards Board, through its Chair Merran Kelsall, to develop an assurance standard for general purpose water accounting.

#### Meetings held in 2012

- WASB17, 27 March 2012
- WASBOOS4, 29 May 2012 (Out of Session 4)
- WASB18, 29 June 2012
- WASB19, 25 September 2012

### Geofabric Steering Committee

The Geofabric Steering Committee provides strategic guidance on technical direction, adoption and government policy with the aim of making Geofabric the authoritative register and data source of Australia's surface and sub-surface water features.

**Members:** Tony Boston (Chair), Greg Scott, Michael Hutchinson, David Lemon, Andrew Woolf, Paul Sheahan.

#### Meetings held in 2012

- 15 May 2012
- 7 December 2012

### The Geofabric Project Management Group

The Geofabric Project Management Group is the main forum for the project partners, the Bureau (Chair), CSIRO, the Australian National University and Geoscience Australia. The group provides scientific and expert knowledge, monitors progress and resolves issues.

**Members:** Elizabeth McDonald (Chair), representatives of the Bureau, and Geofabric partner organisations.

#### Meetings held in 2012

Meetings are held every month.

## Conferences

### International Conference on Climate, Water and Policy, Busan, South Korea (11–13 September 2012)

The conference attracted 80 international scientists and was a partnership of the APEC Climate Centre, the Republic of Korea, the Bureau of Meteorology, the Korean Meteorological Administration, and the Korean Water Resources Corporation (K-Water). The Bureau's Dr Narendra Tuteja was a member of the organising committee, along with delegates from the Republic of Korea and the US. Discussions covered broad climate, water and policy themes. These ranged from seasonal climate and hydrologic forecasting, assessing the accuracy and reliability of forecasts, long-term climate variability and change, developing effective communication channels between scientists and water resource managers, and international cooperation and policy development.

### AusAid workshop on potential international applications for Australia's water management tools, Canberra (20–24 August 2012)

Australia has developed innovative systems and tools to assist governments and the Australian community effectively manage its scarce water resource. The developing world and development partners such as AusAid and the World Bank would benefit from systems designed to reduce water stress and improve decision-making related to water development, management and climate resilience. The Bureau of Meteorology, CSIRO and eWater hosted a team of technical experts from the World Bank, the Asian Development Bank, and leading institutions from south Asia to explain and demonstrate the water modelling tools and technologies in use in Australia. The international visitors experienced first-hand how services are delivered by the Bureau through its climate and water information programs.

# Communication

## Product launches and conferences

The Groundwater Dependent Ecosystem Atlas, produced in partnership with the National Water Commission, was launched by the Hon. Don Farrell, Parliamentary Secretary for Sustainability and Urban Water, at the Bureau's Canberra office on 11 September.

The launch of Australian Water Accounting Standard 1 was held as part of the 15<sup>th</sup> International Riversymposium in Melbourne on 8 October.

Following a process of user-testing, the revised Intensity–Frequency–Duration Design Rainfall product was demonstrated at the Hydrology and Water Resources Symposium in Sydney in November 2012 and will be released in February 2013.

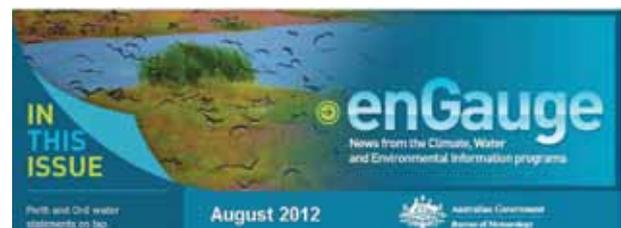
The Water Information Program had trade stands at the Australian Hydrographers Association, OzWater, spatial@gov and the Hydrology and Water Resources Symposium conferences. The events provided an excellent opportunity to demonstrate existing and new services and to seek feedback on how stakeholders use Bureau products, and their areas of interest.

## Stakeholder communication

The Bureau continued to distribute water information program updates through the year with five issues of the external newsletter *enGauge*. More than 2500 people received product updates and special announcements.

The monthly Seasonal Streamflow Forecasts subscriptions grew in popularity. The subscriber email list numbered about 900 by late in the year. Qualitative research conducted with a small group of users showed a strong appreciation of the service.

The *Update* newsletter was replaced with an internal e-newsletter for Climate and Water Division staff. People from outside the Bureau continue to receive relevant news through *enGauge* and other stakeholder activities.



Left: Dr Rob Vertessy, the Hon. Don Farrell, Parliamentary Secretary for Sustainability and Urban Water, and the Bureau's Climate and Water Data Branch Head, Tony Boston, at the launch of the Groundwater Dependent Ecosystem Atlas.  
Right: Bureau staff at the Australian Hydrographers Association conference, August 2012.

'Water information products are reaching more people each year. It is particularly satisfying when stakeholders tell us at industry events, workshops and through user research how the products help make important water decisions.'

JENNY HUNTER, MANAGER PRODUCT MARKETING AND COMMUNICATION, BUREAU OF METEOROLOGY

## Website

The Bureau maintained an active water information website at [www.bom.gov.au/water](http://www.bom.gov.au/water). The site was visited by about 929,000 unique visitors this year, resulting in about 1,109,000 page views (1.1 pages per visitor).

## National Climate and Water Briefings

The National Climate and Water Briefings continued to be a popular event in Canberra each month, with about 40 attendees at each briefing representing about 20 agencies and departments. Participating organisations included the Department of Sustainability, Environment, Water, Population and Communities, Department of Human Services, CSIRO, Murray–Darling Basin Authority, Emergency Management Australia, and the Australian Bureau of Agricultural and Resource Economics and Sciences.

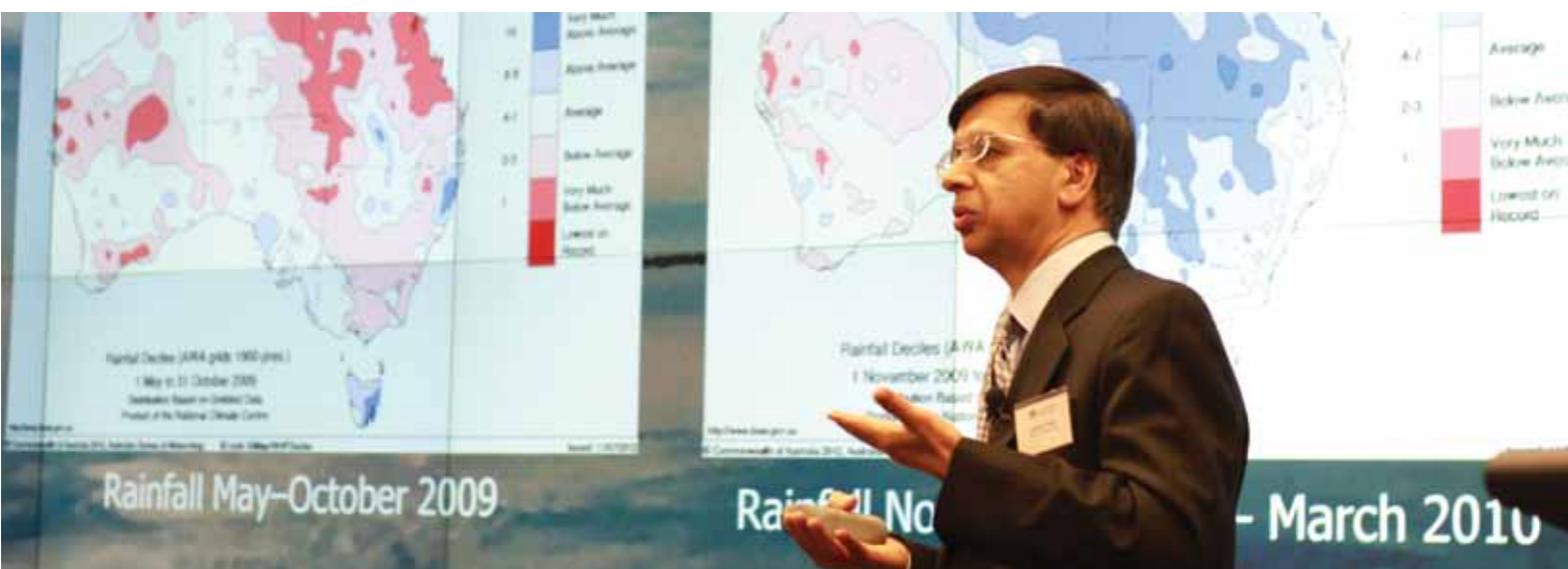
The Bureau extended the invitation for stakeholders to attend the briefings via videoconference from some of our regional offices. A recording of the September briefing was posted on YouTube and further digital media opportunities will be explored.

Feedback from participants at the September and October briefings indicated a strong appreciation of the content and presentation style.

## Webinar

More than 100 people joined our inaugural Geofabric webinars in March and April. Participants dialled-in via computers and phones to see an on-screen presentation and demonstration, ask questions, submit comments and contribute to discussions. The technology proved an excellent way for the Bureau's Geofabric experts to demonstrate how to download and set up Geofabric data in an ArcGIS environment. The feedback from participants was positive, with people keen to attend future webinars.

About 25 per cent of attendees were from outside a capital city, highlighting the greater accessibility and geographic reach provided by this medium.



Dr Narendra Tuteja delivers a presentation at the July 2012 National Climate and Water Briefing in Canberra.

# Notes

---



