4610.0.55.010

Integrated water accounts for the Canberra region

2013–14 to 2016–17

Australian Government
Bureau of Meteorology

Australian Bureau of Statistics

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2013–14 to 2016–17

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AUSTRALIAN BUREAU OF STATISTICS

EMBARGO: 11.30 AM (CANBERRA TIME) TUE 19 FEB 2019

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Produced jointly by the Australian Bureau of Statistics and the Bureau of Meteorology.
Cover images courtesy of Andrew Terracini.

INQUIRIES

- For further information about these and related statistics, contact the ABS's National Information and Referral Service on 1300 135 070 or Steven May on (02) 6252 5593, or the Bureau of Meteorology's Janice Green on (02) 6232 3558.

CONTENTS

INTRODUCTION

WHY INTEGRATED WATER ACCOUNTS?

- The Australian Bureau of Statistics (ABS) and the Bureau of Meteorology (BoM) produce national water accounts of different types for differing but complementary purposes, using two distinct frameworks.
- The BoM's National Water Account (NWA) focuses on the volume of water in the environment, its availability, the rights to abstract water and the actual abstraction over time. The ABS's Water Account Australia (WAA) focuses on flows of water from the environment to the water supply industry and other economic activities, the flows of water from the water supply industry to households and businesses, and the monetary values associated with water supplied and used in the economy.
- A collaboration between these two government organisations has produced an integrated set of water accounts for the Canberra region.

HOW WERE THE ACCOUNTS INTEGRATED?

- This pilot account combines the elements of both the NWA and the WAA using a combination of the Australian Water Accounting Standard (AWAS) (WASB 2012) and the System of Environmental-Economic Accounting (SEEA) framework (UN et al. 2014) to integrate these water accounts.

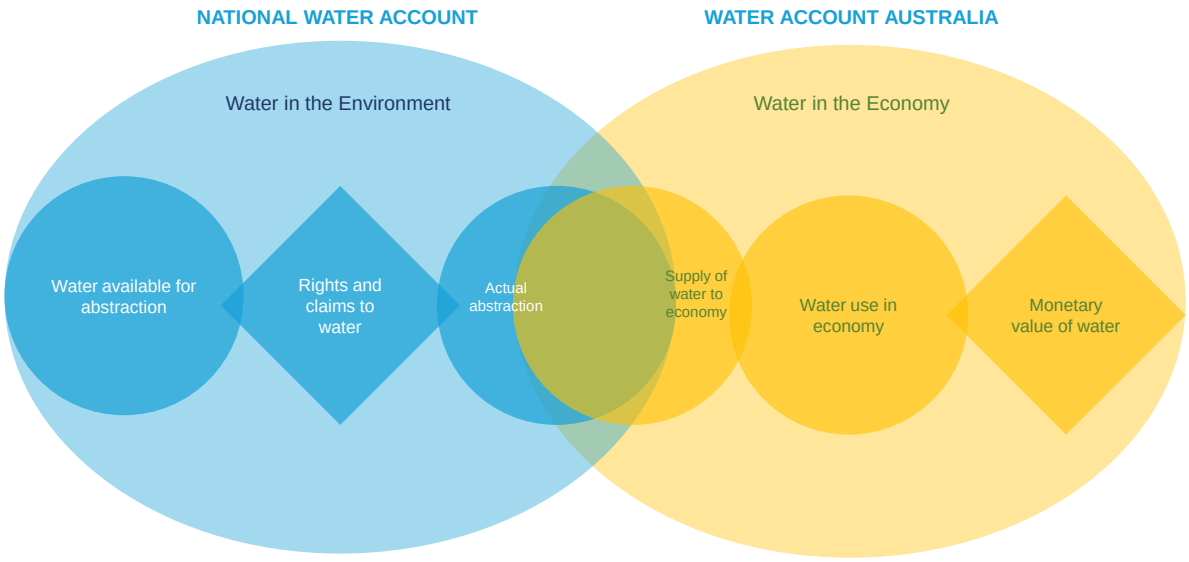


Figure K1 Conceptual relationship between BoM National Water Account and ABS Water Account Australia

- The ABS produces water accounts for Australia and each of its states and territories, while the BoM produces water accounts for 11 nationally significant water regions, including the Canberra region. The Canberra region was chosen as the focus area for this project as it is the region for which there is the closest geographical alignment between the ABS and BoM water accounts.
- This pilot account encompasses four 1-year reporting periods ending on June 30 for the following years: 2013–14, 2014–15, 2015–16 and 2016–17.

WHAT ARE THE BENEFITS OF THE INTEGRATED ACCOUNTS?

- The integration of the ABS and BoM accounts will aid reporting and environmental management in the Australian Capital Territory (ACT) region by providing more integrated information. This builds on previous work by the ACT Office of the Commissioner for Sustainability and the Environment (Smith et al. 2017).
- The pilot account also supports a collaborative governmental national approach to environmental-economic accounting, by bringing together multisector/multidisciplinary expertise, and assisting in a greater understanding and sharing of data sources and data gaps.

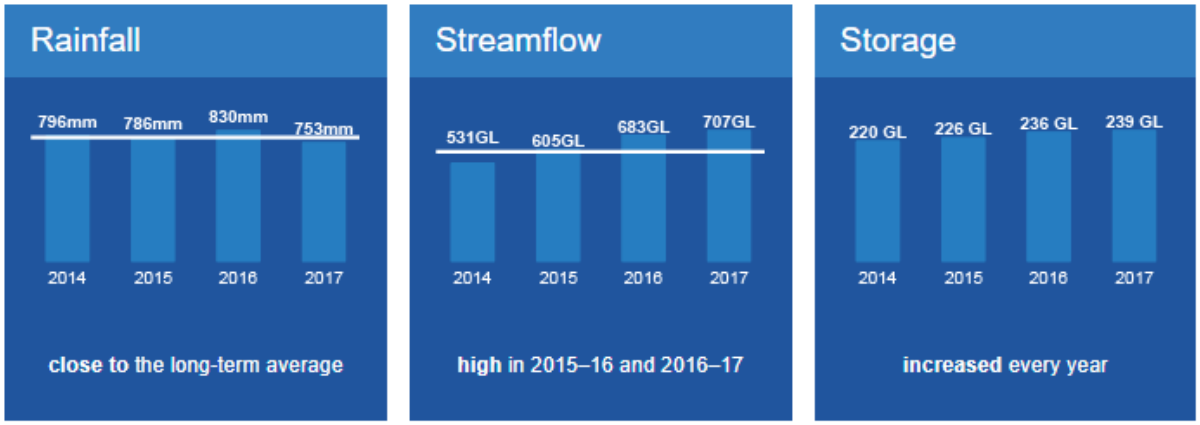
INTEGRATED ACCOUNT STRUCTURE

- This pilot account is organised as follows:

Pilot account section	Description
Key findings	Provides a quick overview of key facts and figures from the accounts.
Background	Provides contextual information for understanding the accounts, including geographic features, land use, water resources and water systems.
Statement of Water Assets and Water Liabilities	Similar to a balance sheet, presents the volume of water assets and water liabilities at the start and end of each year (prepared according to AWAS)
Statement of Changes in Water Assets and Water Liabilities	Similar to an income statement, presents the changes in water assets and water liabilities that occurred during the year including both accrual transactions and actual water flows (prepared according to the AWAS)
Water Asset Accounts	Provides similar information to the previous two statements but with a different presentation based on the SEEA framework, and some further disaggregation.
Supplementary information for Statements/Asset Accounts	Provides supplementary and explanatory information regarding the three statements/accounts in the previous sections.
Water use/water in the economy	Presents the physical water supply and use accounts, and the monetary supply and use accounts, both prepared based on the SEEA framework. These accounts describe the water flows in physical units within the economy and associated monetary data.
Water quality	Presents information on the health and condition of waterways across the Canberra region using the SEEA framework.
Climate and water	Provides an overview of the climatic conditions and important water related events during the reporting period.
Water markets	Provides an overview of water entitlements, allocations, use and trade during the reporting period.
Water management	Provides contextual information about the administrative and legal frameworks of water management in the Canberra region
Water rights	Provides contextual information about water rights in the Canberra region.
Cultural and environmental benefit	Provides contextual information about cultural and environmental benefit derived from water in the Canberra region.
Governance	Provides a summary of water accounting frameworks and policies that have been used to prepare the integrated accounts.
Methods	Provides a summary of the methods used to compile the accounts.
References	Lists references and further reading related to the accounts and the Canberra region.

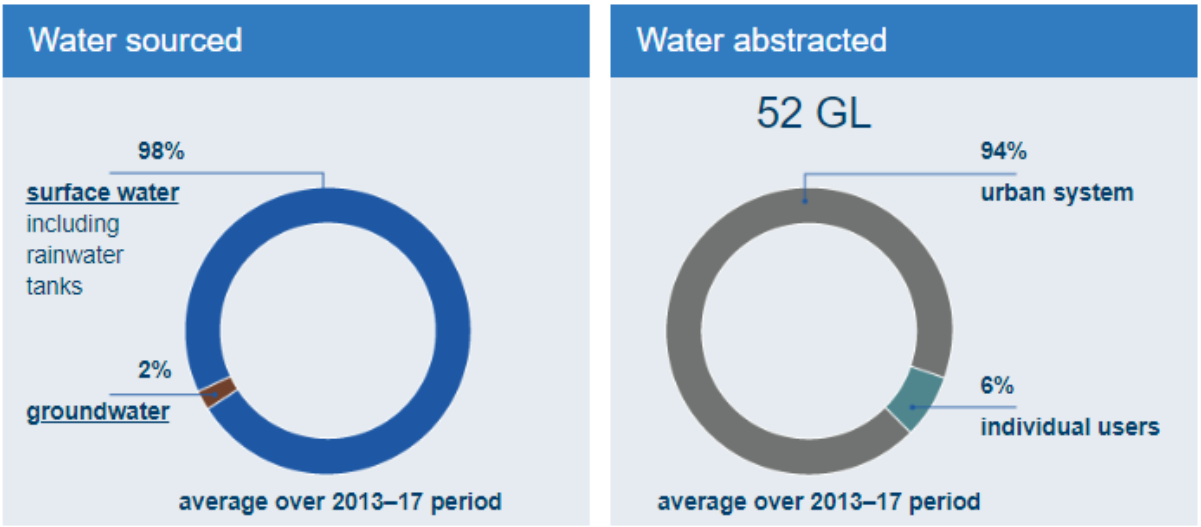
KEY FINDINGS OVER THE PERIOD 1 JULY 2013–30 JUNE 2017

CLIMATE AND WATER



Graphs refer to reporting years ending June 30 of the displayed year.

WATER USE



WATER STATUS

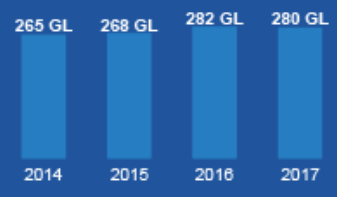
Allocations

73,683 ML

total surface water and groundwater allocations

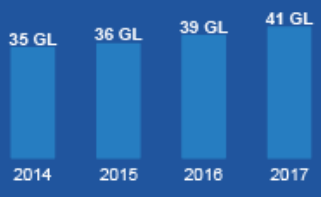
same for every year

Water assets



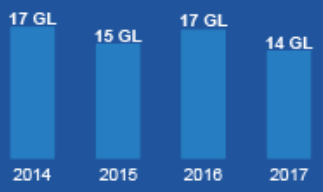
closing net water assets at 30 June

Returns to environment



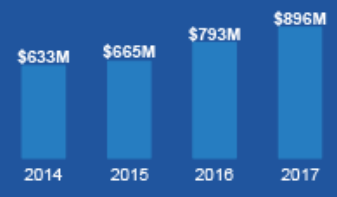
water **returned** from the economy to the environment

Consumption



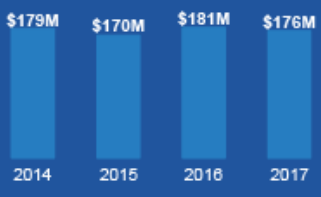
water **consumed** by the economy

Ecosystem services



value of **ecosystem service** of water provisioning

Water supply services



value of **supply** of water products

Graphs refer to reporting years ending June 30 of the displayed year.

BACKGROUND INFORMATION

AT A GLANCE

- The Canberra region is located in the upper reaches of the Murrumbidgee River catchment; the Murrumbidgee River is the main source of the region's water supply.
- The region covers the Australian Capital Territory and parts of New South Wales; Canberra is the largest urban centre in the region.
- Surface water is the main water source, primarily for urban supply.

Water use
0.1% of Australia's water use*

Land use
47% of the region used for conservation and natural environment

Ecosystems
12 nationally important wetlands including Ramsar listed Ginini Flats Wetland complex

Water resources
98% of water is sourced from surface water (including rainwater tanks)

** including in-stream use*

GENERAL DESCRIPTION

Area: 4,202 km²

Population: Approximately 450,000 (Australian Bureau of Statistics 2016)

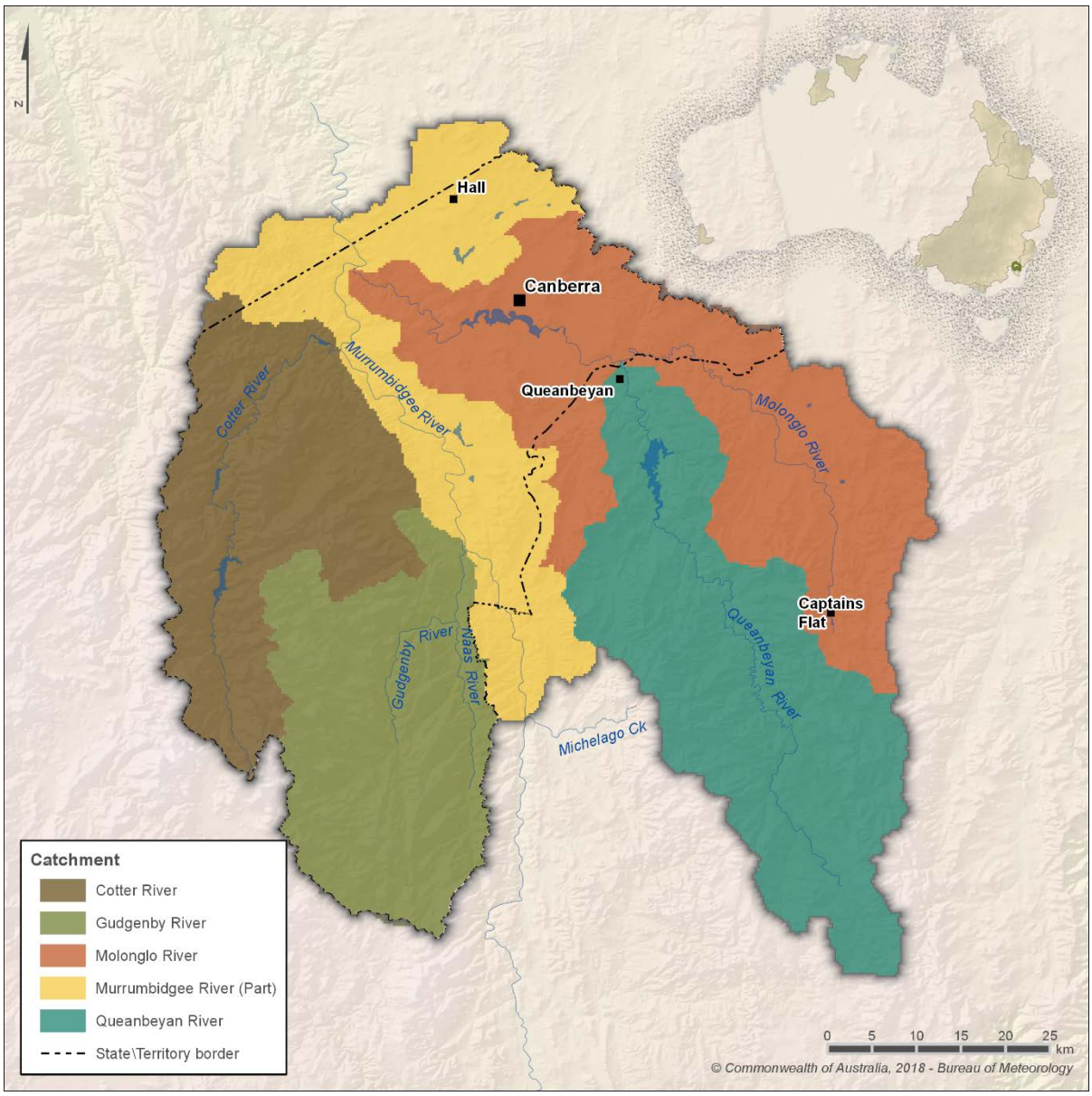


Figure R1 Contextual map of the Canberra region

- The Canberra region is located in the southeast of Australia and within the Murray–Darling Basin.
- The Canberra region boundary adopted for these integrated water accounts encompasses the Australian Capital Territory (ACT) and extends into New South Wales (NSW).
- Included in the region are five river catchments: Cotter River, Gudgenby River, Molonglo River, Murrumbidgee River (part) and Queanbeyan River.
- Only 0.1% of Australia's water use (including in-stream use) occurs within the region. Most of the water used is from surface water stores for urban purposes.

LAND USE

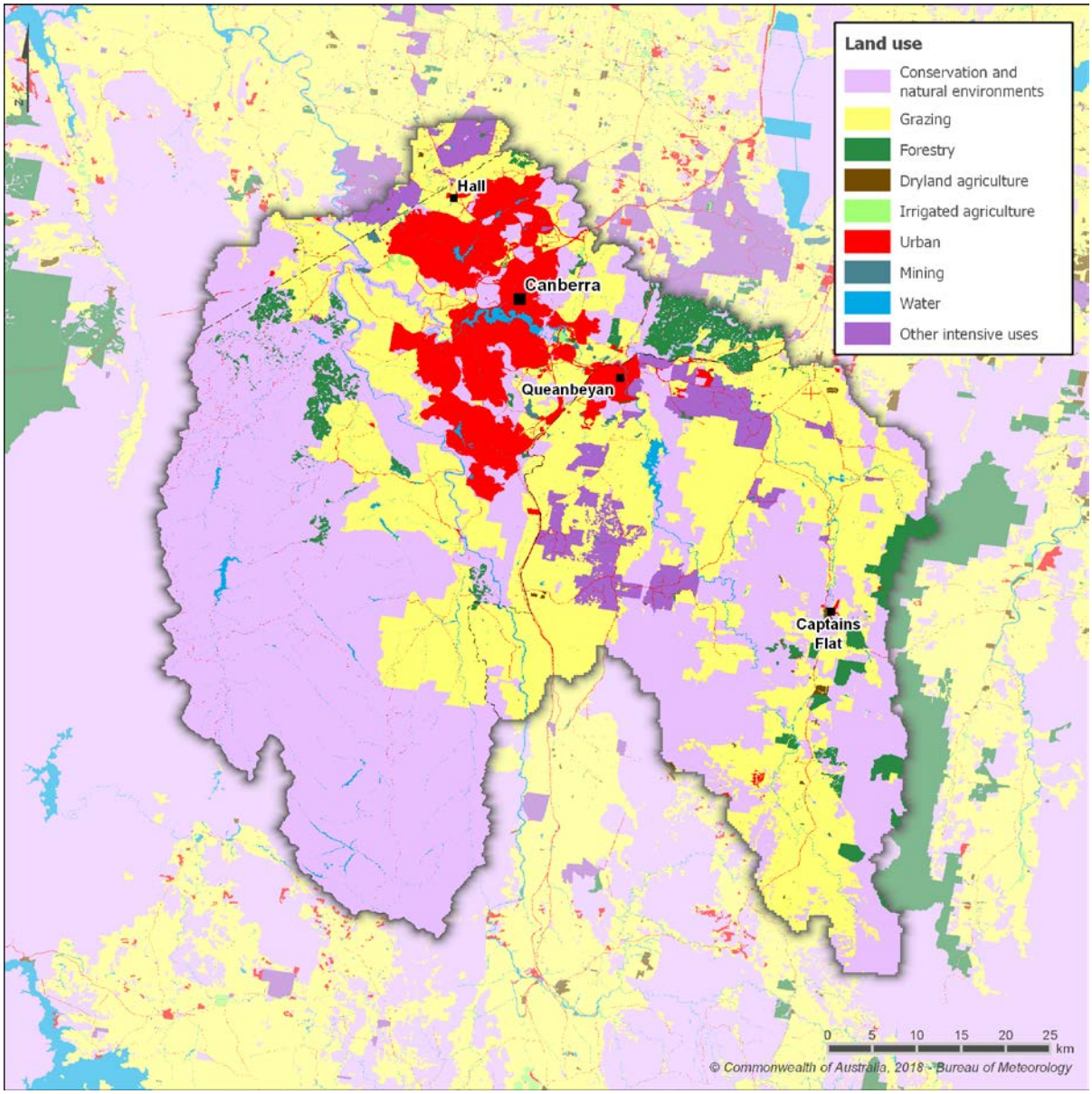


Figure R2 Land use in the Canberra region

Source: Australian Bureau of Agricultural and Resource Economics and Sciences 2016

- The Canberra-Queanbeyan urban area is the major population center in the area. It accounts for 11% of the region's land use and is home to approximately 432,000 residents.
- Conservation and natural environment areas account for 47% of the region's land use, and are particularly extensive over the south and west of the region.
- 29% of the region is used for grazing, which is a key land use activity outside the urban centres.

SIGNIFICANT AQUATIC ECOSYSTEMS

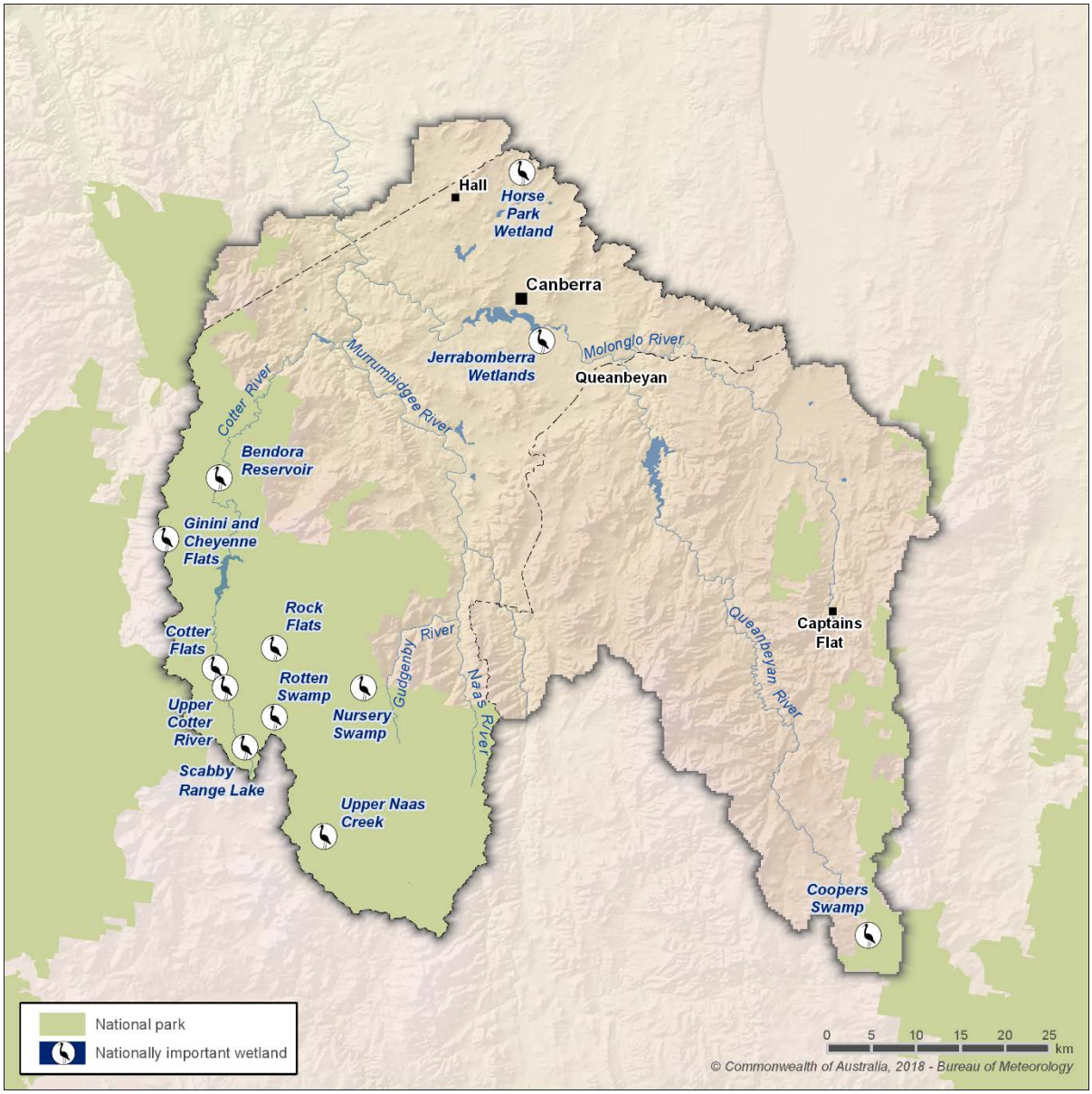


Figure R3 Significant wetlands in the Canberra region

- The Canberra region contains the Ramsar-listed Ginini Flats Wetland Complex in the Namadgi National Park, which consists of a series of interconnected flats known as the Ginini Flats and the Cheyenne Flats.
- The region contains 12 nationally important wetlands listed in the Directory of Important Wetlands in Australia (Environment Australia 2001).
- The nationally important wetlands in the region are located upstream of any water abstraction or storage and so are unaffected by water resource management activities.

WATER RESOURCES

- Most of the region's water supply comes from surface water.
- Groundwater resources are used primarily for town supply and stock and domestic purposes. Recycled wastewater is used for treatment plant operations and irrigation of sports fields.

Surface water

Rivers

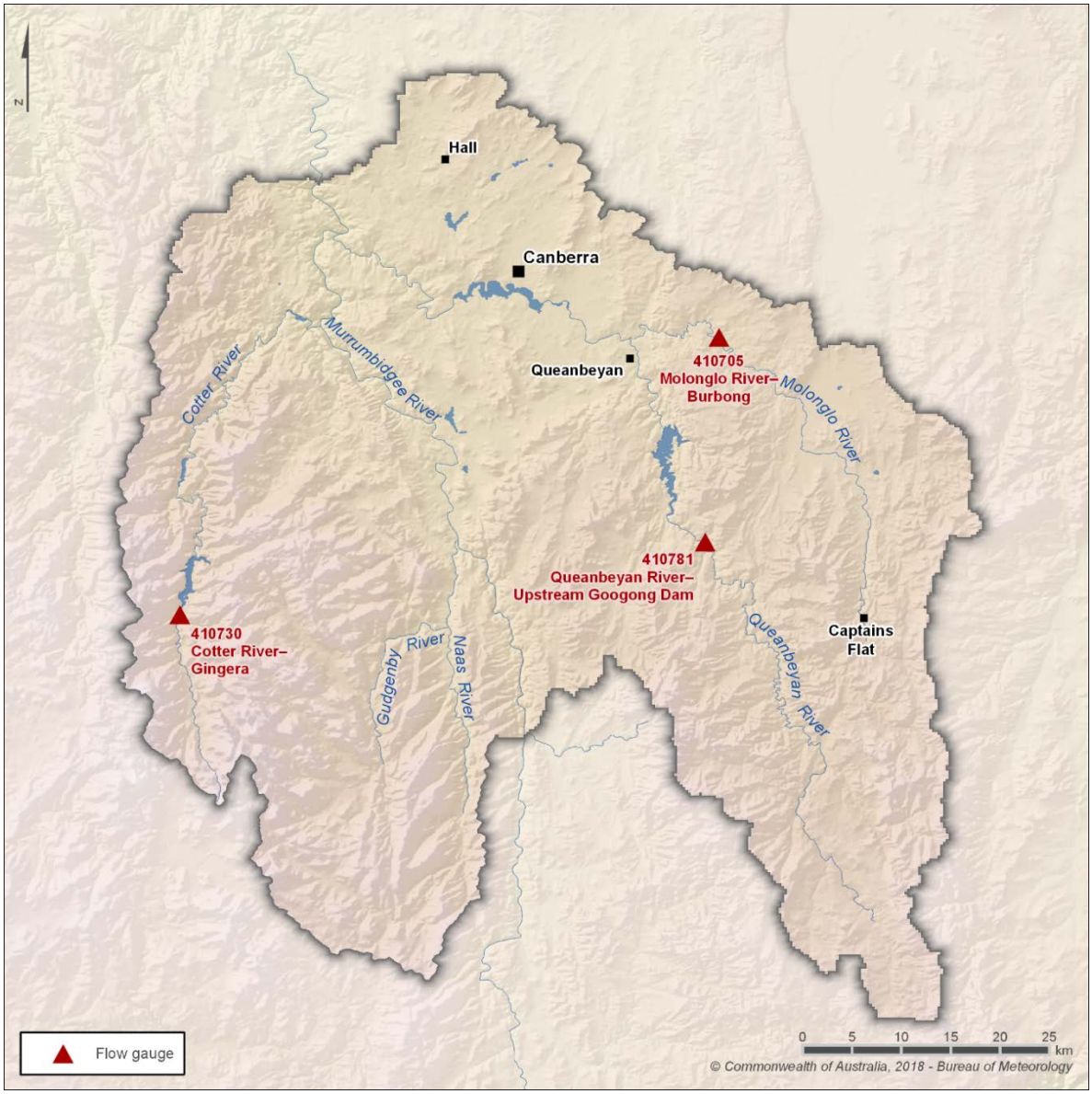
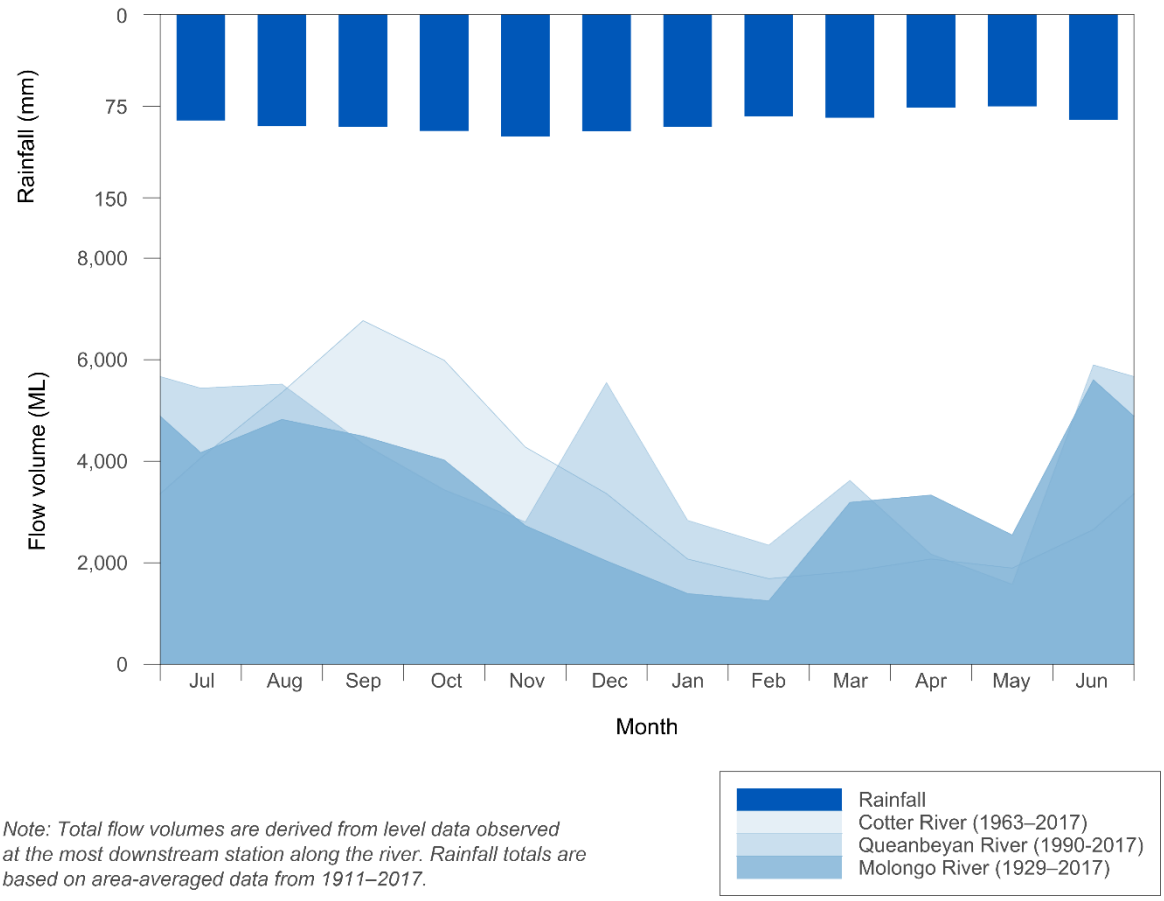


Figure R4 Key flow gauging stations on the Cotter, Molonglo, and Queanbeyan rivers within the Canberra region

- The three main rivers in the Canberra region are the Molonglo, Cotter and Queanbeyan rivers, which all contribute to the Murrumbidgee River.
- The Murrumbidgee River is the largest river that flows through the Canberra region, and is the source of inflows from outside of the region and the destination of all the region's outflows.
- The Murrumbidgee River is the second longest river in Australia, draining much of southern New South Wales and all of the Australian Capital Territory.



Note: Total flow volumes are derived from level data observed at the most downstream station along the river. Rainfall totals are based on area-averaged data from 1911–2017.

Figure R5 Mean monthly flows along the Molonglo, Cotter, and Queanbeyan rivers and mean monthly rainfall for the Canberra region

- The seasonal flow characteristics of rivers within the region reflect seasonal variations in evapotranspiration more so than rainfall, which is relatively uniform throughout the year.
- Typically, high streamflows occur in winter and spring, following high runoff from partially saturated catchments in autumn and winter. Summer typically sees drier catchment conditions due to higher evapotranspiration.

Storages

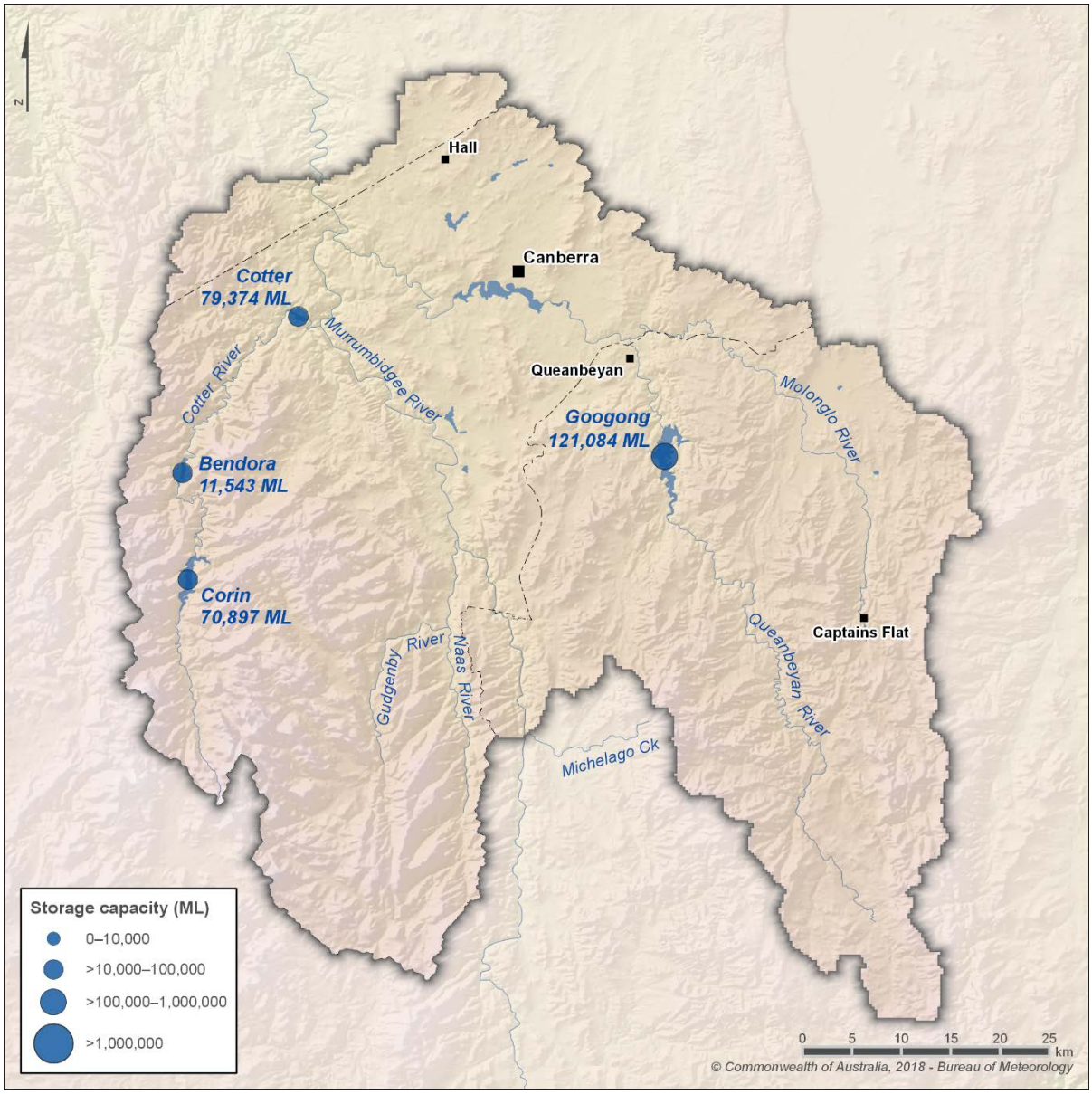


Figure R6 Major storages and lakes in the Canberra region; capacity of each storage is also shown

- The four major storages in the region—Bendora, Corin, Cotter and Googong—are used mainly for urban supply.
- The region also has three lakes used for recreational purposes and water pollution control: Lake Burley Griffin, Lake Ginninderra and Lake Tuggeranong.

Groundwater

- The Canberra region falls within the Lachlan Fold Belt geologic province. The region encompasses low-yield fractured volcanic aquifers overlain in places by minor, high-yield aquifers in superficial, unconsolidated alluvium and colluvium. The alluvial aquifers have local significance as a source of water, but across the wider region, groundwater is a minor component of total water use.

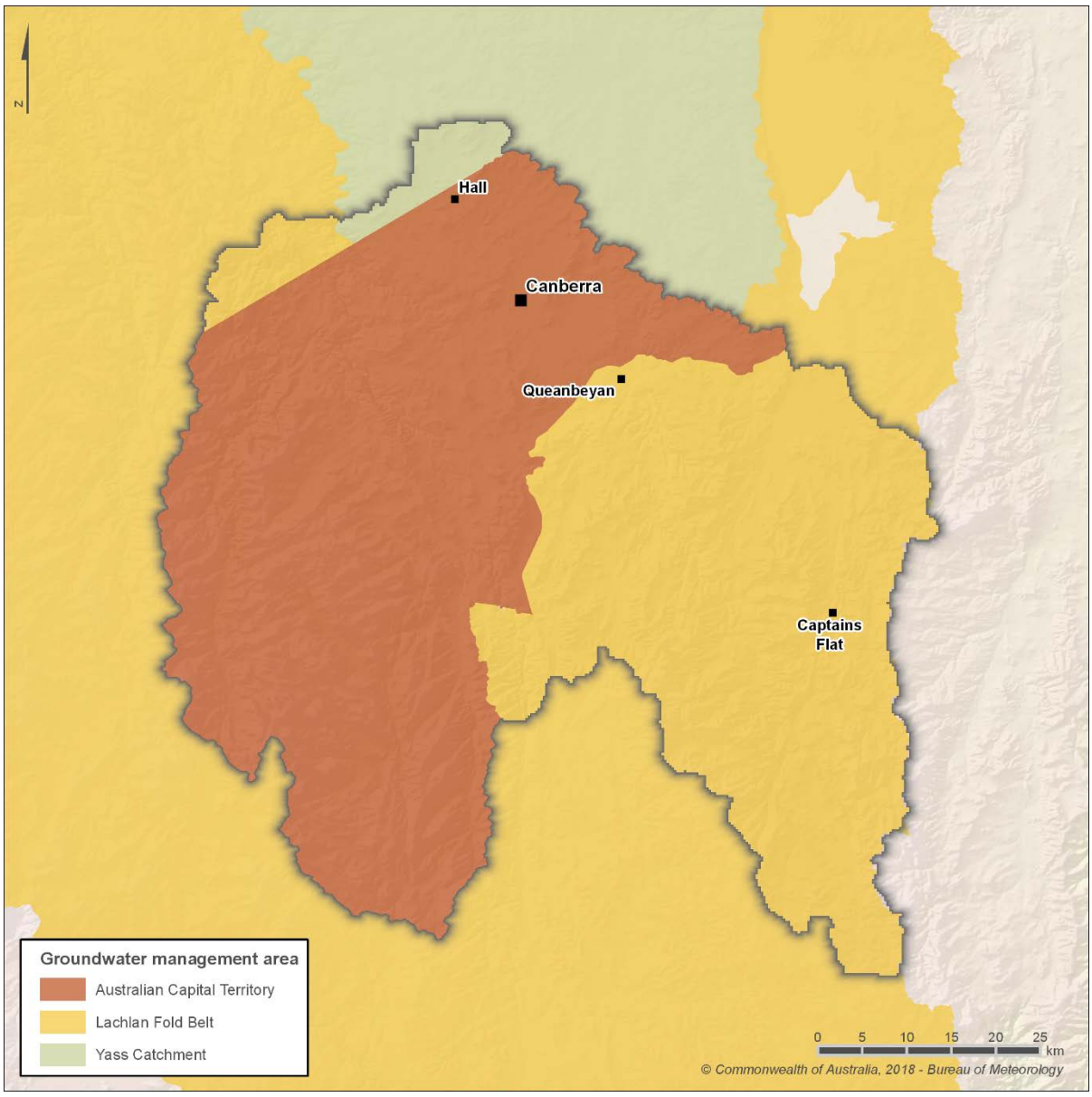


Figure R7 Groundwater management areas in the Canberra region

- There are three groundwater management areas (GMAs) in the Canberra region: the ACT GMA, the Lachlan Fold Belt GMA, and the Yass Catchment GMA. The Lachlan Fold Belt and Yass Catchment GMAs extend beyond the region's boundaries.

WATER SYSTEMS

Urban water system

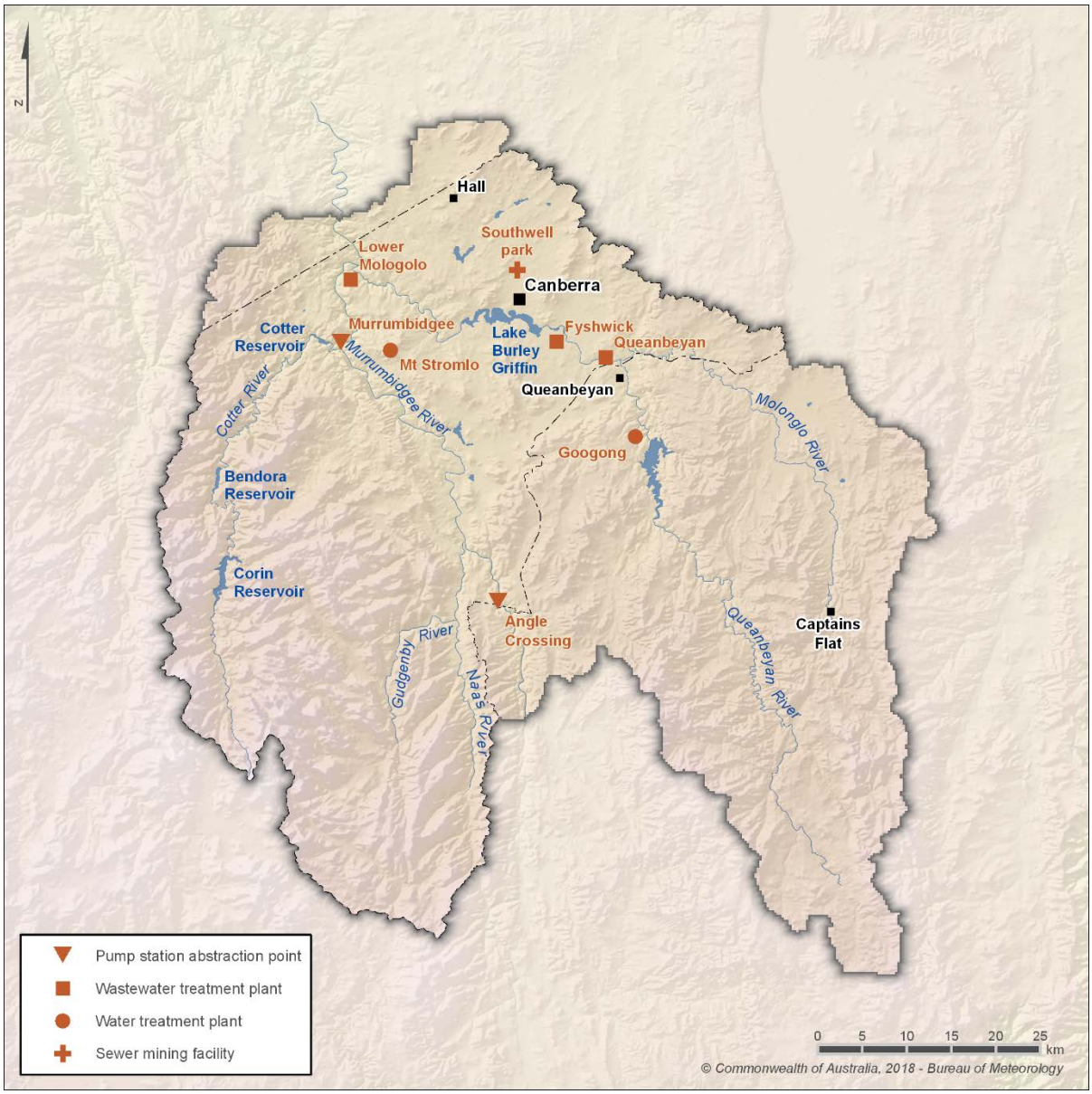


Figure R8 Key infrastructure of the urban water system in the Canberra region

- Water service providers in the region are Icon Water (formerly ACTEW Water), a statutory body of the ACT government, and Queanbeyan-Palerang Regional Council.
- Icon Water owns and manages most of the region's water supply system, including major storages and two water treatment plants. The Mount Stromlo water treatment plant receives water from the Bendora and Cotter reservoirs; the Googong water treatment plant receives water diverted from Googong Reservoir.
- Queanbeyan-Palerang Regional Council receives bulk water from Icon Water, supplies potable water through its reticulation system, and collects and treats wastewater for its own local government area.
- More information about the Canberra urban water system can be found at the Icon Water website.

Recycled water

- Three wastewater reuse schemes operate in the ACT: North Canberra Water Reuse Scheme, Lower Molonglo Water Quality Control Centre effluent reuse scheme and Southwell Park Watermining® Project.
- Most treated wastewater from Icon Water is discharged to the Molonglo River, with the balance recycled for internal use at the treatment plants and/or irrigation purposes.

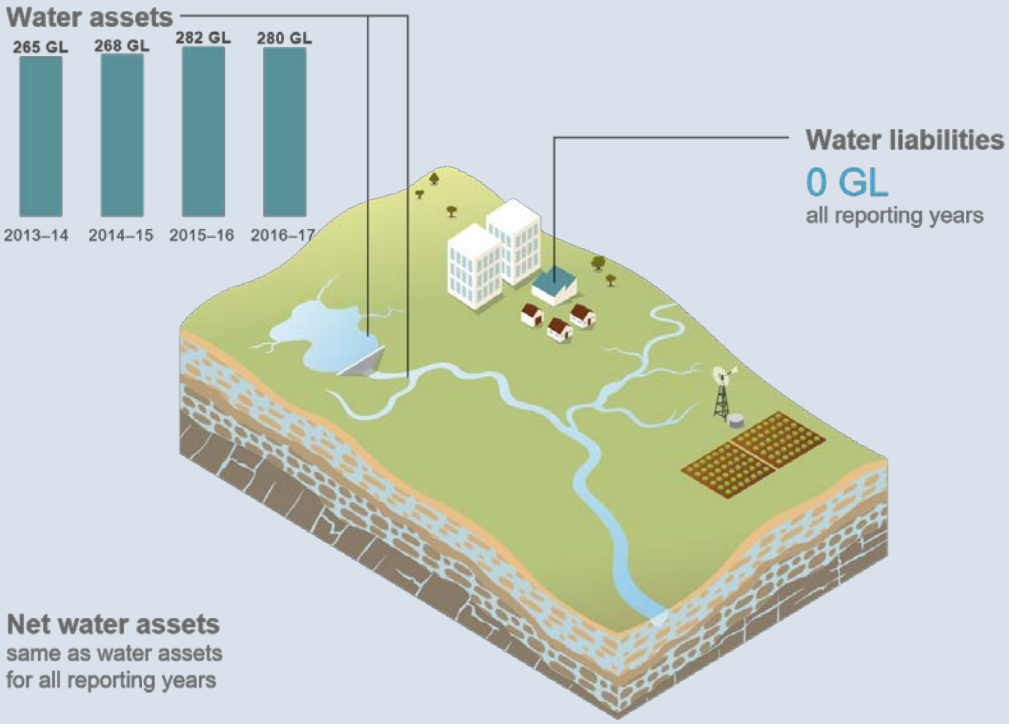
Farm dams

- Farm dams refer to landscape catchment storages used to harvest runoff, floodwater, or collected rainwater. They are an important water resource in the region; however, water held in farm dams is considered to be taken from the shared pool of water resources and, as such, is not included as part of the region's water assets.
- Water held in farm dams is primarily used for stock and domestic, and agricultural purposes.
- The majority of the region's farm dams are filled by rainfall–runoff capture; it has been estimated that runoff harvesting to farm dams reduces runoff to surface water in the Canberra region by approximately 1%. A smaller portion of farm dams are filled by groundwater extractions, surface water diversions, or recycled water transfers. Farm dams in the region hold approximately 7,500 ML, or 2% of the total surface water storage capacity in the region.

STATEMENT OF WATER ASSETS AND WATER LIABILITIES

AT A GLANCE

- Water availability in the region increased from 2013–14 to 2016–17, reaching a peak in 2015–16.
- Water availability is represented by the net water assets, which are the volume of water assets minus the water liabilities.



The Statement of Water Assets and Water Liabilities is prepared according to the Australian Water Accounting Standard 1 and is like a balance sheet. It presents the volume of water assets and water liabilities at the start and end of the reporting year.

Water assets in the integrated water accounts for the Canberra region include water (physical water assets) and rights or claims to water (non-physical water assets). Water liabilities in the integrated accounts include commitments to deliver water to users.

	2017 ML	2016 ML	2015 ML	2014 ML	2013 ML
Water assets	**279,968**	**281,677**	**268,474**	**264,959**	**220,546**
Surface water	**279,002**	**280,711**	**267,508**	**264,059**	**219,591**
Storages	**238,900**	235,971	225,741	219,642	181,297
Rivers	**932**	5,416	2,629	5,675	3,663
Lakes and wetlands	**39,170**	39,324	39,138	38,742	34,631
Groundwater	–	–	–	–	–
Water table aquifer	–	–	–	–	–
Underlying aquifers	–	–	–	–	–
Urban water system	**966**	966	966	900	955
Urban storages	**966**	966	966	900	955
Wastewater storages	–	–	–	–	–
Claim on surface water for urban use	–	–	–	–	–

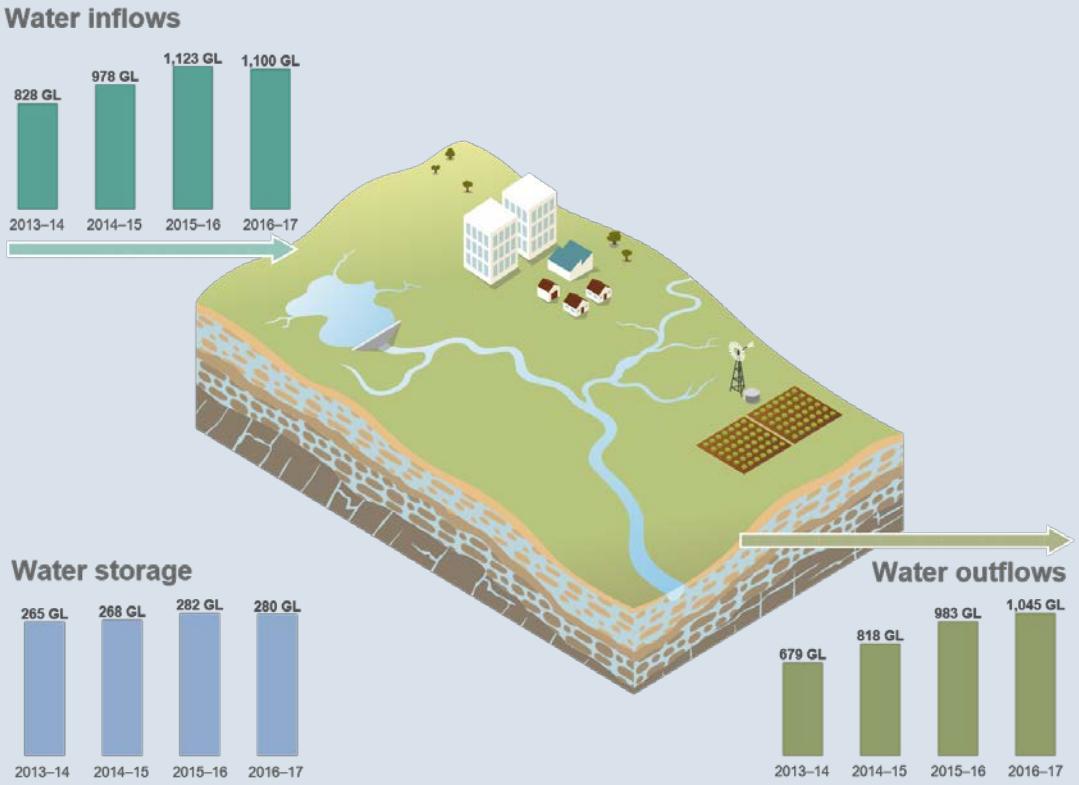
Water liabilities	**0**	**0**	**0**	**0**	0
Surface water liability	**0**	**0**	**0**	**0**	**0**
Allocation remaining: individual users	**0**	0	0	0	0
Allocation remaining: urban system	**0**	0	0	0	0
Groundwater liability	0	0	0	0	0
Allocation remaining: individual users	**0**	0	0	0	0

Opening net water assets	**281,677**	268,474	264,959	220,546	
Change in net water assets	**(1,709)**	13,203	3,515	44,413	
Closing net water assets	**279,968**	281,677	268,474	264,959	220,546

STATEMENT OF CHANGES IN WATER ASSETS AND WATER LIABILITIES

AT A GLANCE

- Water availability in the Canberra region decreased by 1,709 ML during the 2016–17 year.
- This followed three consecutive years of increases in water availability in the region.
- The change in water available in the region at the end of the year is represented by the change in net water assets.



The Statement of Changes in Water Assets and Water Liabilities is prepared according to the Australian Water Accounting Standard 1 and is like an income statement. The statement presents the changes in water assets and water liabilities that occurred during the year, including accrual transactions (e.g. allocations and forfeitures) and actual water flows, both natural and engineered.

	2017 ML	2016 ML	2015 ML	2014 ML
Water inflows	**1,100,266**	1,122,577	978,236	828,231
Surface water inflows	**1,005,408**	**1,029,074**	**890,916**	**740,773**
Precipitation	**21,041**	22,873	21,790	21,662
Inter-region inflow	**262,309**	409,510	350,969	198,586
Runoff	**682,897**	561,041	483,366	486,042
Flood return	**2,190**	1,603	1,760	1,890
Wastewater discharge	**36,971**	34,047	33,031	32,593
Groundwater inflows	**4,079**	**4,454**	**2,920**	**2,081**
Inter-region inflow	**–**	–	–	–
Recharge: landscape	**–**	–	–	–
Leakage from urban system	**4,079**	4,454	2,920	2,081
Urban water system inflows	**90,779**	**89,049**	**84,400**	**85,377**
Wastewater collected	**40,821**	38,646	37,285	36,682
Delivery: inter-region	**–**	0	0	0
Allocated diversion: surface water	**49,958**	50,403	47,115	48,695
Water outflows	**1,045,059**	983,211	818,231	679,006
Surface water outflows	**956,074**	**896,377**	**736,992**	**596,286**
Evaporation	**31,083**	32,404	31,615	32,147
Outflows	**818,608**	773,504	614,786	468,908
Overbank flow	**53,617**	37,517	41,823	45,380
Non-allocated diversion: individual users	**2,808**	2,549	1,653	1,156
Allocated diversion: individual users	**–**	–	–	–
Allocated diversion: urban system	**49,958**	50,403	47,115	48,695
Groundwater outflows	**1,254**	**1,276**	**1,061**	**894**
Extraction: statutory rights	**435**	435	435	435
Non-allocated extraction: individual users	**819**	841	626	459
Allocated extraction: individual users	**–**	–	–	–
Urban water system outflows	**87,731**	**85,558**	**80,178**	**81,826**
Supply system delivery: urban users	**45,244**	45,241	42,694	45,489
Wastewater discharge: landscape	**3**	3	–	–
Wastewater discharge: surface water	**36,971**	34,047	33,031	32,593
Urban leakage to groundwater	**4,079**	4,454	2,920	2,081
Other supply system decreases	**949**	1,187	1,405	1,462
Recycled water delivery: urban users	**91**	246	128	201
Other wastewater and recycled water system decreases	**394**	380	0	0

	2017 ML	2016 ML	2015 ML	2014 ML
Unaccounted-for difference	**(56,916)**	(126,163)	(156,490)	(104,812)
Unaccounted-for difference - surface water	**(51,043)**	(119,494)	(150,475)	(100,019)
Unaccounted-for difference - groundwater	**(2,825)**	(3,178)	(1,859)	(1,187)
Unaccounted-for difference - urban system	**(3,048)**	(3,491)	(4,156)	(3,606)
Changes in water storage	**(1,709)**	13,203	3,515	44,413
Opening water storages	**281,677**	268,474	264,959	220,546
Changes in water storage	**(1,709)**	13,203	3,515	44,413
Closing water storages	**279,968**	281,677	268,474	264,959
Non-physical water changes	**0**	0	0	0
Urban water system	**0**	**0**	**0**	**0**
Claim on surface water for urban use	**0**	0	0	0
Surface water liabilities	**0**	**0**	**0**	**0**
Allocation remaining: individual users	**0**	0	0	0
Allocation remaining: urban water system	**0**	0	0	0
Groundwater liabilities	**0**	**0**	**0**	**0**
Allocation remaining: individual users	**0**	0	0	0
Change in net water assets	**(1,709)**	13,203	3,515	44,413

WATER ASSET ACCOUNTS

INFORMATION PRESENTED IN THE WATER ASSET ACCOUNTS

In this section water assets are presented using the System of Environmental-Economic Accounting (SEEA) framework. These water asset accounts present information, in physical units (e.g. ML), on the stocks (assets) of water resources at the beginning and end of an accounting period, as well as details on the increases and decreases in stocks. They present various water resource types (e.g. reservoirs, lakes, rivers, groundwater) as well as the water inflows (e.g. from upstream sources) and outflows (e.g. to other resources in the region) to each.

COMPARISON TO WATER ACCOUNTING STATEMENTS

These accounts present similar information to the Statement of Water Assets and Water Liabilities and the Statement of Changes in Water Assets and Water Liabilities in the previous sections, albeit in a slightly different presentation. Note that the opening and closing stocks in these tables are aligned with those in the statements, and the increases and decreases are aligned with the inflows and outflows in the statement changes. The main difference between these SEEA-style tables and the statements is that increases and decreases in surface water stocks are further disaggregated (by reservoirs, lakes and rivers – e.g. Table S2). Another key difference is that all inflows and outflows between individual water assets/resources are presented in the SEEA-style tables; for example, flows into and out of each major reservoir are included. Minor differences in volumes of up to 1 ML between the water accounting statements and the water asset accounts may be present due to rounding.

ACCESS TO ASSET ACCOUNT TABLES

For the full asset account tables in spreadsheet format, please see the Downloads section of the publication on the ABS webpage. Summarised versions of the tables are shown below.

Key to water asset account tables

null by definition

- nil or rounded to zero (including null cells)

na not available

ML megalitres

Any discrepancies between totals and sums of components in this publication are due to rounding.

(a) Includes Bendora, Corin, Cotter and Googong reservoirs

(b) Includes Lake Burley Griffin, Lake Ginninderra, Lake Tuggeranong

Table S1 Water asset account for 2016-17 (ML)

	Total Surface water	Groundwater	Urban water system	Total Canberra region
Opening Stocks	**280,711**	**na**	**966**	**281,677**
Increases in stocks	**1,880,713**	**4,079**	**90,779**	**1,975,571**
Returns from the economy	**36,971**	4,079	40,821	**81,871**
Precipitation	**21,041**		-	**21,041**
Flood return	**2,190**			**2,190**
Runoff	**682,897**			**682,897**
Inflows				
from upstream territories	**262,309**	na	-	**262,309**
from other resources in the territory	**875,305**	**na**	49,958	**925,263**
Decreases in stocks	**1,831,380**	**1,254**	**87,731**	**1,920,364**
Abstraction/Diversions	**52,766**	1,254		**54,020**
Evaporation	**31,083**		na	**31,083**
Overbank flow	**53,617**			**53,617**
Outflows				
to downstream territories	**818,608**	na	**0**	**818,608**
to other resources in the territory	**875,305**	na	87,731	**963,036**
Other changes in volume	**-51,042**	-2,825	-3,048	**-56,915**
Net change	**-1,709**	**na**	-	**-1,709**
Closing Stocks	**279,002**	**na**	**966**	**279,968**

Table S2 Water asset account breakdown for surface water for 2016-17 (ML)

	Reservoirs (a)	Lakes (b)	Rivers	Subtotal surface water
Opening Stocks	**235,971**	**39,324**	**5,416**	**280,711**
Increases in stocks	**347,995**	**196,573**	**1,336,144**	**1,880,713**
Returns from the economy	**-**	**-**	36,971	**36,971**
Precipitation	9,776	5,080	6,184	**21,041**
Flood return	**-**	**-**	2,190	**2,190**
Runoff	94,161	22,269	566,467	**682,897**
Inflows				
from upstream territories			262,309	**262,309**
from other resources in the territory	244,058	169,224	462,023	**875,305**
Decreases in stocks	**341,723**	**195,009**	**1,294,648**	**1,831,380**
Abstraction/Diversions	49,958	na	2,808	**52,766**
Evaporation	15,230	9,521	6,332	**31,083**
Overbank flow	**-**	**-**	53,617	**53,617**
Outflows				
to downstream territories			818,608	**818,608**
to other resources in the territory	276,535	185,488	413,282	**875,305**
Other changes in volume	-3,343	-1,719	-45,980	**-51,042**
Net change	**2,929**	**-154**	**-4,484**	**-1,709**
Closing Stocks	**238,900**	**39,170**	**932**	**279,002**

Table S3 Water asset account for 2015-16 (ML)

	Total Surface water	Groundwater	Urban water system	Total Canberra region
Opening Stocks	**267,508**	**na**	**966**	**268,474**
Increases in stocks	**1,746,808**	**4,454**	**89,049**	**1,840,311**
Returns from the economy	**34,047**	4,454	38,646	**77,147**
Precipitation	**22,872**		-	**22,872**
Flood return	**1,603**			**1,603**
Runoff	**561,041**			561,041
Inflows				
from upstream territories	**409,510**	na	-	**409,510**
from other resources in the territory	**717,734**	**na**	50,403	**768,137**
Decreases in stocks	**1,614,111**	**1,276**	**85,558**	**1,700,945**
Abstraction/Diversions	52,952	1,276		**54,228**
Evaporation	**32,404**		na	**32,404**
Overbank flow	**37,517**			**37,517**
Outflows				
to downstream territories	**773,504**	na	**-**	**773,504**
to other resources in the territory	**717,734**	na	85,558	**803,292**
Other changes in volume	**-119,494**	-3,178	-3,491	**-126,163**
Net change	**13,203**	**na**	-	**13,203**
Closing Stocks	**280,711**	**na**	**966**	**281,677**

Table S4 Water asset account breakdown for surface water for 2015-16 (ML)

	Reservoirs (a)	Lakes (b)	Rivers	Subtotal surface water
Opening Stocks	**225,741**	**39,138**	**2,629**	**267,508**
Increases in stocks	**287,735**	**171,168**	**1,287,906**	**1,746,808**
Returns from the economy	**-**	**-**	34,047	**34,047**
Precipitation	9,314	5,146	8,413	**22,873**
Flood return	**-**	**-**	**1,603**	**1,603**
Runoff	60,351	10,289	490,400	**561,041**
Inflows				
from upstream territories			409,510	409,510
from other resources in the territory	218,069	155,733	343,932	**717,734**
Decreases in stocks	**248,195**	**170,982**	**1,194,934**	**1,614,111**
Abstraction/Diversions	50,403	na	2,549	52,952
Evaporation	14,912	9,930	7,562	**32,404**
Overbank flow	**-**	**-**	37,517	**37,517**
Outflows				
to downstream territories			773,504	**773,504**
to other resources in the territory	182,880	161,052	373,802	**717,734**
Other changes in volume	-29,309	0	-90,184	**-119,494**
Net change	**10,230**	**186**	**2,787**	**13,203**
Closing Stocks	**235,971**	**39,324**	**5,416**	**280,711**

Table S5 Water asset account for 2014-15 (ML)

	Total Surface water	Groundwater	Urban water system	Total Canberra region
Opening Stocks	**264,059**	**na**	**900**	**264,959**
Increases in stocks	**1,491,428**	**2,920**	**84,400**	**1,578,748**
Returns from the economy	**33,031**	2,920	37,285	**73,236**
Precipitation	**21,790**		-	**21,790**
Flood return	**1,760**			**1,760**
Runoff	**483,366**			**483,366**
Inflows				
from upstream territories	**350,969**	na	-	**350,969**
from other resources in the territory	**600,511**	**na**	47,115	**647,626**
Decreases in stocks	**1,337,503**	**1,061**	**80,178**	**1,418,742**
Abstraction/Diversions	**48,768**	1,061		**49,829**
Evaporation	**31,615**		na	**31,615**
Overbank flow	**41,823**			**41,823**
Outflows				
to downstream territories	**614,786**	na	**-**	**614,786**
to other resources in the territory	**600,511**	na	80,178	**680,690**
Other changes in volume	**-150,476**	-1,859	-4,156	**-156,491**
Net change	**3,449**	**na**	66	**3,515**
Closing Stocks	**267,508**	**na**	**966**	**268,474**

Table S6 Water asset account breakdown for surface water for 2014-15 (ML)

	Reservoirs (a)	Lakes (b)	Rivers	Subtotal surface water
Opening Stocks	**219,642**	**38,742**	**5,675**	**264,059**
Increases in stocks	**251,922**	**133,943**	**1,105,562**	**1,491,428**
Returns from the economy	**-**	**-**	33,031	**33,031**
Precipitation	9,068	4,905	7,817	**21,790**
Flood return	**-**	**-**	1,760	**1,760**
Runoff	46,299	11,003	426,063	**483,366**
Inflows				
from upstream territories			350,969	**350,969**
from other resources in the territory	196,555	118,035	285,921	**600,511**
Decreases in stocks	**223,871**	**133,547**	**980,084**	**1,337,503**
Abstraction/Diversions	47,115	na	1,653	**48,768**
Evaporation	14,859	9,523	7,233	**31,615**
Overbank flow	**-**	**-**	41,823	**41,823**
Outflows				
to downstream territories			614,786	**614,786**
to other resources in the territory	161,897	124,024	314,590	**600,511**
Other changes in volume	**-21,952**	**-**	**-128,524**	**-150,476**
Net change	**6,099**	**396**	**-3,046**	**3,449**
Closing Stocks	**225,741**	**39,138**	**2,629**	**267,508**

Table S7 Water asset account for 2013-14 (ML)

	Total Surface water	Groundwater	Urban water system	Total Canberra region
Opening Stocks	**219,591**	**na**	**955**	**220,546**
Increases in stocks	**1,300,136**	**2,081**	**85,377**	**1,387,594**
Returns from the economy	**32,593**	2,081	36,682	**71,356**
Precipitation	**21,662**		-	**21,662**
Flood return	**1,890**			**1,890**
Runoff	**486,042**			**486,042**
Inflows				
from upstream territories	**198,586**	na	-	**198,586**
from other resources in the territory	**559,363**	**na**	48,695	**608,058**
Decreases in stocks	**1,155,648**	**894**	**81,826**	**1,238,369**
Abstraction/Diversions	**49,851**	**894**		**50,746**
Evaporation	**32,147**		na	**32,147**
Overbank flow	**45,380**			**45,380**
Outflows				
to downstream territories	**468,908**	na	**-**	**468,908**
to other resources in the territory	**559,363**	na	81,826	**641,189**
Other changes in volume	**-100,020**	-1,187	-3,606	**-104,812**
Net change	**44,468**	**na**	-55	**44,413**
Closing Stocks	**264,059**	**na**	**900**	**264,959**

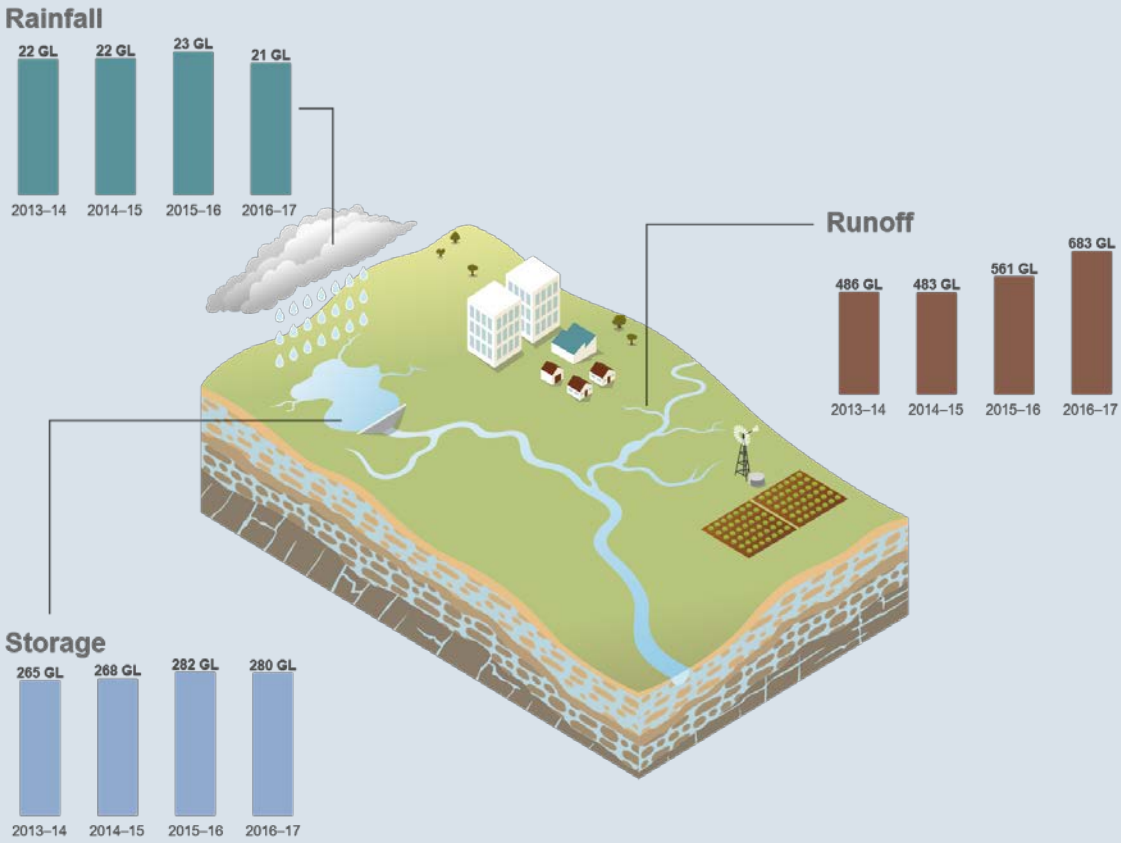
Table S8 Water asset account breakdown for surface water for 2013-14 (ML)

	Reservoirs (a)	Lakes (b)	Rivers	Subtotal surface water
Opening Stocks	**181,297**	**34,631**	**3,663**	**219,591**
Increases in stocks	**257,274**	**136,614**	**906,247**	**1,300,136**
Returns from the economy	**-**	**-**	32,593	**32,593**
Precipitation	9,194	5,144	7,324	**21,662**
Flood return	**-**	**-**	1,890	**1,890**
Runoff	55,595	28,292	402,155	**486,042**
Inflows				
from upstream territories			198,586	**198,586**
from other resources in the territory	192,485	103,179	263,699	**559,363**
Decreases in stocks	**205,302**	**132,277**	**818,069**	**1,155,648**
Abstraction/Diversions	48,695	na	1,156	**49,851**
Evaporation	14,994	10,191	6,961	32,147
Overbank flow	**-**	**-**	45,380	**45,380**
Outflows				
to downstream territories			468,908	**468,908**
to other resources in the territory	141,613	122,086	295,663	**559,363**
Other changes in volume	-13,627	-226	-86,167	**-100,020**
Net change	**38,345**	**4,111**	**2,012**	**44,468**
Closing Stocks	**219,642**	**38,742**	**5,675**	**264,059**

SUPPLEMENTARY INFORMATION FOR STATEMENTS/ASSET ACCOUNTS

AT A GLANCE

- Above-average rainfall in 2015–16 led to increased storage volumes for that year.
- Although rainfall was below average for most of the 2016–17 year, heavy rainfall in September contributed to high runoff volumes and helped maintain storage levels.
- The majority of water stocks in the region are held in surface water storages, though most of the changes in water stocks occur in rivers.



This section provides further supporting information and analysis relating to the three preceding sections - the Statement of Water Assets and Water Liabilities, the Statement of Changes in Water Assets and Liabilities and the Water Asset Accounts.

WATER ASSETS / STOCKS

- In 2016-17 the total closing water asset/stocks volumes in the Canberra region were 279,968 ML, equivalent to approximately 55% of the volume of water held in Sydney Harbour. Most of the stored water was from surface water (99.7%), with the remaining water from the urban water system.
- The amount of water stocks in the Canberra region increased by 27% between the beginning of the 2013-14 and the end of the 2016-17 reference periods, from 220,546 ML to 279,968 ML. There was a positive net change in water stocks every year from 2013-14 to 2015-16, before a slight decrease (0.6%) in 2016-17.

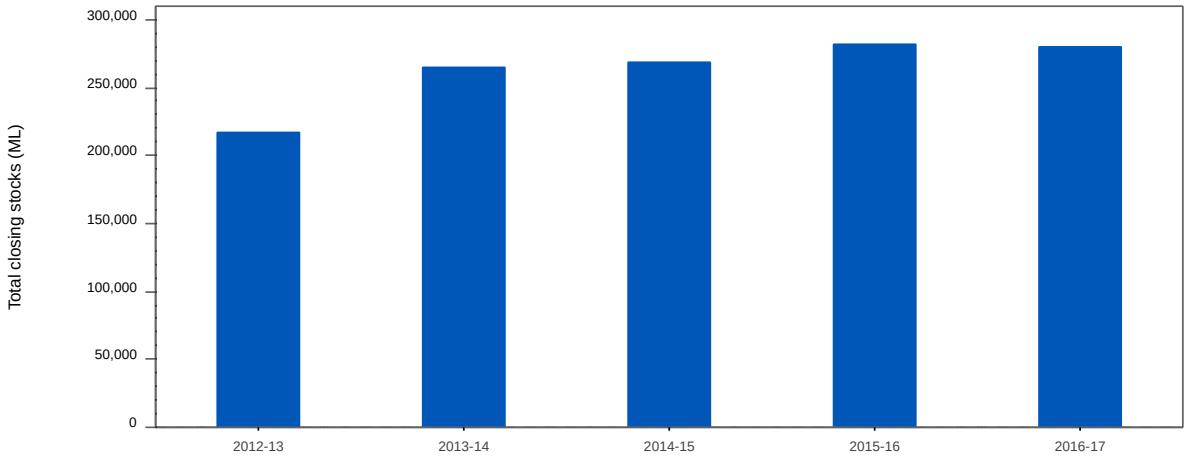


Figure S1 Total closing water asset volumes / stocks by year

Storages

- Major reservoirs account for 86% of the 279,002 ML of total surface water stored.
- Storage volumes increased to 84% full (238,900 ML) at 30 June 2017, the fourth consecutive increase in end of year storage volume.
- The increases in storage volume are due to inflows exceeding outflows for all four years.

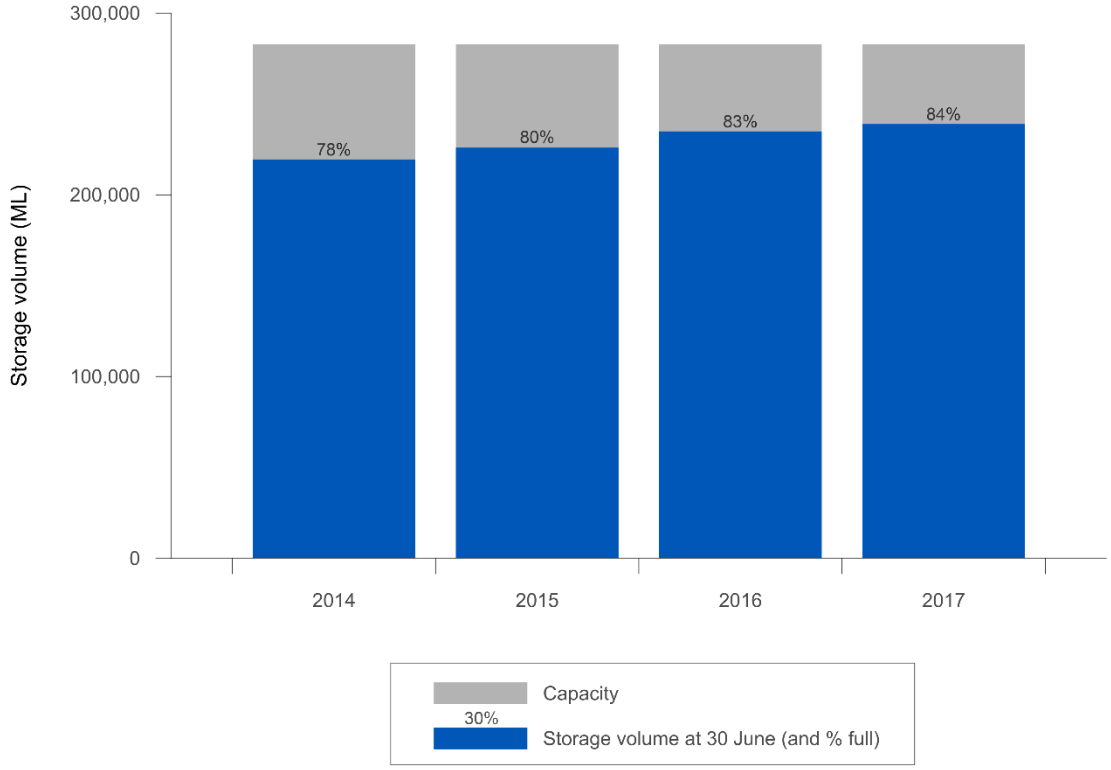


Figure S2 Total storage volume in the region at 30 June 2017 compared with the previous 3 years

- During the 2016–17 period, above-average rainfall during winter and spring contributed to storage volumes reaching 100% full in mid-October 2016. Storage volumes steadily decreased for the remainder of the 2016–17 year.
- The region's smallest surface water storages—Corin and Bendora reservoirs—held 18% and 3% of the water held in storages at 30 June 2017. The storage levels of these two dams fluctuated the most between 2013-14 and 2016-17 as these are the primary source of the region’s water supply.
- The largest storage in the Canberra region is Googong Reservoir which, at 30 June 2017, held 46% of the total amount of water held in storages in the region. Googong Reservoir is the region's secondary source of water and has remained full, or near full, since the end of the millennium drought in 2010. This trend continued for the first half of the 2016–17 year before decreasing steadily, closing at 90% of capacity.
- Cotte Reservoirr is the second largest storage in the region and held 32% of water held in storage in the region at 30 June 2017. In 2013 the Cotter Reservoir was enlarged, increasing the region's total storage capacity. Since then, storage levels have fluctuated very little, due to the preferential use of water from Corin and Bendora reservoirs.

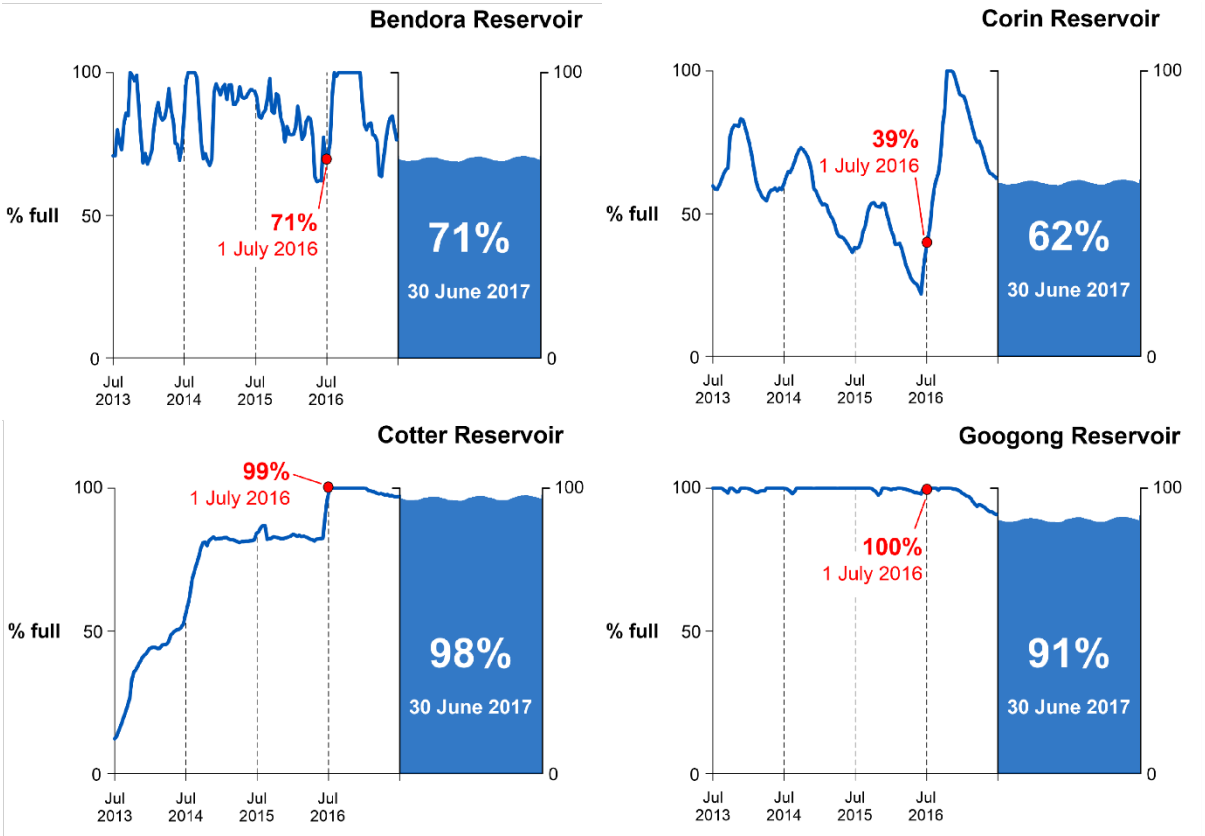


Figure S3 Percentage-full volume over 2013–17 period for each storage

Lakes and wetlands

- Lake Burley Griffin, the largest lake in the region, had a closing volume of 33,670 ML at 30 June 2017. The closing volumes of Lake Ginninderra and Lake Tuggeranong were 3,700 ML and 1,800 ML, respectively.
- The volume of water held in Canberra's lakes remained steady from 1 July 2014 to 30 June 2017, however during the 2013-14 period a 12% increase was recorded. This increase was mostly due to restoring normal water levels to Lake Burley Griffin following repair work undertaken on Scrivener Dam.
- More detailed information on the individual storages within the region is available on the Bureau of Meteorology's Water Storage website.

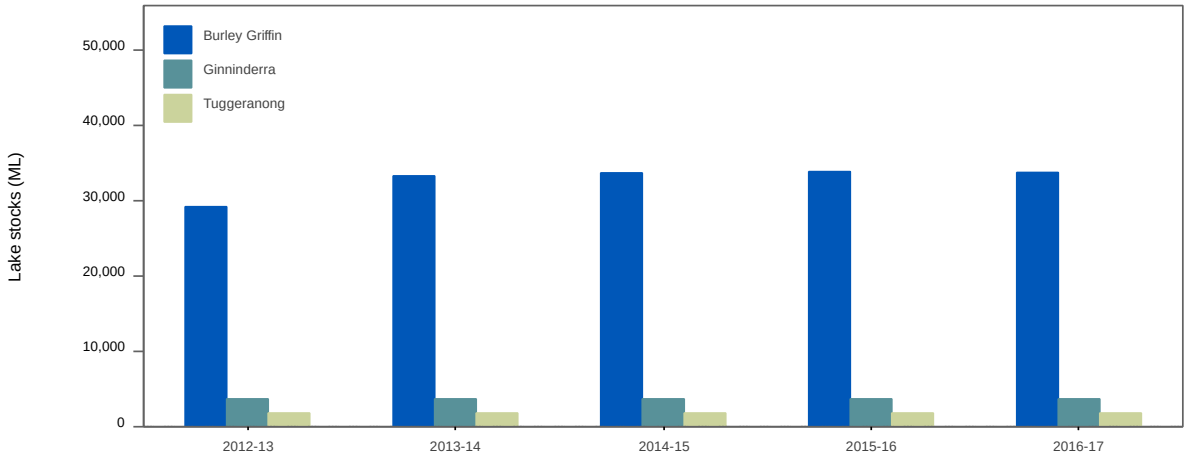


Figure S4 Volume of lakes in Canberra region by year over the 2012–17 period

Other water assets/stocks

- River storage closing water asset (stocks) volume was 932 ML for 2016–17, representing less than 0.3% of the total water assets (stocks) in the Canberra region.
- The volume of groundwater in aquifers cannot be quantified, and is assumed to remain unchanged throughout the year.
- The urban water system closing water asset (stock) volume was 966 ML for 2016–17, representing the volume of water held in the distribution pipe network. This represents only 0.3% of the total closing water assets (stocks) in the Canberra region.

WATER LIABILITIES

- Water liabilities in the Canberra region refer to the volume of allocation remaining on licence entitlements at the end of the water management year.

Table S5 Volume of surface water allocation remaining for individual users at 30 June 2017

Description	Volume ML
Opening balance at 1 July 2016	**0**
Allocation	1,832
Allocated diversion	–
Adjustment and forfeiture	(1,832)
Closing balance at 30 June 2017	**0**

Table S6 Volume of groundwater allocation remaining for individual users at 30 June 2017

Description	Volume ML
Opening balance at 1 July 2016	**0**
Allocated	851
Allocation extraction	–
Adjustment and forfeiture	(851)
Closing balance at 30 June 2017	**0**

- The water supply licences for the region have a water management year that ends on 30 June. The portion of water allocation that has not been abstracted at the end of the water year is either forfeited or is carried over into the next water year.
- As the carryover cannot be quantified, the unused portion of the allocation is assumed to be forfeited and the allocation remaining at the end of the year was 0 ML.
- A more detailed description of water allocations and associated water rights in the Canberra region is given in the Water rights note.

WATER FLOWS

- Total water inflow to the region for 2016–17 was 1,100,266 ML and total water outflow from the region was 1,045,059 ML.

Surface water flows

- Total inflows to surface water for the region were 1,005,408 ML in 2016–17, primarily made up of runoff and river inflow.
- Total outflows from surface water asset for the region were 956,074 ML in 2016–17, primarily made up of outflow from the region.

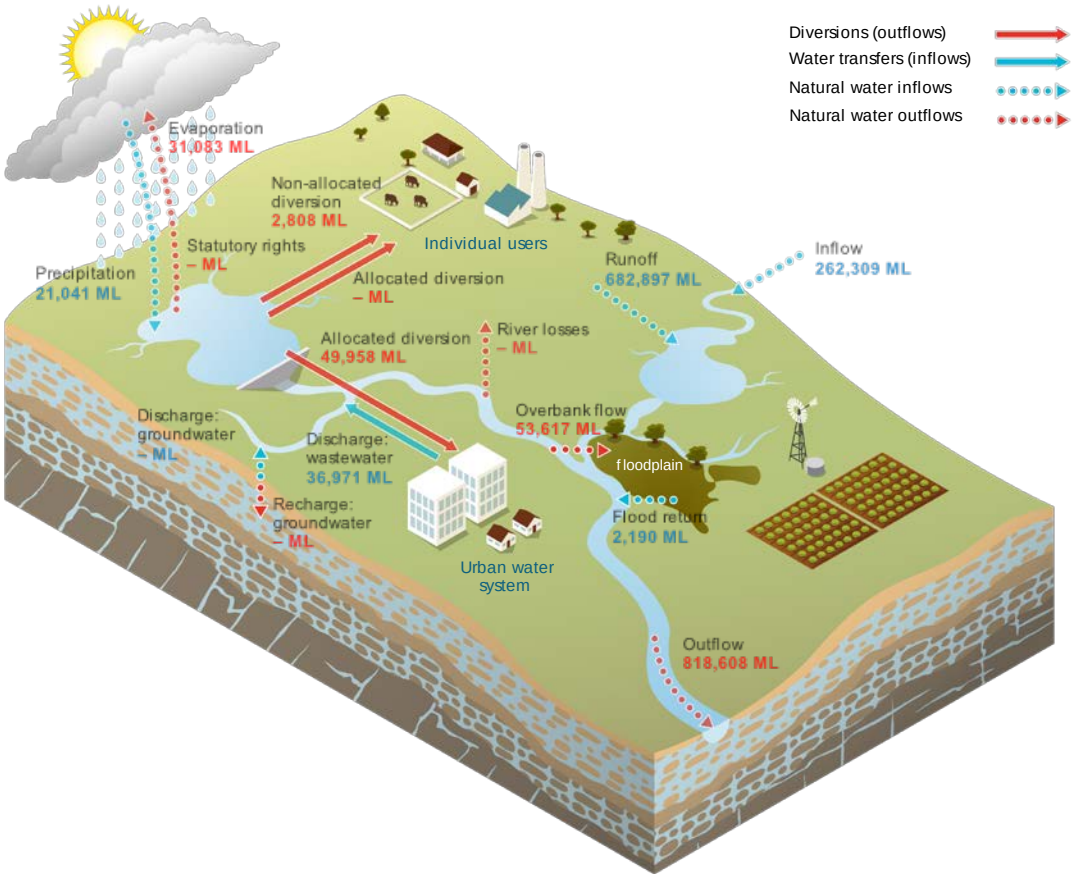


Figure S5 Water inflows and outflows for the Canberra region's surface water store during the 2016–17 year

Runoff

- Runoff in the Canberra region increased by 41% between 2013-14 and 2016-17, from 486,042 ML to 682,897 ML. The largest increase (21%) occurred between the 2015-16 and 2016-17 period and can be attributed to heavy rainfall in September 2016.
- Most of the runoff in the Canberra region flows into rivers (83% in 2016-17), with the remaining flowing into major reservoirs and lakes, which account for 14% and 3% of total runoff flow respectively.

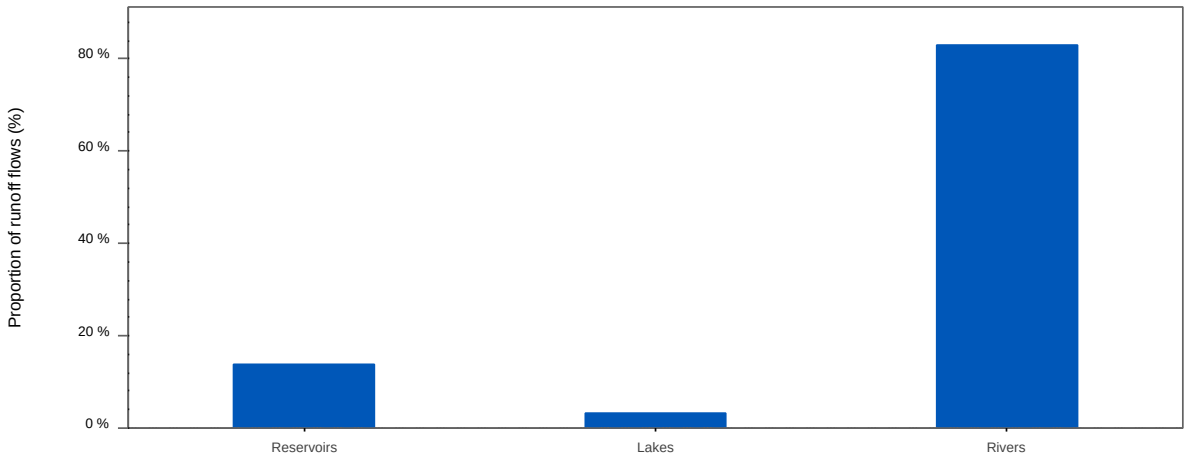


Figure S6 Proportion of runoff apportioned to reservoirs, lakes, and rivers for the 2016–17 year

Rivers

- River inflows to the Canberra region increased every year from 2013–14 to 2015–16, with a 106% increase over the period. This was followed by a 36% decrease from 2015-16 to 2016-17.
- A large proportion of the surface water that flows into the Canberra region eventually flows out of the region, via the Murrumbidgee River. Outflows from the region increased every year from 2013-14 (468,908 ML) to 2016-17 (818,608 ML), an increase of 75% over the period.
- In 2016-17, 262,309 ML of water flowed into the Canberra region via the Murrumbidgee River, while 818,608 ML flowed out of the region, a difference of 556,300 ML.

Abstractions / diversions

- During the 2016-17 year total surface water diverted in the region was 52,766 ML with 95% (49,958 ML) diverted for the urban system and the remaining 5% (2,808 ML) for licenced individual users.
- Between 2013-14 and 2016-17, abstractions/diversions from major reservoirs remained relatively consistent, varying between a low of 47,115 ML in 2014-15 and a high of 50,403 ML in 2015-16. This was an increase of 7% between these two years, before a slight decrease in 2016-17 of just less than 1%, to 49,958 ML.
- For a more detailed description of the water usage in the region, and the associated entitlements, see the Water rights note.

Groundwater flows

- Total inflow to groundwater for the region was 4,079 ML, which is all leakage from the urban water system. This volume has remained steady from 2013–14 to 2016–17.
- Total groundwater extracted in the region was 1,254 ML, similar to previous years. 65% of total extraction was for non-allocated extractions: individual users; 35% for extraction: statutory rights.
- Groundwater movement across the region boundary as well as surface water–groundwater interactions are considered to occur within the region; however, these flows could not be quantified due to a lack of available data.

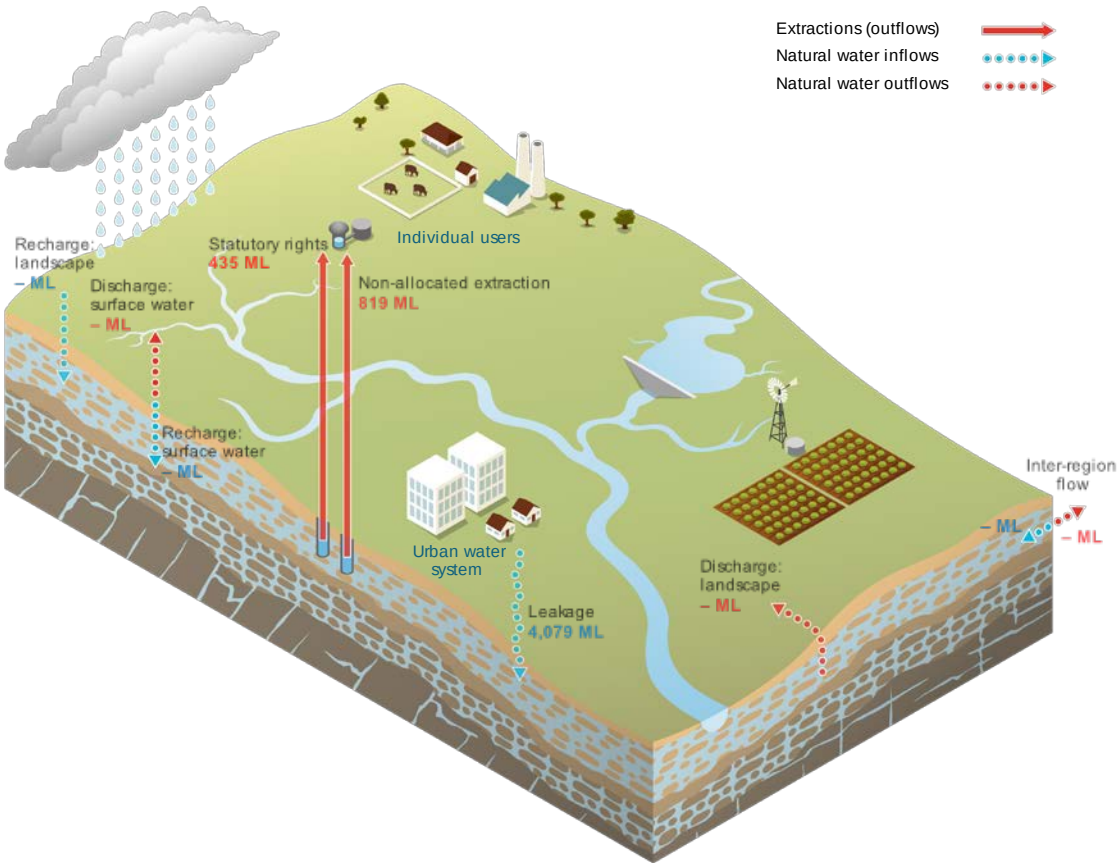


Figure S7 Water inflows and outflows for the Canberra region's groundwater store during the 2016–17 year

Urban water system flows

- The increases to the urban water system were 90,779 ML in 2016-17. The increases included water diverted from storages to the urban supply system and wastewater supplied to the sewerage system.
- The total decreases from the urban water system was 87,731 ML, which included water delivered to urban users, treated wastewater discharged from the wastewater system to rivers, and leakage to the groundwater.

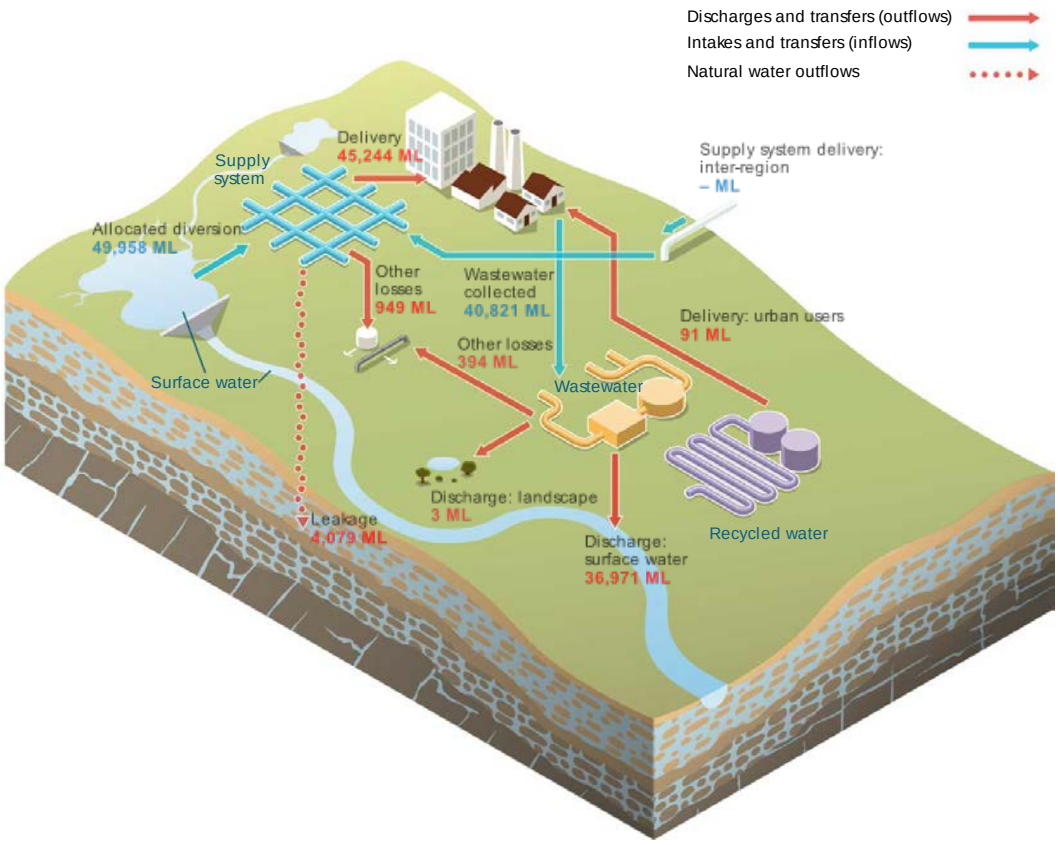


Figure S8 Water inflows and outflows for the Canberra region's urban water system during the 2016–17 year

- Between 2013-14 and 2016-17, diversions from storages remained relatively consistent, varying between a low of 47,115 ML in 2014-15 and a high of 50,403 ML in 2015-16.
- During the period 2013-14 to 2016-17, most of the water abstracted/diverted was from Bendora Dam (88% in 2016-17) located on the Cotter River. The remaining 12% of water abstractions/diversions in 2016-17 was from Googong Dam.
- The majority (90%) of water diverted from surface water for use by the urban system is supplied to users. Losses account for 10% of the total urban supply system outflows.
- The majority of treated wastewater is discharged to surface water. A small portion is recycled for other uses.

WATER USE / WATER IN THE ECONOMY

AT A GLANCE

- Natural inputs of water resources to the economy–nearly all from surface water–increased from 2013–14 to 2016–17, peaking in 2015–16.
- Households use around 70% of distributed water, and generate approximately 75% of wastewater collected.
- Around 70% of flows are returned to the environment from the economy, most of which are treated wastewater flows.
- The value of the ecosystem service of water provisioning increased every year from 2013–14 to 2016–17, while revenue from sales of water remained fairly constant over this period.

Natural water inputs
98% of water is sourced from surface water (including rainwater tanks)*

Water use
70% of distributed water use by households*

Returns to the environment
70% of flows are returned from the economy to the environment*

Ecosystem service provisioning
value increased every year from 2013–14 to 2016–17

** on average over the period 2013–14 to 2016–17*

PHYSICAL SUPPLY AND USE ACCOUNTS

Introduction

- The physical water supply and use accounts, using the System of Environmental-Economic Accounting framework, describe water flows in physical units within the economy. These accounts describe the initial abstraction of water from the environment by the economy (i.e. by water utilities and other water users) and its supply and use within the economy, through to its final discharge back to the environment (e.g. as treated wastewater by the sewerage industry).
- The physical supply and use tables are separated into three main components:
    - flows from the environment to the economy (natural inputs), including surface water, groundwater and rainwater (delivered through rainwater tanks);
    - flows within the economy (products), including distributed water, reused water and wastewater;
    - flows from the economy to the environment (return flows), including flows to surface water and groundwater.
- For the full physical water supply and use tables in spreadsheet format, please see the Downloads section of the publication. A reproduction of the full tables is also included in this document.

Natural inputs

- During 2016-17, the total natural inputs from all water resources were 55,120 ML, with more than 95% from surface water. The total natural inputs of water to the economy increased by 6.3% between 2013-14 and 2016-17.

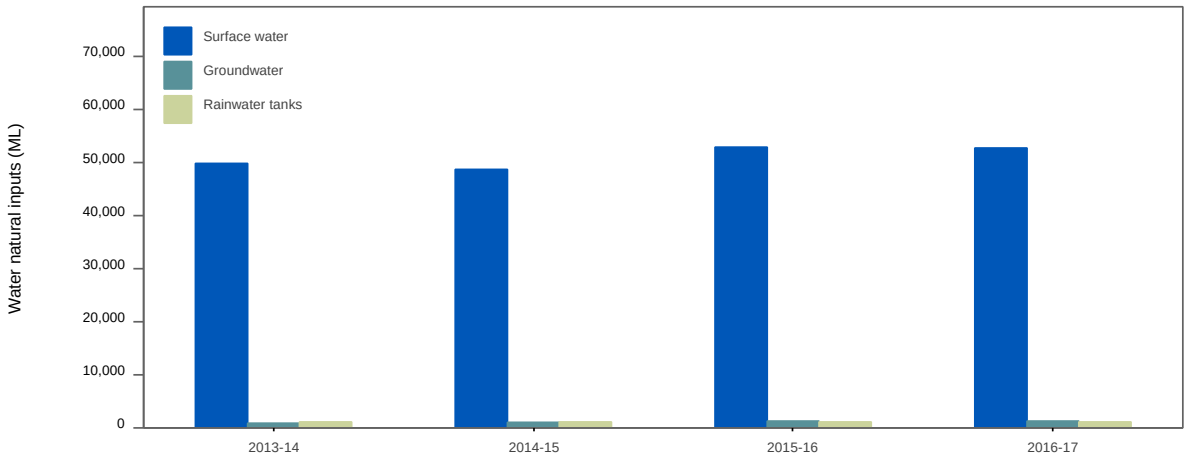


Figure W1 Natural inputs of water by water resource by year

- Approximately 90% of total natural water inputs in 2016-17 was surface water abstracted by Icon Water from the region's major reservoirs for distribution to households and industry. The remaining 10%, abstracted by Other industries for their own use, came mainly from rivers.
- 1,254 ML of groundwater was extracted in 2016-17. The majority was extracted by Other industries (90%), followed by agriculture (6%), and households (4%).

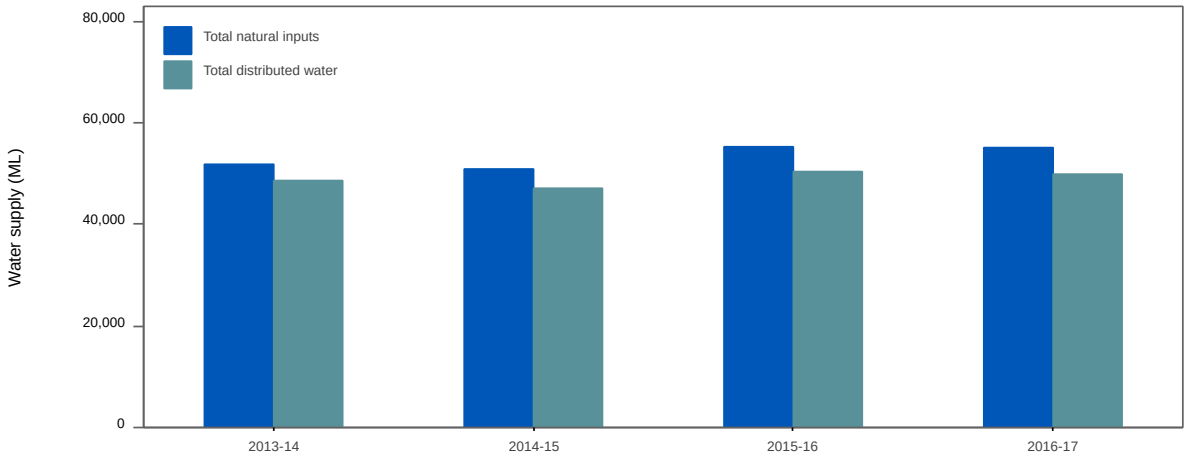


Figure W2 Comparison of total natural water inputs and total distributed water by year

Use of distributed water

- Distributed water is water supplied by a water utility to other users.
- Households were the main users of distributed water, accounting in 2016–17 for 68% of the Canberra region's total water use.
- In 2016–17, 94% of all water use was distributed water.

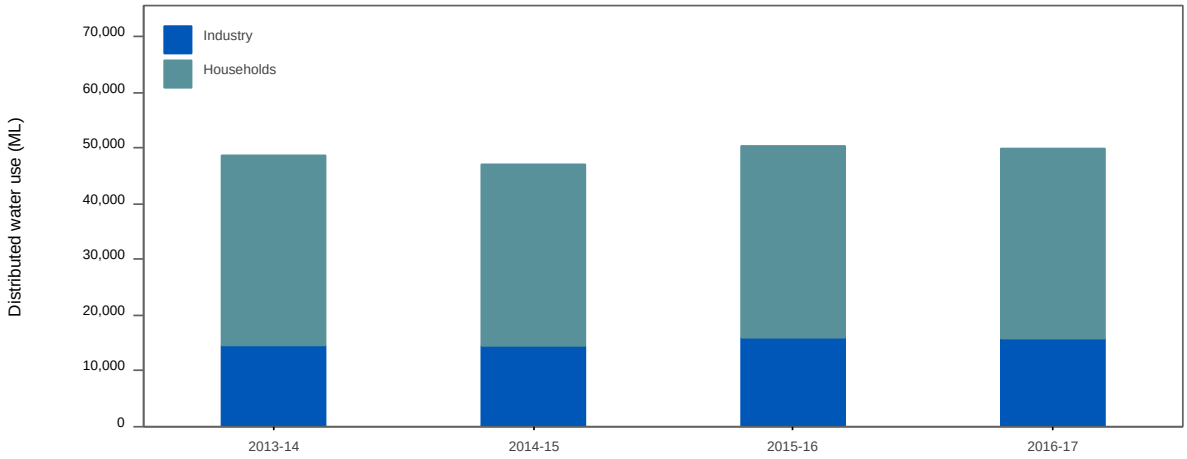


Figure W3 Breakdown of distributed water use by households / industry by year

Use of reused water

- Reused water is wastewater that is on-supplied to another user (with or without treatment). Households and industries in the Canberra region used 3,392 ML of reused water in 2016-17, a small increase of 2.9% (96 ML) from 2015-16. The sewerage industry was the main user of reused water, using more than 95% for purposes such as irrigation of their own grounds.

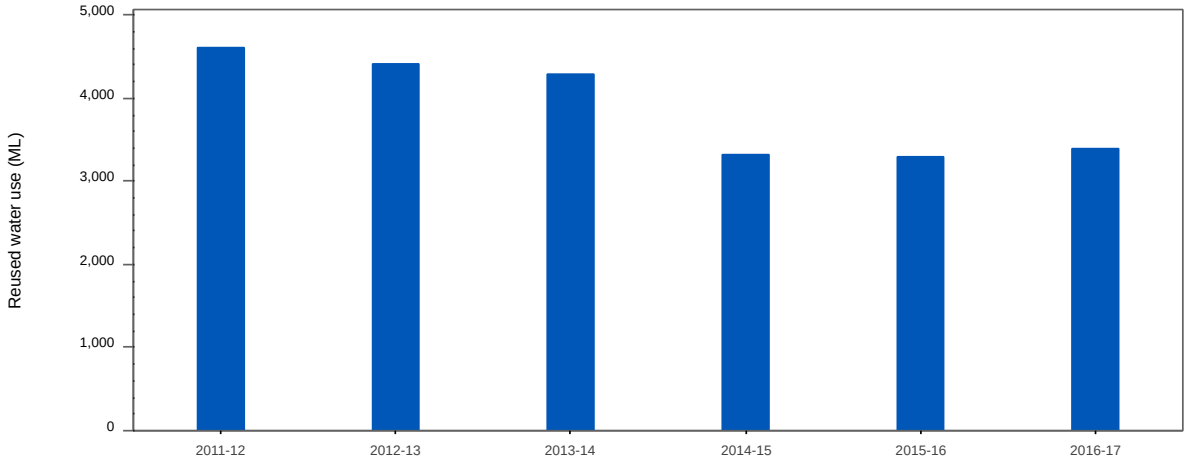


Figure W4 Total reused water use volume by year

Wastewater collection

- The amount of wastewater generated by households and industry in the Canberra region was 40,821 ML in 2016-17, an increase of 5.6% or 2,175 ML from 2015-16. About 75% of wastewater was generated by households and 25% was produced by industry.

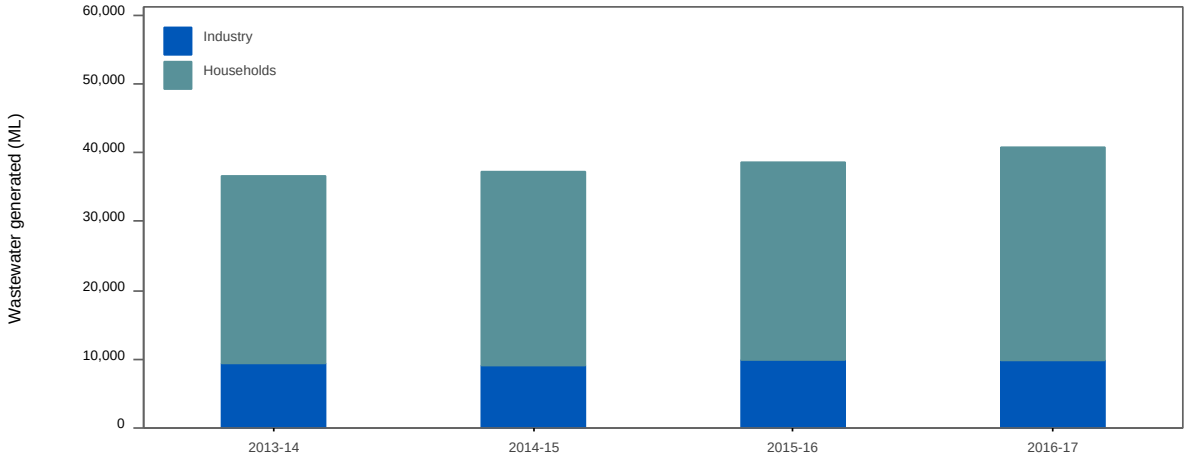


Figure W5 Breakdown of wastewater generated by households / industry by year

Returns to the environment

- Return flows are flows from the economy to either surface water or groundwater resources. The majority of return flows are treated wastewater flows.
- In 2016-17, 41,050 ML of water was returned to the environment, an increase of 6.6% or 2,549 ML from the previous year. The increase was driven by the increase of surface water return inflows (8.6% or 2,924 ML), which was offset by the decrease in groundwater return flows or leakage (8.4% or 375 ML).

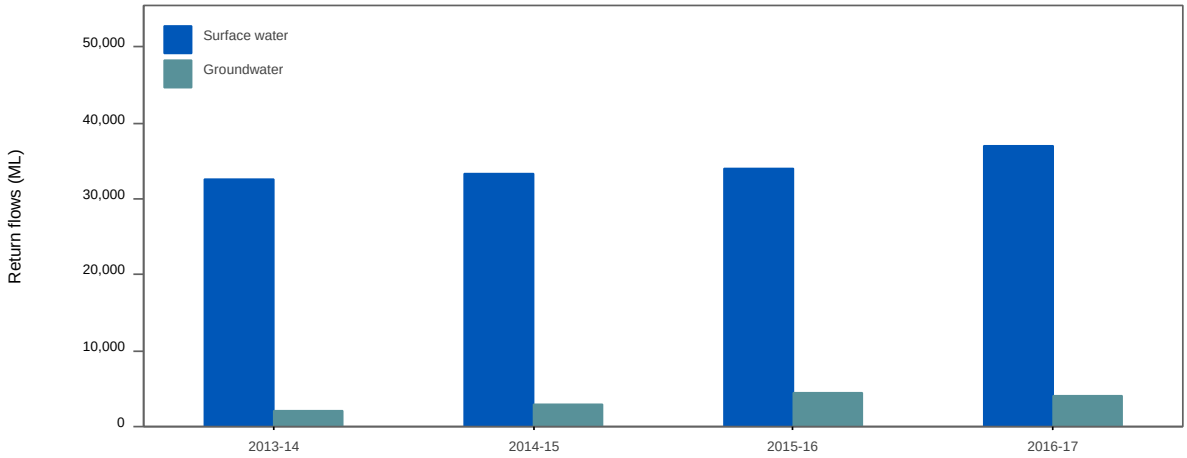


Figure W6 Return flows to surface water / groundwater by year

Consumption

- According to SEEA, water that is “consumed” by an economic unit (e.g. business/organisation) is water that has been incorporated into products, evaporated or transpired while being used by that unit. Consumption excludes water distributed by the unit to other economic units as well as water that is returned to the environment (e.g. via treated wastewater returns or pipes leaking to the groundwater system). In the physical supply and use tables water consumption is estimated by calculating total use less total supply.
- The water consumed by households and industry was 14,070 ML in 2016-17, a decrease of 16% from 2015-16.

Links between the Asset Account tables and the Physical Supply and Use tables

- There are several points of intersection between the water asset and physical supply and use accounts:
    - the volume of water abstracted from the environment (surface water and groundwater) by the economy;
    - wastewater collected (usually by the water supply industry);
    - return flows from the economy to the environment (surface water and groundwater).
- For example, for 2016-17:
    - In Table 1.1 (see the Downloads section), the asset account, total abstractions/diversions from surface water and groundwater for the Canberra region were 52,766 ML (cell E18) and 1,254 ML (cell F18), respectively; these figures correspond with Table 2.1 (see the Downloads section), the physical supply and use table, in cells L9 (52,766 ML) and L10 (1,254 ML).
    - In Table 1.1, the asset account, the total volume of wastewater collected (by the urban water system) was 40,821 ML (cell G10); this figure corresponds with Table 2.1, the physical supply and use table, in cell L16 (40,821 ML).
    - In Table 1.1, the asset account, total return flows from the economy to surface water and groundwater in the Canberra region were 36,971 ML (cell E10) and 4,079 ML (cell F10), respectively; these figures correspond with Table 2.1, the physical supply and use table, in cells L19 (36,971 ML) and L20 (4,079 ML).

Physical supply and use tables

- For the full physical water supply and use tables in spreadsheet format, please see the Downloads section of the publication. Reproductions of the full tables are shown overleaf.

Table W1 Reproduction of physical water supply and use table for the 2016–17 year

Australian Bureau of Statistics

4610.0.55.010 Integrated Water Accounts for the Canberra region, 2013-14 to 2016-17

Released at 11.30am (Canberra time) 19 February 2019

Table 2.1 Physical Water Supply and Use, Canberra region, ML, 2016-17

Physical Supply table (ML)

	Industry								Households	Environment	Total
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total			
Natural inputs (flows from the environment to the economy)											
Surface water										52,766	**52,766**
Groundwater										1,254	**1,254**
Rainwater tanks										1,100	**1,100**
Subtotal natural inputs										**55,120**	**55,120**
Products (flows within the economy)											
Distributed water	-	-	-	-	49,958	-	-	**49,958**	-		**49,958**
Reused water	-	-	-	-	-	3,392	-	**3,392**	-		**3,392**
Wastewater	87	12	375	-	115	-	9,256	**9,845**	30,976		**40,821**
Subtotal products	**87**	**12**	**375**	-	**50,073**	**3,392**	**9,256**	**63,195**	**30,976**		**94,171**
Return flows (flows from the economy to the environment)											
Surface water	-	np	np	-	-	36,929	42	**36,971**	-		**36,971**
Groundwater	-	np	np	-	4,079	-	-	**4,079**	-		**4,079**
Subtotal return flows	-	np	np	-	**4,079**	**36,929**	**42**	**41,050**	-		**41,050**
Total supply	**87**	**12**	**375**	-	**54,152**	**40,321**	**9,297**	**104,245**	**30,976**	**55,120**	**190,341**

Physical Use table (ML)

	Industry								Households	Environment	Total
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total			
Natural inputs (flows from the environment to the economy)											
Surface water	np	742	np	-	49,958	-	1,524	**52,766**	-		**52,766**
Groundwater	np	4	np	-	-	-	1,120	**1,201**	53		**1,254**
Rainwater tanks	na	na	na	na	na	na	na	**na**	1,100		**1,100**
Subtotal natural inputs	**615**	**746**	**3**	-	**49,958**	-	**2,644**	**53,967**	**1,153**		**55,120**
Products (flows within the economy)											
Distributed water	96	13	np	np	5,127	-	10,194	**15,843**	34,115		**49,958**
Reused water	-	np	np	np	-	3,298	np	**3,392**	-		**3,392**
Wastewater	-	np	-	np	-	40,821	np	**40,821**	-		**40,821**
Subtotal products	**96**	**np**	**414**	**np**	**5,127**	**44,119**	**10,287**	**60,056**	**34,115**		**94,171**
Return flows (flows from the economy to the environment)											
Surface water										36,971	**36,971**
Groundwater										4,079	**4,079**
Subtotal return flows										**41,050**	**41,050**
Total use	**711**	**760**	**417**	-	**55,085**	**44,119**	**12,932**	**114,023**	**35,268**	**41,050**	**190,341**
Total Consumption (Total Use less Total Supply)	**624**	**748**	**41**	-	**933**	**3,798**	**3,634**	**9,778**	**4,292**	**-14,070**	-

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\- nil or rounded to Zero (including null cells)

ML megalitres

na not available

np not available for publication but included in totals where applicable, unless otherwise indicated.

Any discrepancies between totals and sums of components in this publication are due to rounding.

(a) Industry estimates that were unable to be allocated to a specific industry have been allocated to Other industries.

Table W2 Reproduction of physical water supply and use table for the 2015–16 year

Australian Bureau of Statistics

Australian Bureau of Statistics

4610.0.55.010 Integrated Water Accounts for the Canberra region, 2013-14 to 2016-17

Released at 11.30am (Canberra time) 19 February 2019

Table 2.2 Physical Water Supply and Use, Canberra region, ML, 2015-16

Physical Supply table (ML)

	Industry								Households	Environment	Total
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total			
Natural inputs (flows from the environment to the economy)											
Surface water										52,952	52,952
Groundwater										1,276	1,276
Rainwater tanks										1,100	1,100
Subtotal natural inputs										55,328	55,328
Products (flows within the economy)											
Distributed water	-	-	-	-	50,403	-	-	50,403	-		50,403
Reused water	-	-	-	-	-	3,296	-	3,296	-		3,296
Wastewater	135	11	209	-	77	-	9,440	9,873	28,773		38,646
Subtotal products	135	11	209	-	50,480	3,296	9,440	63,572	28,773		92,345
Return flows (flows from the economy to the environment)											
Surface water	-	np	np	-	-	34,007	40	34,047	-		34,047
Groundwater	-	np	np	-	4,454	-	-	4,454	-		4,454
Subtotal return flows	-	np	np	-	4,454	34,007	40	38,501	-		38,501
Total supply	135	11	209	-	54,934	37,303	9,480	102,073	28,773	55,328	186,174

Physical Use table (ML)

	Industry								Households	Environment	Total
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total			
Natural inputs (flows from the environment to the economy)											
Surface water	np	863	np	-	50,403	-	1,397	52,952	-		52,952
Groundwater	np	4	np	-	-	-	1,231	1,276	-		1,276
Rainwater tanks	na	na	na	na	na	na	na	na	1,100		1,100
Subtotal natural inputs	328	867	3	-	50,403	-	2,628	54,228	1,100		55,328
Products (flows within the economy)											
Distributed water	np	13	np	-	4,253	-	11,296	15,974	34,429		50,403
Reused water	np	-	np	-	-	3,200	np	3,296	-		3,296
Wastewater	np	-	-	-	-	38,646	np	38,646	-		38,646
Subtotal products	162	13	251	-	4,253	41,846	11,392	57,916	34,429		92,345
Return flows (flows from the economy to the environment)											
Surface water										34,047	34,047
Groundwater										4,454	4,454
Subtotal return flows										38,501	38,501
Total use	489	880	253	-	54,656	41,846	14,019	112,144	35,529	38,501	186,174
Total Consumption (Total Use less Total Supply)	354	869	44	-	-278	4,543	4,539	10,072	6,756	-16,827	-

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ML megalitres

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Table W3 Reproduction of physical water supply and use table for the 2014–15 year

Australian Bureau of Statistics

4610.0.55.010 Integrated Water Accounts for the Canberra region, 2013-14 to 2016-17

Released at 11.30am (Canberra time) 19 February 2019

Table 2.3 Physical Water Supply and Use, Canberra region, ML, 2014-15

Physical Supply table (ML)

	Industry								Households	Environment	Total
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total			
Natural inputs (flows from the environment to the economy)											
Surface water										48,768	**48,768**
Groundwater										1,061	**1,061**
Rainwater tanks										1,100	**1,100**
Subtotal natural inputs										**50,929**	**50,929**
Products (flows within the economy)											
Distributed water	-	-	-	-	47,115	-	-	**47,115**	-		**47,115**
Reused water	-	-	-	-	-	3,321	-	**3,321**	-		**3,321**
Wastewater	51	10	199	-	77	-	8,772	**9,108**	28,177		**37,285**
Subtotal products	**51**	**10**	**199**	-	**47,192**	**3,321**	**8,772**	**59,544**	**28,177**		**87,721**
Return flows (flows from the economy to the environment)											
Surface water	-	np	np	-	-	32,995	36	**33,031**	-		**33,031**
Groundwater	-	np	np	-	2,920	-	-	**2,920**	-		**2,920**
Subtotal return flows	-	**np**	**np**	-	**2,920**	**32,995**	**36**	**35,951**	-		**35,951**
Total supply	**51**	**10**	**199**	-	**50,112**	**36,316**	**8,808**	**95,495**	**28,177**	**50,929**	**174,601**

Physical Use table (ML)

	Industry								Households	Environment	Total
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total			
Natural inputs (flows from the environment to the economy)											
Surface water	196	469	np	-	47,115	-	np	**48,768**	-		**48,768**
Groundwater	42	4	np	-	-	-	np	**1,061**	-		**1,061**
Rainwater tanks	na	na	na	na	na	na	na	**na**	1,100		**1,100**
Subtotal natural inputs	**238**	**472**	**2**	-	**47,115**	-	**2,002**	**49,829**	**1,100**		**50,929**
Products (flows within the economy)											
Distributed water	59	11	230	-	4,047	-	10,153	**14,500**	32,615		**47,115**
Reused water	-	-	np	-	-	3,249	np	**3,321**	-		**3,321**
Wastewater	-	-	-	-	-	37,285	-	**37,285**	-		**37,285**
Subtotal products	**59**	**11**	**230**	-	**4,047**	**40,534**	**10,225**	**55,106**	**32,615**		**87,721**
Return flows (flows from the economy to the environment)											
Surface water										33,031	**33,031**
Groundwater										2,920	**2,920**
Subtotal return flows										35,951	**35,951**
Total use	**297**	**484**	**232**	-	**51,162**	**40,534**	**12,227**	**104,935**	**33,715**	**35,951**	**174,601**
Total Consumption (Total Use less Total Supply)	**246**	**474**	**33**	-	**1,050**	**4,218**	**3,418**	**9,440**	**5,538**	**-14,977**	-

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ML megalitres

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Table W4 Reproduction of physical water supply and use table for the 2013–14 year

Australian Bureau of Statistics

4610.0.55.010 Integrated Water Accounts for the Canberra region, 2013-14 to 2016-17

Released at 11.30am (Canberra time) 19 February 2019

Table 2.4 Physical Water Supply and Use, Canberra region, ML, 2013-14

Physical Supply table (ML)

	Industry								Households	Environment	Total
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total			
Natural inputs (flows from the environment to the economy)											
Surface water										49,851	49,851
Groundwater										894	894
Rainwater tanks										1,100	1,100
Subtotal natural inputs										51,846	51,846
Products (flows within the economy)											
Distributed water	-	-	-	-	48,695	-	-	48,695	-		48,695
Reused water	-	-	-	-	-	4,288	-	4,288	-		4,288
Wastewater	149	6	266	3	68	-	8,891	9,383	27,299		36,682
Subtotal products	149	6	266	3	48,763	4,288	8,891	62,366	27,299		89,665
Return flows (flows from the economy to the environment)											
Surface water	-	-	4	-	-	32,588	1	32,593	-		32,593
Groundwater	-	-	-	-	2,081	-	-	2,081	-		2,081
Subtotal return flows	-	-	4	-	2,081	32,588	1	34,674	-		34,674
Total supply	149	6	270	3	50,844	36,876	8,892	97,040	27,299	51,846	176,185

Physical Use table (ML)

	Industry								Households	Environment	Total
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total			
Natural inputs (flows from the environment to the economy)											
Surface water	164	30	5	22	48,695	-	936	49,851	-		49,851
Groundwater	44	-	4	-	-	-	846	894	-		894
Rainwater tanks	na	na	na	na	na	na	na	na	1,100		1,100
Subtotal natural inputs	208	30	9	22	48,695	-	1,781	50,746	1,100		51,846
Products (flows within the economy)											
Distributed water	186	8	332	3	2,995	-	11,098	14,621	34,074		48,695
Reused water	848	8	409	-	-	2,558	465	4,288	-		4,288
Wastewater	-	-	-	-	-	36,682	-	36,682	-		36,682
Subtotal products	1,034	16	741	3	2,995	39,240	11,563	55,591	34,074		89,665
Return flows (flows from the economy to the environment)											
Surface water										32,593	32,593
Groundwater										2,081	2,081
Subtotal return flows										34,674	34,674
Total use	1,242	45	750	25	51,690	39,240	13,344	106,337	35,174	34,674	176,185
Total Consumption (Total Use less Total Supply)	1,093	39	480	23	846	2,364	4,452	9,297	7,875	-17,172	-

null by definition

\- nil or rounded to Zero (including null cells)

ML megalitres

na not available

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(a) Industry estimates that were unable to be allocated to a specific industry have been allocated to Other industries.

MONETARY SUPPLY AND USE ACCOUNTS

Introduction

- The monetary supply and use accounts, using the System of Environmental-Economic Accounting framework, present aggregates of all available quantitative monetary data (dollars) in terms of the supply and use of water within the economy as well the valuation of natural inputs.
- Ecosystem services are the many and varied benefits that humans freely gain from the natural environment and from properly-functioning ecosystems. One such service is "Water provisioning", defined in this publication, in physical terms, by the runoff or water yield (including precipitation) from the catchments within the Canberra region, which provide inflows to the major reservoirs (Keith et al., 2016).
- Although the ecosystem services of water provisioning is not generally included as a component of SEEA water supply and use flow accounts, it is a significant service provided to society. The water provided by this service is used (abstracted) by the water supply industry as an input to the production of water supplied and used in the economy and is therefore valuable information for inclusion in water accounts.
- The replacement cost method (i.e. the amount that an entity would have to pay to replace an asset at the present time) was used to value the water provisioning services, broadly following the method recommended by Edens and Graveland (2014). The value of the ecosystem water provisioning service was estimated by calculating the volume of inflows into major reservoirs and then multiplying this by the market price of water supplied in the Canberra region.
- For the full monetary water supply and use tables in spreadsheet format, please see the Downloads section of the publication.

Valuation of natural inputs and supply of water

- In the Canberra region the value of the water provisioning service increased from $633 million in 2013-14 to $896 million in 2016-17, while the revenue from sales of water by the water supply industry was stable at about $175 million during the same period.

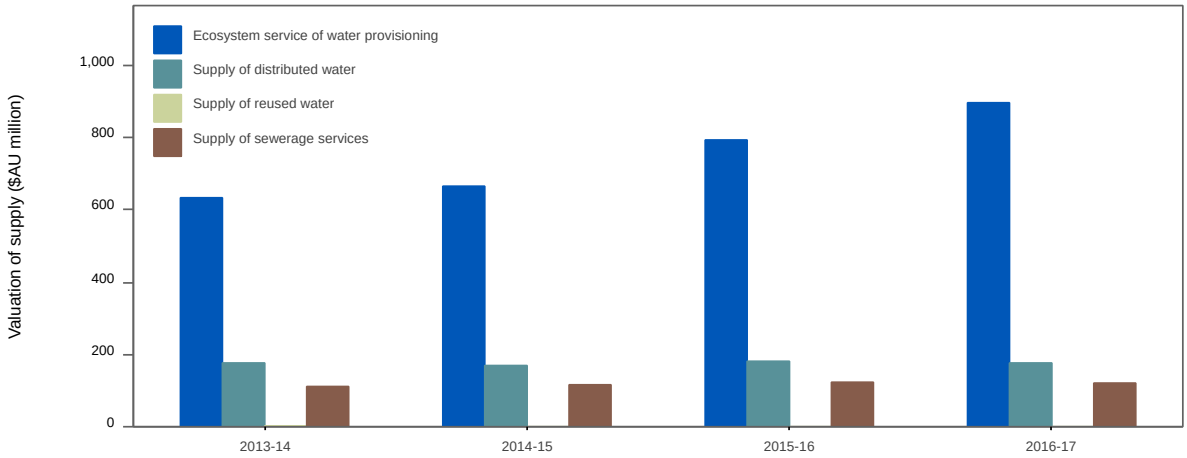

Figure W7 Total valuation of ecosystems services and supply of water by year

Valuation of intermediate consumption and final use

- Total revenue from the sales of water and the provision of water, wastewater and sewerage services in the Canberra region decreased slightly in 2016-17 (by 2.1% or $6.3 million). All of this revenue is from the water supply, sewerage and drainage services industry, with 60% of revenue coming from the supply of water, and the rest for wastewater and sewerage services
- Households spent $124 million on distributed water in 2016-17 (similar to 2015-16), while industry spent $52 million in 2016-17, a 9% decrease (driven by Other industries) from 2015-16.

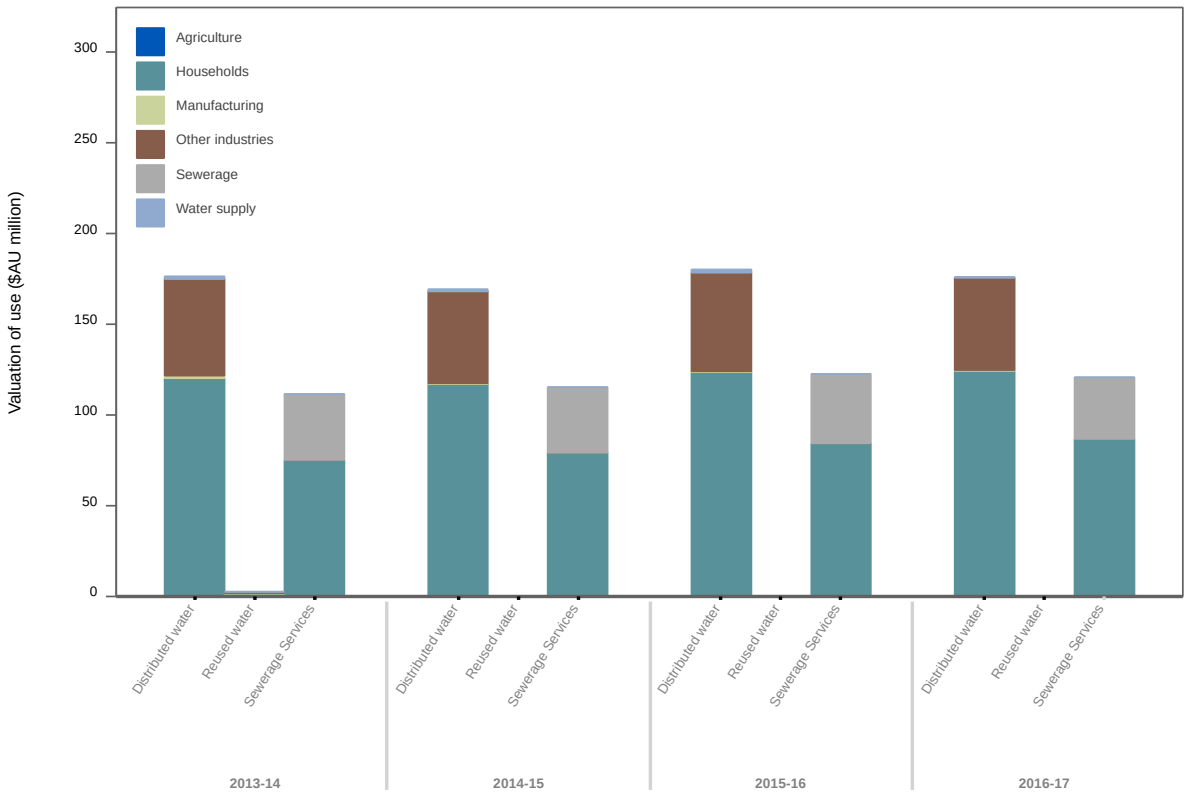

Figure W8 Valuation of water use by industries and households by year

Monetary supply and use tables

- For the full monetary water supply and use tables in spreadsheet format, please see the Downloads section of the publication. Reproductions of the full tables are shown overleaf.

Table W5 Reproduction of monetary water supply and use tables for the 2016–17 and 2015–16 years

Australian Bureau of Statistics

Australian Bureau of Statistics

4610.0.55.010 Integrated Water Accounts for the Canberra region, 2013-14 to 2016-1

Released at 11.30am (Canberra time) 19 February 2019

Table 3.1 Monetary Supply and Use, Canberra region, $AU million, 2016-17

	Industry											
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total	Taxes less subsidies on products, trade & transport margins	Actual Consumption		Total
										Households	Governments	
Valuation of natural inputs (Ecosystem service of water provisioning)												**896.0**
Supply of water and sewerage services ($m)												
Distributed water	-	-	-	-	175.6	-	-	**175.6**	0.4	-	-	**176.0**
Reused water	-	-	-	-	-	0.1	-	**0.1**	-	-	-	**0.1**
Total supply of water products	**-**	**-**	**-**	**-**	**175.6**	**0.1**	**-**	**175.8**	**0.4**	**-**	**-**	**176.2**
Sewerage Services	-	-	-	-	-	120.2	-	**120.2**	0.7	-	-	**121.0**
Total supply of water products and sewerage services	-	-	-	-	**175.6**	**120.4**	-	**296.0**	**1.1**	-	-	**297.2**
Intermediate consumption and final use ($m):												
Distributed water	-	-	0.4	-	0.2	-	51.0	**51.6**	-	124.5	-	**176.0**
Reused water	-	-	-	-	-	-	0.1	**0.1**	-	-	-	**0.1**
Total use of water products	-	-	0.4	-	0.2	-	51.1	**51.7**	-	124.5	-	**176.2**
Sewerage Services	-	-	-	-	-	34.2	-	**34.2**	-	86.8	-	**121.0**
Total use of water products and sewerage services	**-**	**-**	**0.4**	**-**	**0.2**	**34.2**	**51.1**	**85.9**	**-**	**211.3**	**-**	**297.2**

- nil or rounded to zero (including null cells)

Any discrepancies between totals and sums of components in this publication are due to rounding.

(a) Industry estimates that were unable to be allocated to a specific industry have been allocated to Other industries.

Australian Bureau of Statistics

Australian Bureau of Statistics

4610.0.55.010 Integrated Water Accounts for the Canberra region, 2013-14 to 2016-17

Released at 11.30am (Canberra time) 19 February 2019

Table 3.2 Monetary Supply and Use, Canberra region, $AU million, 2015-16

	Industry											
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total	Taxes less subsidies on products, trade & transport margins	Actual Consumption		Total
										Households	Governments	
Valuation of natural inputs (Ecosystem service of water provisioning)												**793.0**
Supply of water and sewerage services ($m)												
Distributed water	-	-	-	-	180.2	-	-	**180.2**	0.4	-	-	**180.6**
Reused water	-	-	-	-	-	0.2	-	**0.2**	-	-	-	**0.2**
Total supply of water products	**-**	**-**	**-**	**-**	**180.2**	**0.2**	**-**	**180.3**	**0.4**	**-**	**-**	**180.7**
Sewerage Services	-	-	-	-	-	122.0	-	**122.0**	0.7	-	-	**122.7**
Total supply of water products and sewerage services	-	-	-	-	**180.2**	**122.2**		**302.3**	**1.1**	-	-	**303.5**
Intermediate consumption and final use ($m):												
Distributed water	-	-	0.6	-	1.7	-	54.5	**56.8**	-	123.7	-	**180.6**
Reused water	-	-	-	-	-	-	0.2	**0.2**	-	-	-	**0.2**
Total use of water products	-	-	0.6	-	1.7	-	54.7	**57.0**	-	123.7	-	**180.7**
Sewerage Services	-	-	-	-	-	38.2	-	**38.2**	-	84.5	-	**122.7**
Total use of water products and sewerage services	-	-	**0.6**	-	**1.7**	**38.2**	**54.7**	**95.2**	-	**208.2**	-	**303.5**

- nil or rounded to zero (including null cells)

Any discrepancies between totals and sums of components in this publication are due to rounding.

(a) Industry estimates that were unable to be allocated to a specific industry have been allocated to Other industries.

Table W6 Reproduction of monetary water supply and use tables for the 2014–15 and 2013–14 years

Australian Bureau of Statistics

Australian Bureau of Statistics

4610.0.55.010 Integrated Water Accounts for the Canberra region, 2013-14 to 2016-17

Released at 11.30am (Canberra time) 19 February 2019

Table 3.3 Monetary Supply and Use, Canberra region, $AU million, 2014-15

	Industry											
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total	Taxes less subsidies on products, trade & transport margins	Actual Consumption		Total
										Households	Governments	
Valuation of natural inputs (Ecosystem service of water provisioning)												**665.0**
Supply of water and sewerage services ($m)												
Distributed water	-	-	-	-	169.5	-	-	**169.5**	0.2	-	-	**169.7**
Reused water	-	-	-	-	-	0.1	-	**0.1**	-	-	-	**0.1**
Total supply of water products	**-**	**-**	**-**	**-**	**169.5**	**0.1**	**-**	**169.6**	**0.2**	**-**	**-**	**169.9**
Sewerage Services	-	-	-	-	-	115.0	-	**115.0**	0.5	-	-	**115.5**
Total supply of water products and sewerage services	**-**	-	-	-	**169.5**	**115.1**	-	**284.6**	**0.7**	-	-	**285.3**
Intermediate consumption and final use ($m):												
Distributed water	-	-	0.5	-	1.2	-	50.7	**52.5**	-	117.2	-	**169.7**
Reused water	-	-	-	-	-	-	0.1	**0.1**	-	-	-	**0.1**
Total use of water products	-	-	0.5	-	1.2	-	50.8	**52.6**	-	117.2	-	**169.9**
Sewerage Services	-	-	-	-	-	36.2	-	**36.2**	-	79.3	-	**115.5**
Total use of water products and sewerage services	-	-	**0.5**	-	**1.2**	**36.2**	**50.8**	**88.8**	-	**196.6**	-	**285.3**

- nil or rounded to zero (including null cells)

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(a) Industry estimates that were unable to be allocated to a specific industry have been allocated to Other industries.

Australian Bureau of Statistics

Australian Bureau of Statistics

4610.0.55.010 Integrated Water Accounts for the Canberra region, 2013-14 to 2016-17

Released at 11.30am (Canberra time) 19 February 2019

Table 3.4 Monetary Supply and Use, Canberra region, $AU million, 2013-14

	Industry											
	Agriculture	Mining	Manufacturing	Energy	Water supply	Sewerage	Other industries (a)	Industry Total	Taxes less subsidies on products, trade & transport margins	Actual Consumption		Total
										Households	Governments	
Valuation of natural inputs (Ecosystem service of water provisioning)												**633.0**
Supply of water and sewerage services ($m)												
Distributed water	-	-	-	-	176.4	-	-	**176.4**	0.3	-	-	**176.7**
Reused water	-	-	-	-	-	2.7	-	**2.7**	-	-	-	**2.7**
Total supply of water products	**-**	**-**	**-**	**-**	**176.4**	**2.7**	**-**	**179.1**	**0.3**	**-**	**-**	**179.4**
Sewerage Services	-	-	-	-	-	111.0	-	**111.0**	0.5	-	-	**111.5**
Total supply of water products and sewerage services	**-**	-	-	-	**176.4**	**113.7**	-	**290.1**	**0.8**	-	-	**290.9**
Intermediate consumption and final use ($m):												
Distributed water	-	-	1.4	-	1.4	-	53.4	**56.3**	-	120.5	-	**176.7**
Reused water	1.3	-	0.6	-	-	-	0.7	**2.7**	-	-	-	**2.7**
Total use of water products	1.3	-	2.0	-	1.4	-	54.1	**58.9**	-	120.5	-	**179.4**
Sewerage Services	-	-	-	-	-	36.2	-	**36.2**	-	75.4	-	**111.5**
Total use of water products and sewerage services	**1.0**	**-**	**2.0**	-	**1.4**	**36.2**	**54.1**	**95.1**	-	**195.8**	-	**290.9**

- nil or rounded to zero (including null cells)

Any discrepancies between totals and sums of components in this publication are due to rounding.

(a) Industry estimates that were unable to be allocated to a specific industry have been allocated to Other industries.

WATER QUALITY ACCOUNTS

AT A GLANCE

- Water quality scores for the region's rivers generally improved from 2013–14 to 2016–17.
- There was little change in water quality scores for the region's lakes and ponds over the same period.
- However, overall catchment health condition scores declined over this period.

River water quality
poor to good* for three rivers in region (Cotter, Murrumbidgee, and Molonglo)

Lake and pond water quality
fair to good* for four lakes / ponds in region (Ginninderra, Yerrabi, Tuggeranong, Burley Griffin)

Catchment health
fair to good* for three catchments in region (Murrumbidgee, Molonglo, and Southern region)

** based on assessments for the years 2013–14 and 2016–17*

INTRODUCTION

- The water quality accounts quantify the health and condition of waterways across the Canberra region.
- The accounts, using the System of Environmental-Economic Accounting framework, demonstrate water quality and condition at the beginning and end of the reference period, and how quality and condition have changed over time.
- The water quality score is based on chemical and physical indicators of water quality, including pH, conductivity, turbidity, phosphorus, dissolved oxygen and nitrate. The accounts also present a Catchment Health Indicator Program (CHIP) score, which factors in water bugs and riparian condition, as well as water quality, in order to develop an overall measurement of the water catchment health.
- The water quality and CHIP scores come with the following ratings (note the lower the score, the better the quality):
    - 1: excellent condition,
    - 2: good condition,
    - 3: fair condition,
    - 4: poor condition, and
    - 5: degraded condition.
- For more information refer to the Explanatory Note on the ABS webpage. For the full water quality tables in spreadsheet format, please see the Downloads section of the publication.

WATER QUALITY OF LAKES AND PONDS

- In 2016–17 the water quality score recorded for all lakes and ponds in the Canberra region was “good”. However, the average CHIP score (which also factors in water bugs and riparian condition) was “fair” for all the lakes and ponds, with the exception of Lake Burley Griffin (data not available).

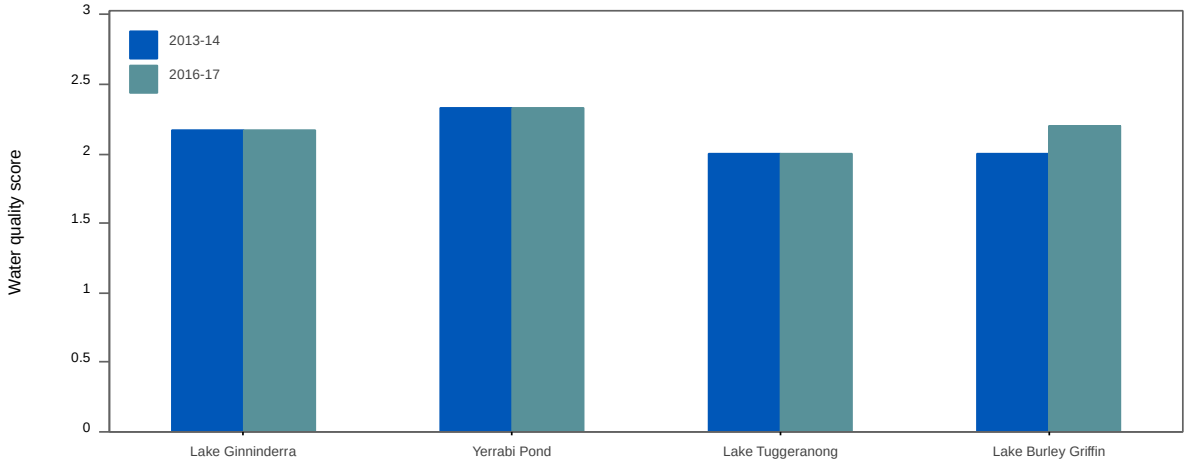


Figure Q1 Water quality score for lakes and ponds for 2013–14 and 2016–17 years

WATER QUALITY OF RIVERS

- In 2016–17 the Cotter River recorded higher water quality (a water quality score of 1.2) compared to the Murrumbidgee River (1.7) and the Molonglo River (2.1).
- Water quality in both the Murrumbidgee and the Molonglo rivers improved between 2013–14 and 2016–17. The Molonglo River water quality improved from a score of 3.0 to 2.1 and the Murrumbidgee River improved slightly from a score of 2.0 to 1.7. For the Molonglo River, this improvement was mostly due to a large reduction in recorded turbidity, while for the Murrumbidgee River the improvement was largely due to reductions in the amount of phosphorus detected in the river. Note that a water quality score was not available for the Cotter River for 2013–14.

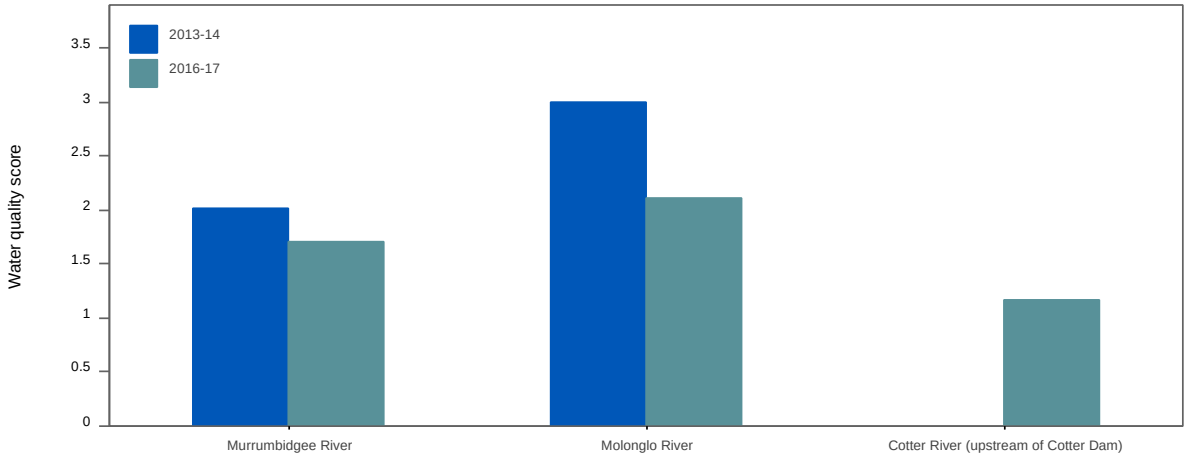


Figure Q2 Water quality score for rivers for 2013–14 and 2016–17 years

CHIP SCORE BY CATCHMENT

- In 2016–17 water resources in the Southern region recorded the healthiest condition (good condition) compared to the Ginninderra and the Molonglo catchments, which both recorded fair condition.
- The overall condition of the waterways in all three catchments regressed slightly from 2013–14 to 2016–17. The largest regression was in the Southern region, where the CHIP score increased from 2.4 to 2.8, however the Molonglo catchment registered the worst CHIP score (3.3) in 2016-17.

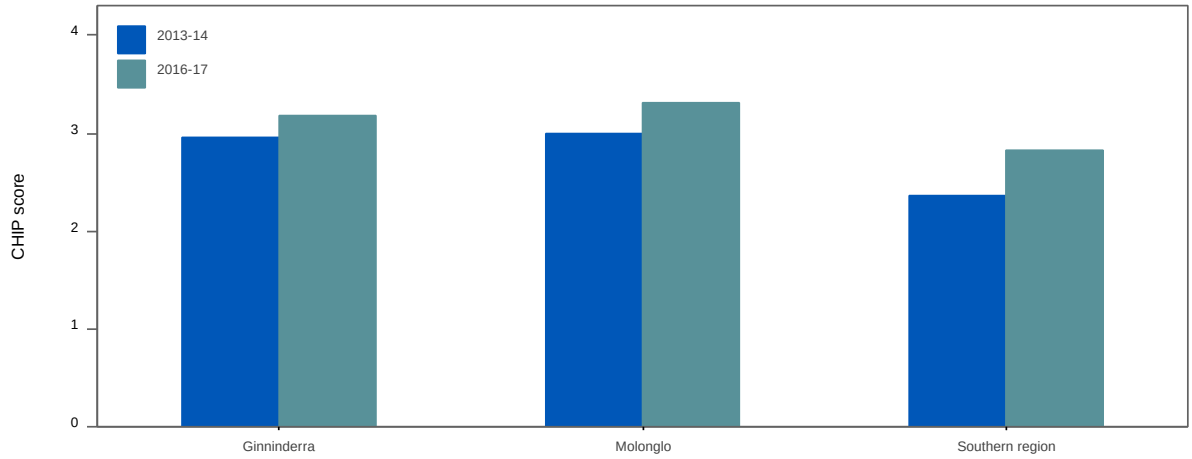
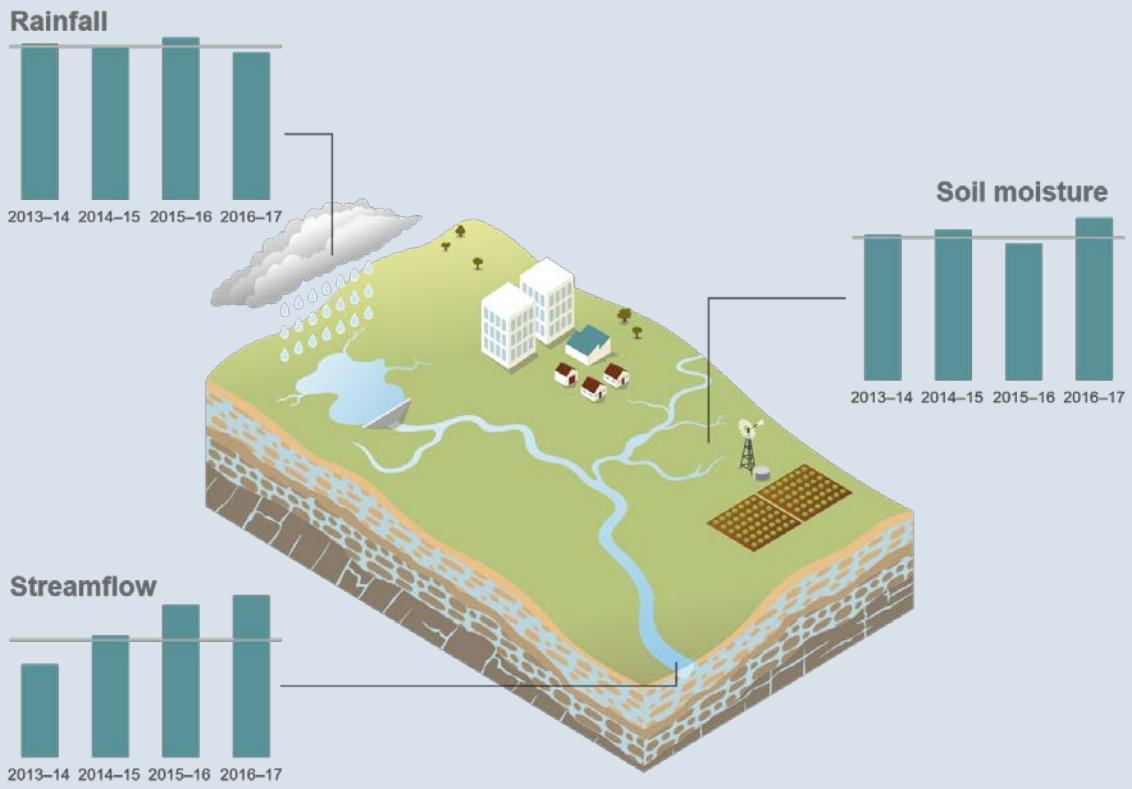


Figure Q3 CHIP score by catchment for 2013–14 and 2016–17 years

CLIMATE AND WATER

AT A GLANCE

- Annual rainfall was similar to the average in 2013–14 and 2014–15, above average in 2015–16, and below average in 2016–17.
- High rainfall in September 2013, June 2016 and September 2016 contributed to well above-average streamflow during these months.
- Rainfall totals for June and September 2016 were both the second highest on record for these months, while 2017 brought the driest June on record to more than 50% of the region.



Note: grey line on bar graphs shows long-term average for the Canberra region. Rainfall and soil moisture refer to area-averaged totals; streamflow refers to gauged stream outflows from the region.

ABOUT THE REGION

- The Canberra region has a relatively dry, continental climate with warm to hot summers and cool to cold winters. Rainfall in the region is relatively uniform throughout the year with a long-term monthly average of 50–75 mm.
- The main rivers in the region are the Molonglo, Cotter and Queanbeyan rivers, which all contribute to the Murrumbidgee River. Higher streamflows typically occur during winter and spring, following higher runoff from partially saturated catchments in autumn and winter. Streamflows in the Murrumbidgee River can also be influenced by water diversions from the Snowy Mountains Scheme.

CLIMATE CONDITIONS

Rainfall

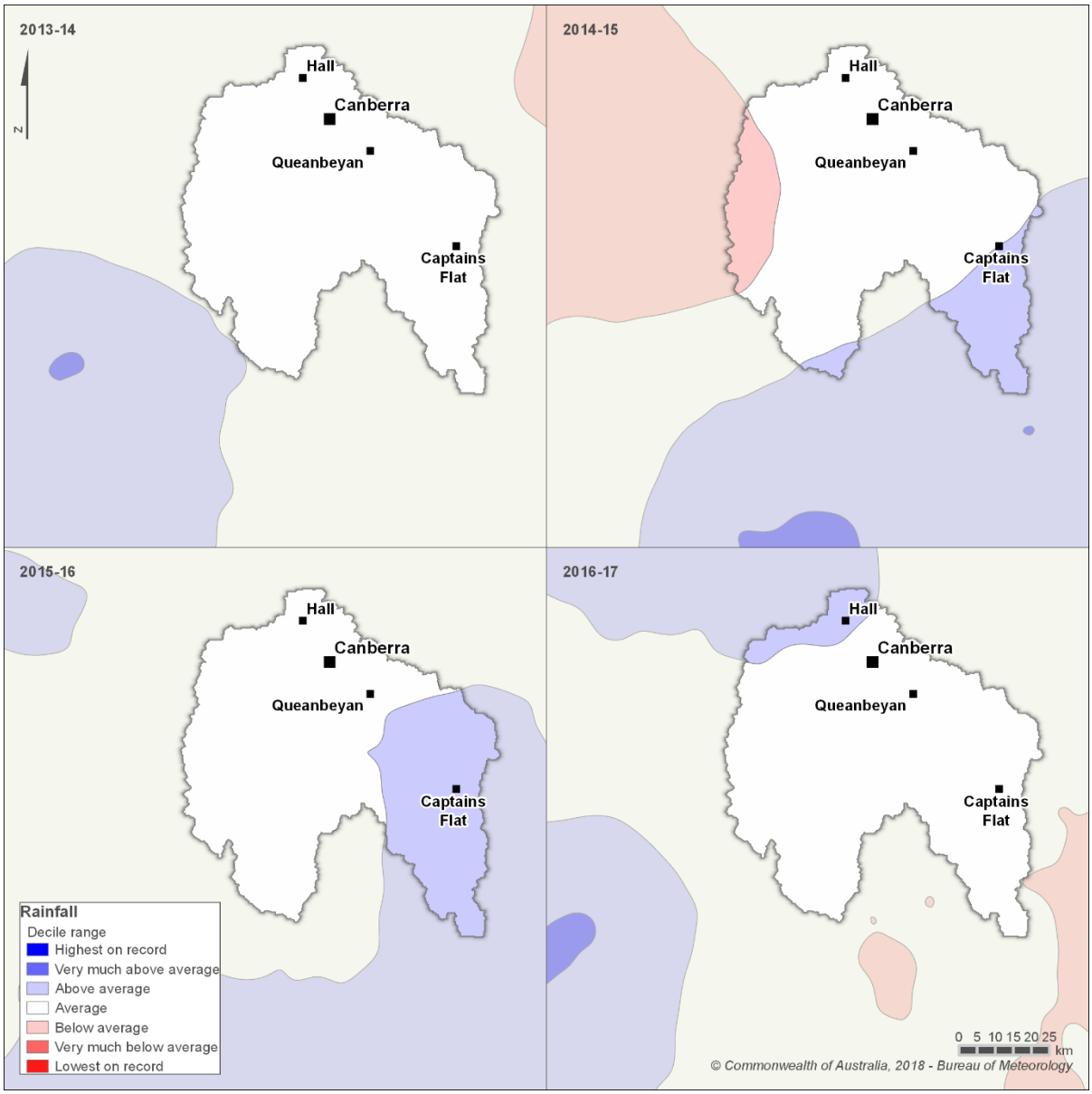
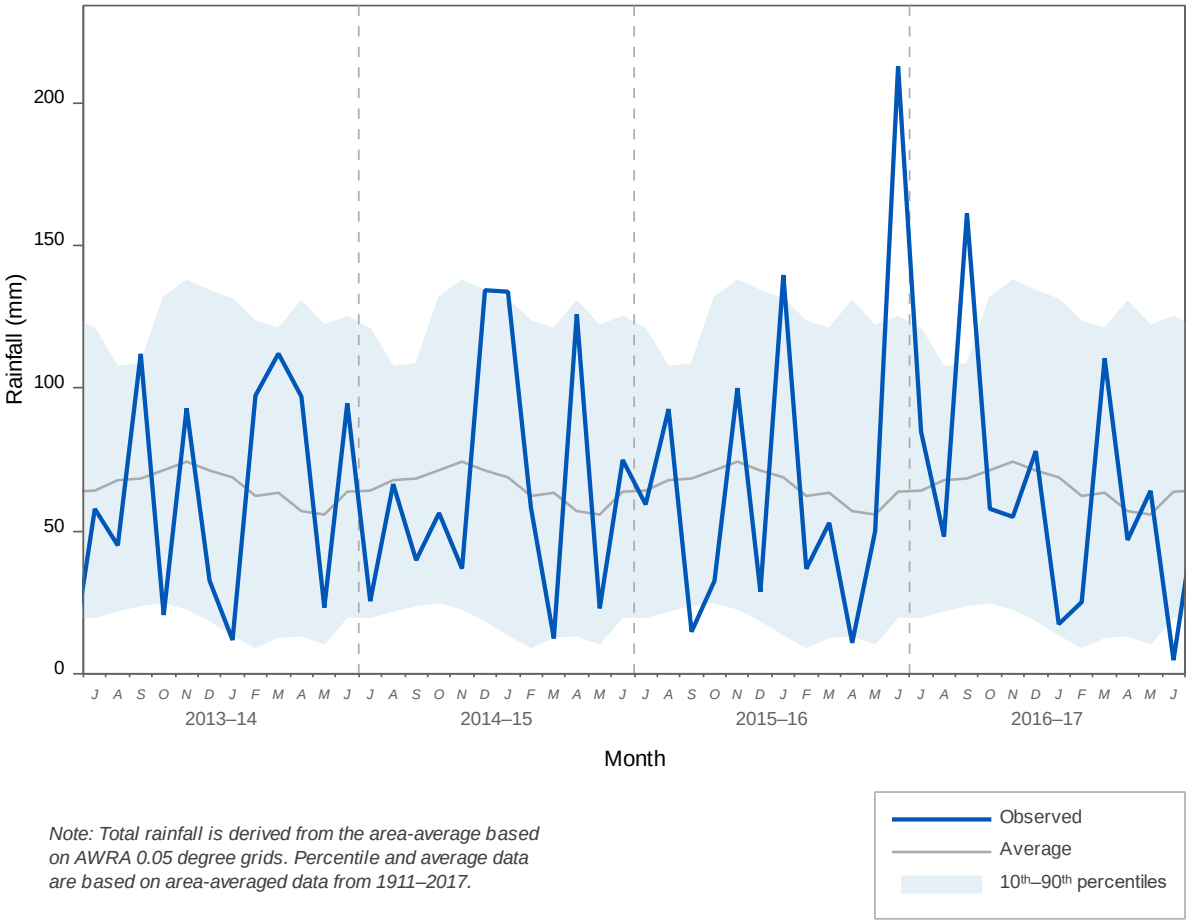


Figure C1 Annual rainfall deciles for the Canberra region during the 2013–2017 period

- Total area-averaged rainfall was similar to the long-term average of 787 mm for the 2013–14 and 2014–15 years, above average in 2015–16, and below average in 2016–17.
- Most of the region experienced average rainfall for all four years, however the southeastern part of the region (mainly in the Queanbeyan River catchment) received above-average rainfall in 2014–15 and 2015–16.
- Rainfall was below average for the western part of the region over the 2014–15 year.



Note: Total rainfall is derived from the area-average based on AWRA 0.05 degree grids. Percentile and average data are based on area-averaged data from 1911–2017.

Figure C2 Total monthly rainfall for the Canberra region during the 2013–2017 period compared with the long-term average and percentiles for the region

- An east coast low event in June 2016 caused the second highest June rainfall total on record for the region. This brought annual rainfall for 2015–16 to above average levels, despite below-average rainfall for eight months of the year.
- Despite very high rainfall in September 2016 (the second highest September total on record), 2016–17 rainfall was below average.
- Very dry conditions occurred in June 2017, with more than 50% of the region recording its driest June on record.

Actual evapotranspiration

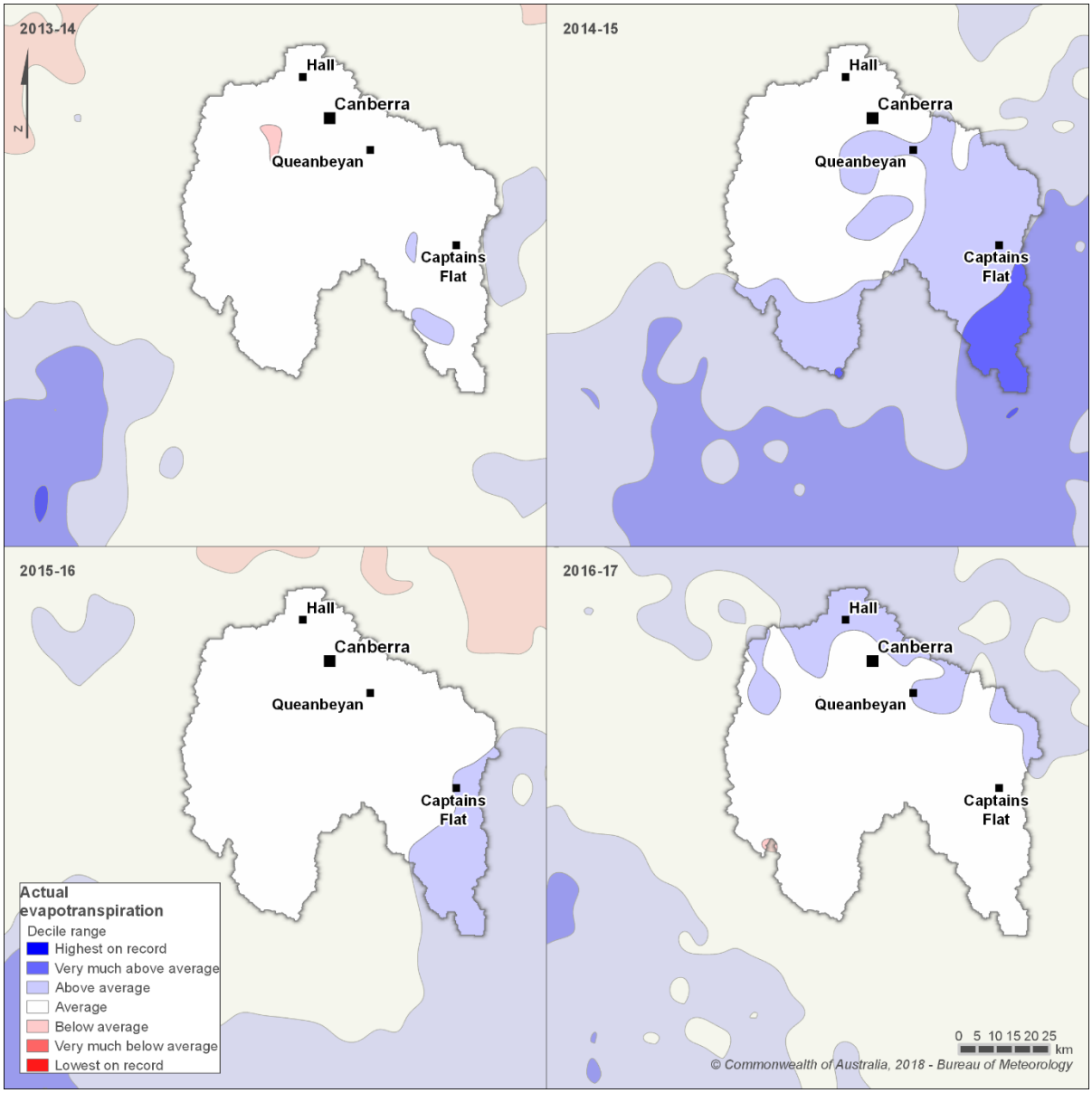
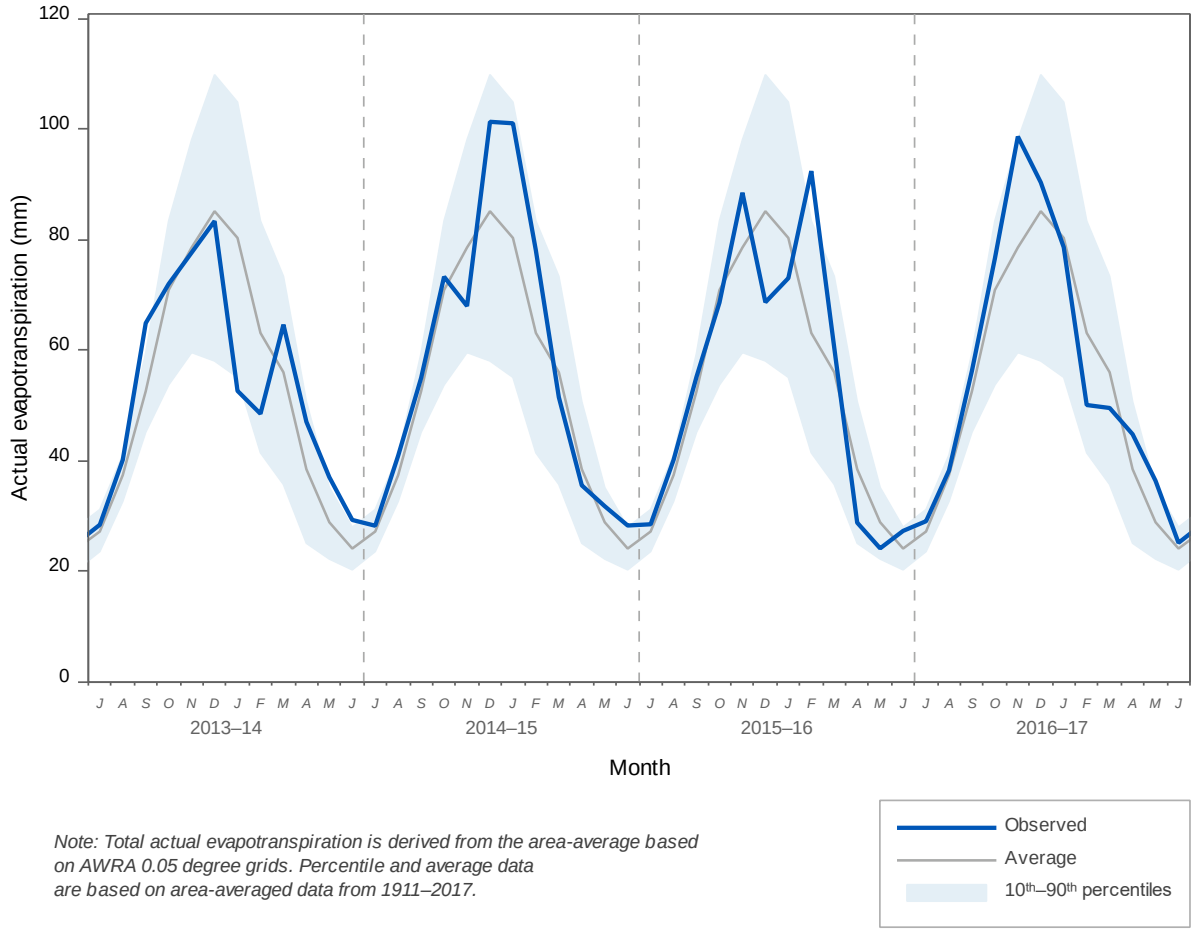


Figure C3 Annual actual evapotranspiration deciles for the Canberra region during the 2013–2017 period

- Total area-averaged actual evapotranspiration was slightly above the long-term average value of 642 mm for all four years.
- For most of the region, annual actual evapotranspiration was in the average range for all of the four-year period.
- Above average evapotranspiration occurred mostly in the south-eastern corner of the region (the Queanbeyan River catchment) in 2014–15 and 2015–16, and in the northern part of the region in 2016–17.



Note: Total actual evapotranspiration is derived from the area-average based on AWRA 0.05 degree grids. Percentile and average data are based on area-averaged data from 1911–2017.

Figure C4 Total monthly actual evapotranspiration for the Canberra region during the 2013–2017 period compared with the long-term average and percentiles for the region

- For most of the four-year period, total area-averaged actual evapotranspiration was close to the long-term average.
- Above-average actual evapotranspiration was generally observed in the spring and summer months corresponding to above-average temperatures (e.g. December 2014–February 2015, February 2016).
- High actual evapotranspiration for some months was also likely due to increased water availability from high rainfall events in preceding months (e.g. in October–November 2016 following very high rainfall in September 2016).

SOIL MOISTURE

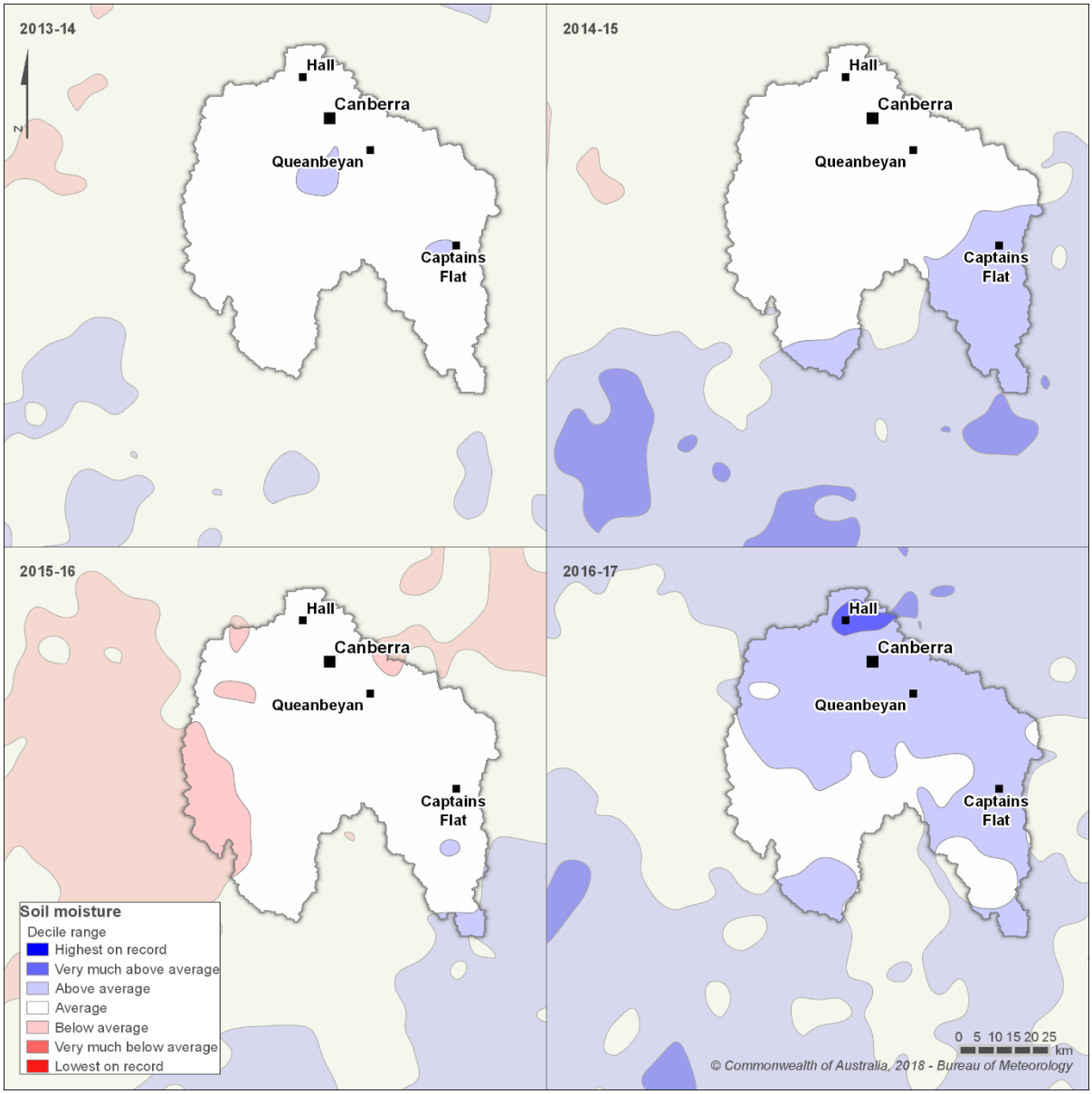


Figure C5 Annual soil moisture deciles for the Canberra region over the 2013–2017 period

- Soil moisture in the root zone (0–1 m depth) was average across most of the region for 2013–14, 2014–15 and 2015–16. It was above average for most of the region during 2016–17.
- Rainfall and soil moisture are typically closely aligned. For example, annual soil moisture deciles for 2013–14, 2014–15, and 2015–16 roughly correspond to the rainfall deciles for those years.
- Despite mostly average rainfall, soil moisture for 2016–17 was above average for most of the region. This is likely due to the cumulative effect of high rainfall in June and September 2016.

STREAMFLOW RESPONSES

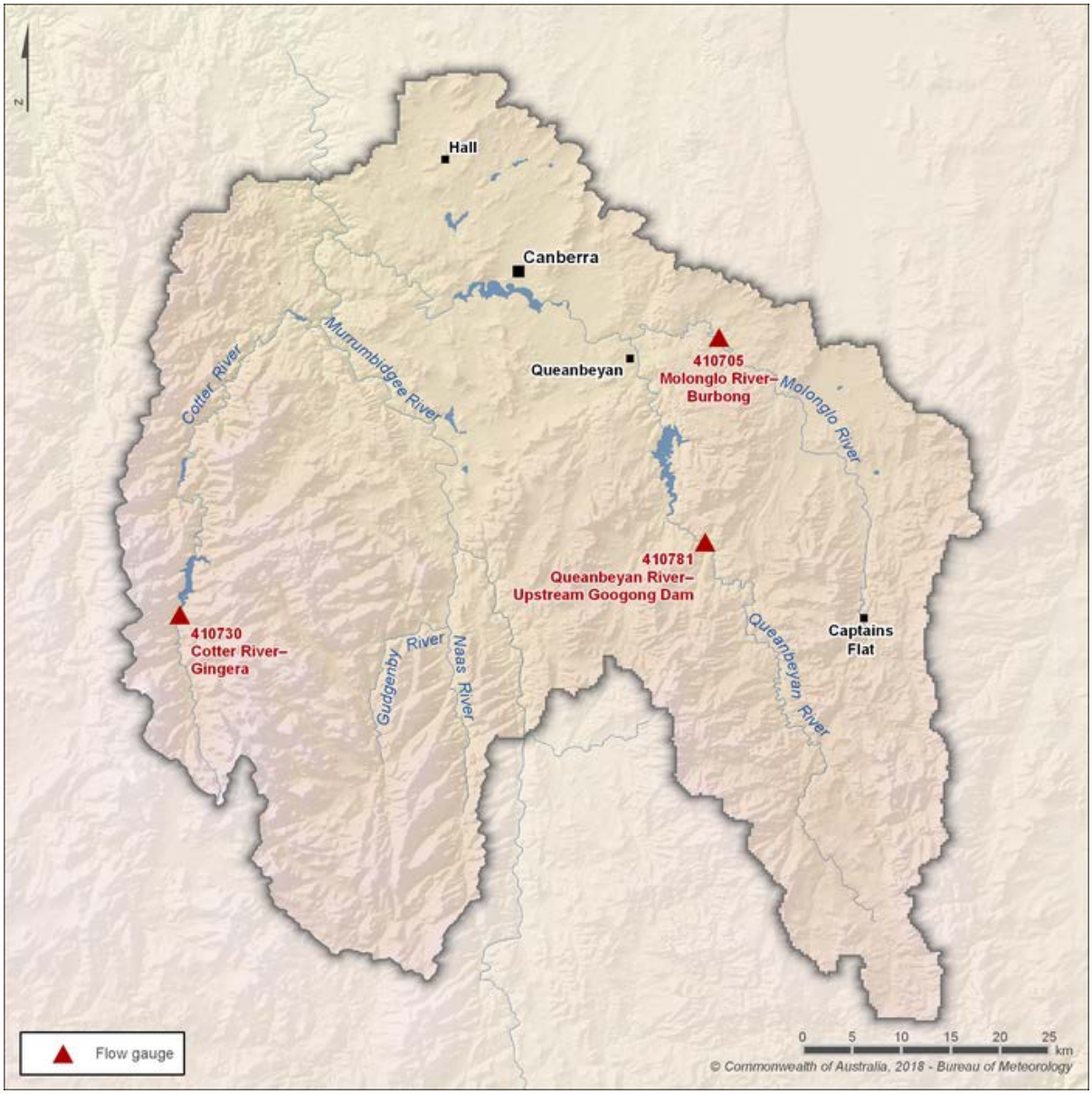


Figure C6 Key flow gauging stations along the main rivers within the Canberra region

- The Cotter and Queanbeyan rivers contribute most of the inflows to the storages in the Canberra region.
- Molonglo River, one of the major tributaries of the Murrumbidgee River, runs through the Canberra city centre where it is dammed to form Lake Burley Griffin.

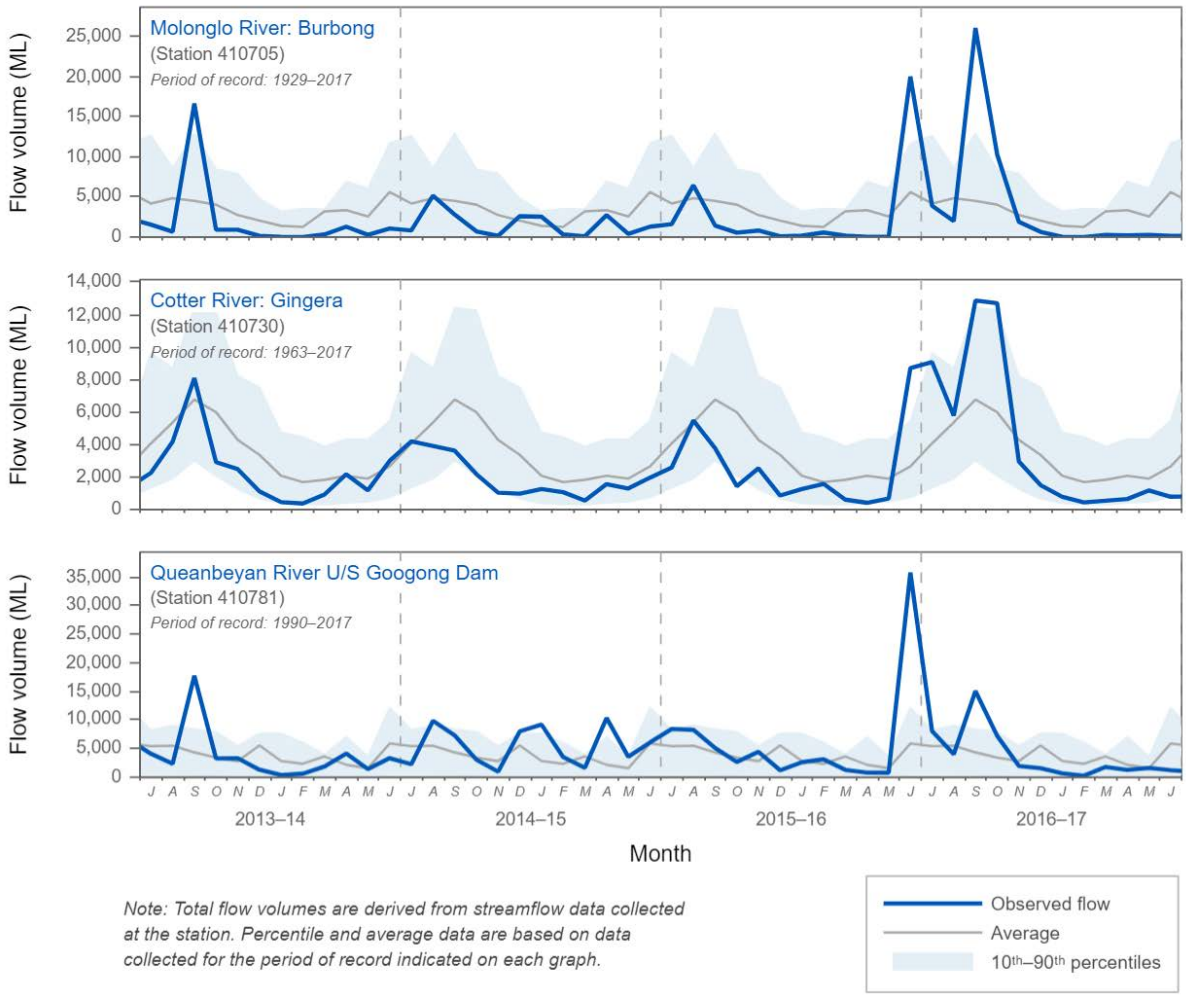


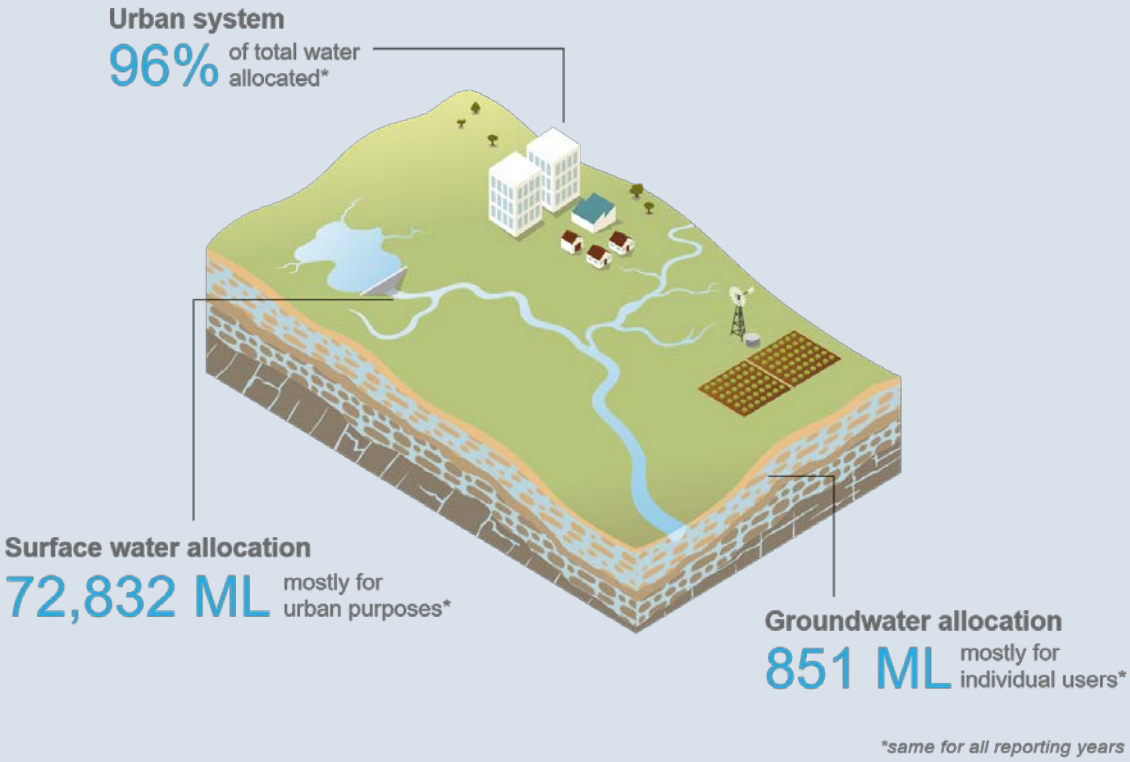
Figure C7 Total monthly flow for key rivers during the 2013–2017 period compared with long-term average and percentiles

- Streamflow in the Cotter and Molonglo rivers was generally below average for most of the four-year period. Flows in the Queanbeyan River were comparatively higher, especially during 2014–15 and 2015–16, mostly due to comparatively higher rainfall in the southeastern part of the region.
- Most of the annual streamflow for 2016–17 occurred during September–October 2016. The well above-average streamflow during this 2-month period was due to heavy rainfall during September 2016 across the entire region.
- Well above-average streamflows in July 2016 followed high rainfall in June 2016, caused by an east coast low event.
- Well above-average streamflows were also observed in the Molonglo and Queanbeyan rivers in September 2013, due to high rainfall in that month.
- There was little streamflow response following the above-average rainfall in March 2017, which can be attributed to the relatively low soil moisture conditions across the region following a very dry summer.

WATER MARKETS

AT A GLANCE

- About 96% of the region's water allocations were for the urban system, primarily for residential use.
- Total water use was similar across all four reporting years, reflecting broadly similar surface water availability conditions in the region over this period.
- Water trading volumes were very small compared to allocation volumes in the region over the account period.



WATER RIGHTS, ENTITLEMENTS, ALLOCATIONS AND RESTRICTIONS

Surface water rights

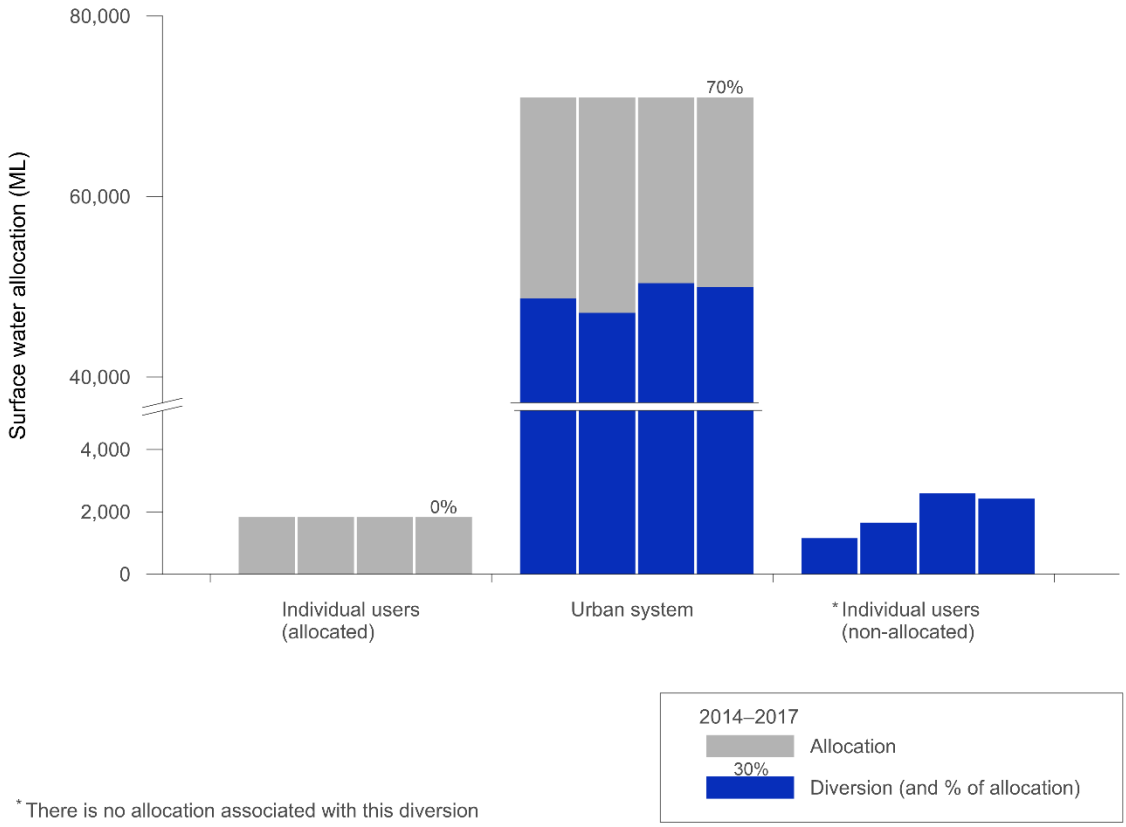


Figure M1 Surface water allocations and diversions in the Canberra region for the years ending 30 June, from 2012–2017

- Surface water allocations for individual users and the urban system were the same for the 2013–17 period.
- Diversions to individual users and the urban water system were similar over the 2013–17 period, reflecting the similar surface water availability conditions in the region for these years.

Figure M2 Surface water allocation to individual users for each licence purpose for the 2016–17 year

- 3% of the surface water allocated is for individual users. These licences primarily relate to water diversions for domestic consumption and commercial activities under the ‘unregulated river’ entitlement class.

Groundwater rights

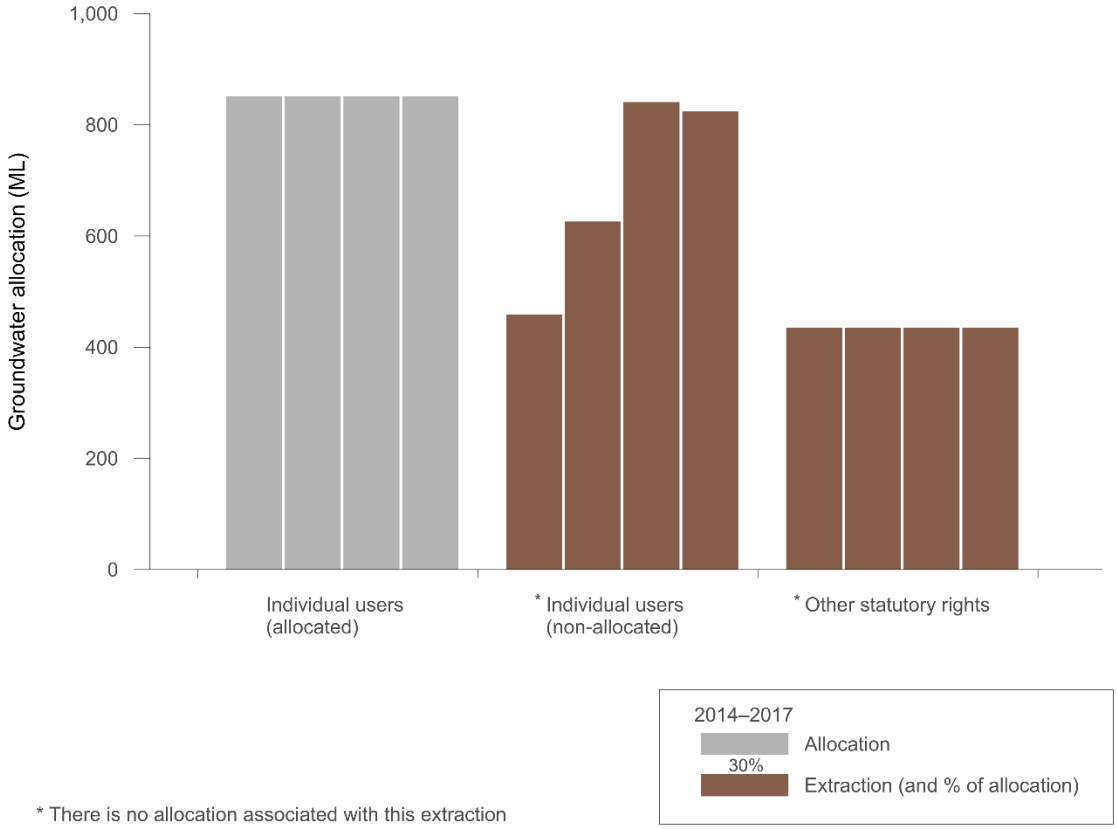


Figure M3 Groundwater access entitlements, allocations and extractions in the Canberra region for the years ending 30 June, from 2012–2017

- Groundwater allocations for individual users remained the same as previous years.
- Actual extractions for individual users were similar to last year, which reflects the similar water availability conditions in the region to last year.

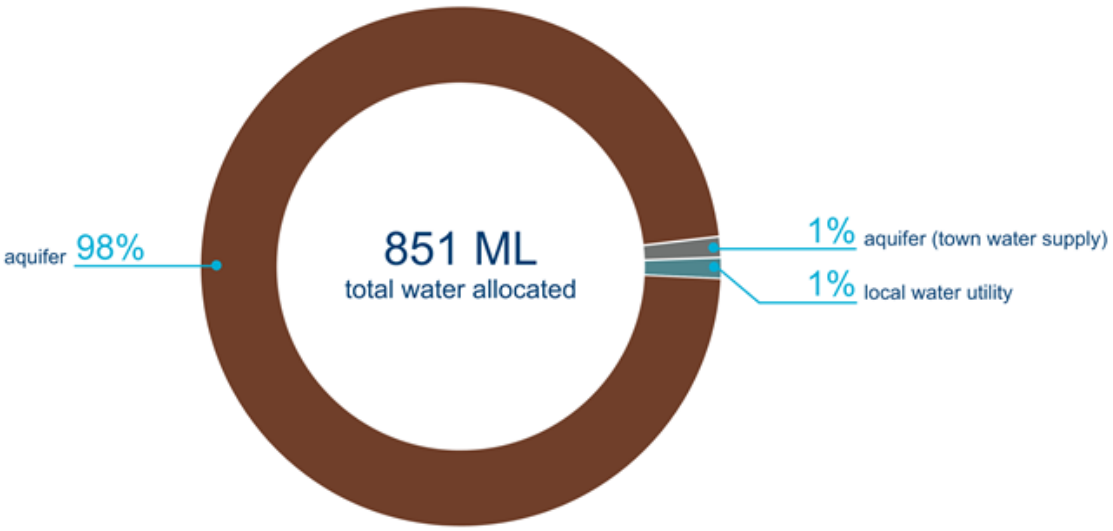


Figure M4 Groundwater allocation to individual users for each licence purpose for the 2016–17 year

- 100% of the total groundwater allocated was for individual users. These licences primarily relate to water extractions for irrigation purposes under the ‘aquifer’ entitlement class.

Combined surface water and groundwater rights

- In the Canberra region, there are provisions to abstract water from either surface water or groundwater resources as specified in the entitlement category 'combined surface water and groundwater rights'.
- The combined surface water and groundwater entitlement volume was 2,412 ML.

Water restrictions

- Icon Water introduced 'Permanent Water Conservation Measures' for potable water use in November 2010 that are mandatory and enforceable. Non-potable sources are not restricted. These rules govern how water can be used on gardens and lawns, during pool filling, car washing, and cleaning.
- For more information, refer to the Bureau of Meteorology's Water Restrictions website.

Water market activity

- Surface water and groundwater entitlement trades reported in the Canberra region during the 2016–17 year were 0 ML and 9 ML respectively.

WATER MANAGEMENT

AT A GLANCE

- Management of surface water and groundwater resources in the Canberra region is governed by the ***Water Resources Act 2007*** (ACT) and ***Water Management Act 2000*** (NSW).
- The region is divided into 14 water management areas.
- The ACT Government manages the areas within the ACT boundary while the NSW Government manages those outside the ACT boundary.

Water management
The Environment, Planning and Sustainable Development Directorate prepared the **ACT Water Strategy 2014–44**

Environmental water
Water provisions defined in **2013 Environmental flow guidelines** and the **Water Management ACT 2000**

Cultural water
The **Aboriginal Water Initiative** is administered by **Department of Industry** and improves cultural representation

SURFACE WATER AND GROUNDWATER MANAGEMENT

Water legislation

Australian Capital Territory (ACT)

- The *Water Resources Act 2007* (ACT) provides for the management of surface water and groundwater resources within the ACT through the issuing of water access entitlements and water licences.
- The *Territory Plan 2008* provides the policy framework for the administration of planning in the ACT. It also details the management policies for environmental values in every catchment and serves as an umbrella document for the *2013 Environmental flow guidelines.*
- The *ACT Water Strategy 2014–44: Striking the Balance* (ACT Water Strategy) guides management of the Territory's water supply, management, and catchment practices over the next 30 years.
- Lake Burley Griffin is an Australian Government responsibility and is administered by the National Capital Authority in accordance with the Lakes Ordinance 1976.

New South Wales (NSW)

- The *Water Management Act 2000* (NSW) governs the management of surface and groundwater resources within New South Wales.

Water management plans

ACT

- The region is divided into 14 water management areas (WMAs), with 32 subcatchment areas within the WMAs.
- WMAs in the ACT are consistent with the planning framework of the *Territory Plan 2008*. The ACT Government manages the WMAs that fall within the ACT boundary. The NSW Government manages the sections outside the ACT boundary.

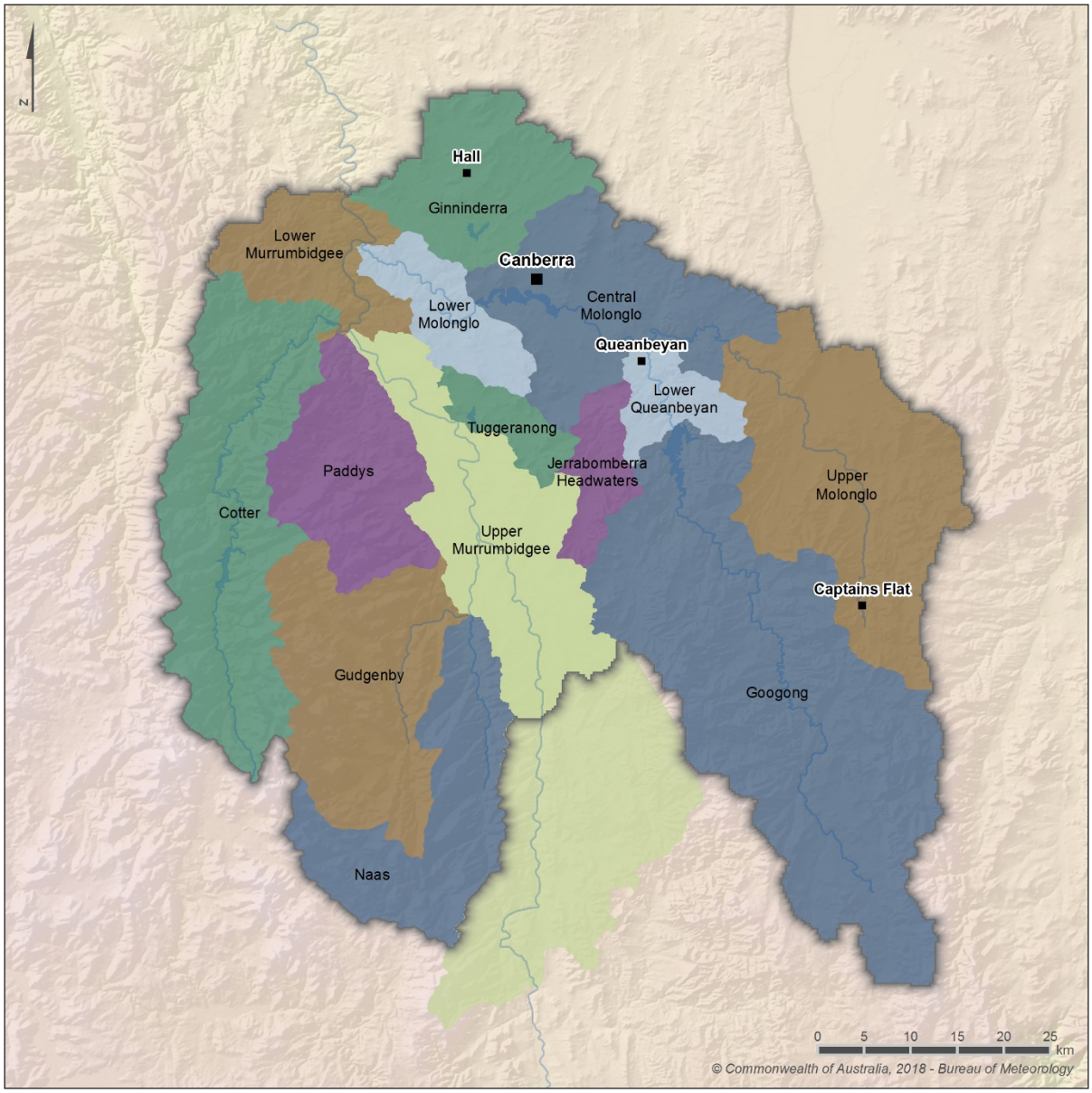


Figure R9 Water management areas in the Canberra region

- WMAs in the ACT cover both surface water and groundwater resources. Within each WMA, maximum surface water plus groundwater abstractions are set.
- The management of each WMA is dictated by the primary environmental value of the subcatchments within that WMA. Subcatchments within the ACT WMAs are assigned one of three potential primary environmental values: conservation; water supply; and drainage and open space.
- The management policies for each type of catchment are detailed in section 11.8 of the *Territory Plan 2008.*

NSW

- The *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012* (New South Wales Office of Water 2012b) provides detailed information on granting and managing access licences: 'Part 7 Rules for granting access licences' and 'Part 8 Rules for managing access licences'.

ENVIRONMENTAL WATER MANAGEMENT

Environmental water legislation

ACT

- Environmental water within the region is managed by the ACT Government's Environment, Planning and Sustainable Development Directorate.
- The *Water Resources Act 2007* provides for the identification and management of water for ecosystems, which are identified in the *2013 Environmental flow guidelines*.
- Environmental water in the Canberra region is delivered in two ways: releases from storages and restrictions on the volume of water that can be abstracted from a catchment (National Water Commission 2011).

NSW

- The *Water Management Act 2000* recognises the following classes of environmental water: environmental health water, supplementary environmental water and adaptive environmental water.
- For groundwater, planned environmental water is derived from the average annual rainfall recharge volumes and storage volumes as described in the *Water Sharing Plan for the NSW Murray–Darling Basin Porous Rock Groundwater Sources* (New South Wales Office of Water 2012a).

Environmental water provisions

ACT

- Environmental water provisions are the responsibility of the relevant ACT minister and are administered and managed through the ACT Environmental Protection Authority (EPA).
- The *2013 Environmental flow guidelines* is the primary document which outlines environmental water provisions in the ACT. The purpose of the guidelines is to identify the components of flow from the variable flow regime that are necessary to maintain stream health.
- The *2013 Environmental flow guidelines* categorise each of the 14 WMAs and 32 subcatchments as one of four possible aquatic ecosystem types and assigns each an environmental management goal.

The guidelines also identify four components of environmental flow to be maintained within these ecosystem types (see Environmental benefit note for more details).

NSW

- Section 8 of the *Water Management Act 2000* defines the environmental water requirements in NSW. In addition, the Department of Industry recognises that a significant number of water access licences are purchased and/or held for an environmental purpose. This type of licensed environmental water is described in the Environmental Water Register as having a 'non-statutory' environmental purpose. A licence is classified as having a 'non-statutory' environmental purpose by agreement between Department of Industry and the holder of the respective licence.
- The Environmental Water Register provides a record of: licensed environmental water information, environmental water set aside as 'rules' in water sharing plans and environmental water use plans approved by the Minister.
- The Environmental Water Register provides reports on: the assignment of water allocations to and from adaptive environmental water access licences and changes in the share component of adaptive environmental water access licences over time.

CULTURAL WATER MANAGEMENT

- The Aboriginal Water Initiative was established in June 2012 to improve Aboriginal involvement and representation in water planning and management within NSW.
- The Department of Industry monitor the success of water sharing plans in meeting their statutory requirements for Aboriginal- specific performance indicators, including: providing water for native title rights and recognising spiritual, social, customary and economic values of water to Aboriginal people.
- The Ngunnawal people are the Traditional Custodians of the Canberra region. Neighbouring regions include the Ngarigo, Wolgalu, Gundungurra, Yuin and Wiradjuri people.
- River corridors play an important role in travel routes, and provide varied flora and fauna which are readily available food sources. Access to rivers is important in ensuring knowledge of Country, dreaming and future land management is passed down to younger generations.
- One of the actions in the Australian Capital Territory (ACT) Government's Water Strategy 2014-44 is to "Ensure that indigenous and other cultural values are recognised in managing water planning and use", addressing the strategic objective to 'engage the community on understanding and contributing to a more sustainable city.'
- For further information refer to Aboriginal Cultural Heritage of the ACT- Ngunnawal Country (Environment, Planning and Sustainable Development Directorate (ACT) 2010) and ACT Water Strategy 2014-44: Striking the Balance (Environment, Planning and Sustainable Development Directorate (ACT) 2014).

ORGANISATIONS RESPONSIBLE FOR WATER MANAGEMENT

- Organisations responsible for water management within the Canberra region are shown below.

Table R2 Organisations responsible for water management in the Canberra region during the 2013–17 period

Organisation	Responsibility	Major storages operated within the region
ACT Government, Environment, Planning and Sustainable Development Directorate (EPSDD) – formerly ACT Government, Environmental and Planning Directorate (EPD)	• manages ACT water resources • approves water trades within and outside the ACT • grants water entitlements • manages and monitors environmental flows.	n/a
Icon Water (formerly ACTEW Water)	• manages urban water supply • manages and maintains water supply infrastructure • operates water distribution, wastewater collection and treatment, and wastewater recycling infrastructure operator.	• Corin Reservoir • Cotter Reservoir • Bendora Reservoir • Googong Reservoir
NSW Office of Environment and Heritage	• manages the environment • manages water quality, water pollution and water treatment • conserves and manages wetlands • secures water for the environment.	n/a
Department of Industry (formerly DPI Water / NSW Office of Water)	• sets policy and necessary legal instruments and oversees mechanisms to manage water within NSW.	n/a
ACT Government, Transport Canberra and City Services (TCCS)	• plans and manages ACT's parks, reserves, forestry plantations, and public domains.	• Lake Ginninderra • Lake Tuggeranong
Environmental Protection Authority (ACT)	• responsible for administering the ACT *Environmental Protection Act 1997*	n/a
National Capital Authority	• manages Lake Burley Griffin.	• Lake Burley Griffin
Queanbeyan-Palerang Regional Council (formerly Queanbeyan City Council and Palerang Council)	• distributes urban water in Queanbeyan and Captains Flat regions.	n/a

WATER RIGHTS

AT A GLANCE

- Licences to take water are administered by the Environment, Planning and Sustainable Development Directorate for the ACT and by the Department of Industry, Lands and Water for the NSW portion of the region.
- The total water access entitlement in the region is 82,324 ML, of which 71,000 ML is for urban water supply.

Water entitlements
Licences to abstract water are administered by the **Environment, Planning and Sustainable Development Directorate (ACT)** and **Department of Industry (NSW)**

Water allocations
96% of water is allocated for urban water supply

Water trades
Trading can occur within the same **water management area.** Interstate trading is allowed in the ACT but not in NSW

OPERATING RULES AND CONSTRAINTS

Urban water restrictions

- Icon Water, with the approval of the Australian Capital Territory (ACT) Government, can impose urban water restrictions in the Canberra region.
- The *ACT Water Strategy 2014–44: Striking the Balance* (ACT Water Strategy) guides management of the ACT's water supply, management, and catchment practices over the next 30 years, building on the achievements of the original ACT Water Strategy, *Think Water, Act Water*.
- Water restrictions in the region are managed by Icon Water and Queanbeyan-Palerang Regional Council. During 2017–18, there were no water restrictions; however, permanent water conservation measures remain in place by Icon Water (since 1 November 2010) and Queanbeyan-Palerang Regional Council (since 1 November 2011).
- Further information on water restrictions can be found on the Bureau of Meteorology's water restrictions site.

Murray–Darling Basin Cap

- The Murray–Darling Basin Cap (the Cap) was established in 1995, introducing long-term limits on how much surface water could be taken from rivers in 24 designated river valleys (Cap valleys). The Cap is managed in accordance with Schedule E of the Australian Government *Water Act 2007 (Water Act)*. The implementation of the Cap within a State or Territory is the responsibility of the concerned Government.
- The *Basin Plan* sets sustainable diversion limits (SDLs), which represent the maximum long-term average annual volumes of water that can be taken for consumptive use on a sustainable basis from Basin water resources. It includes 29 surface water SDL resource units and 81 groundwater SDL resource units for the whole region.
- Valleys managed under the Cap framework will transition to management within an SDL framework from 1 July 2019.

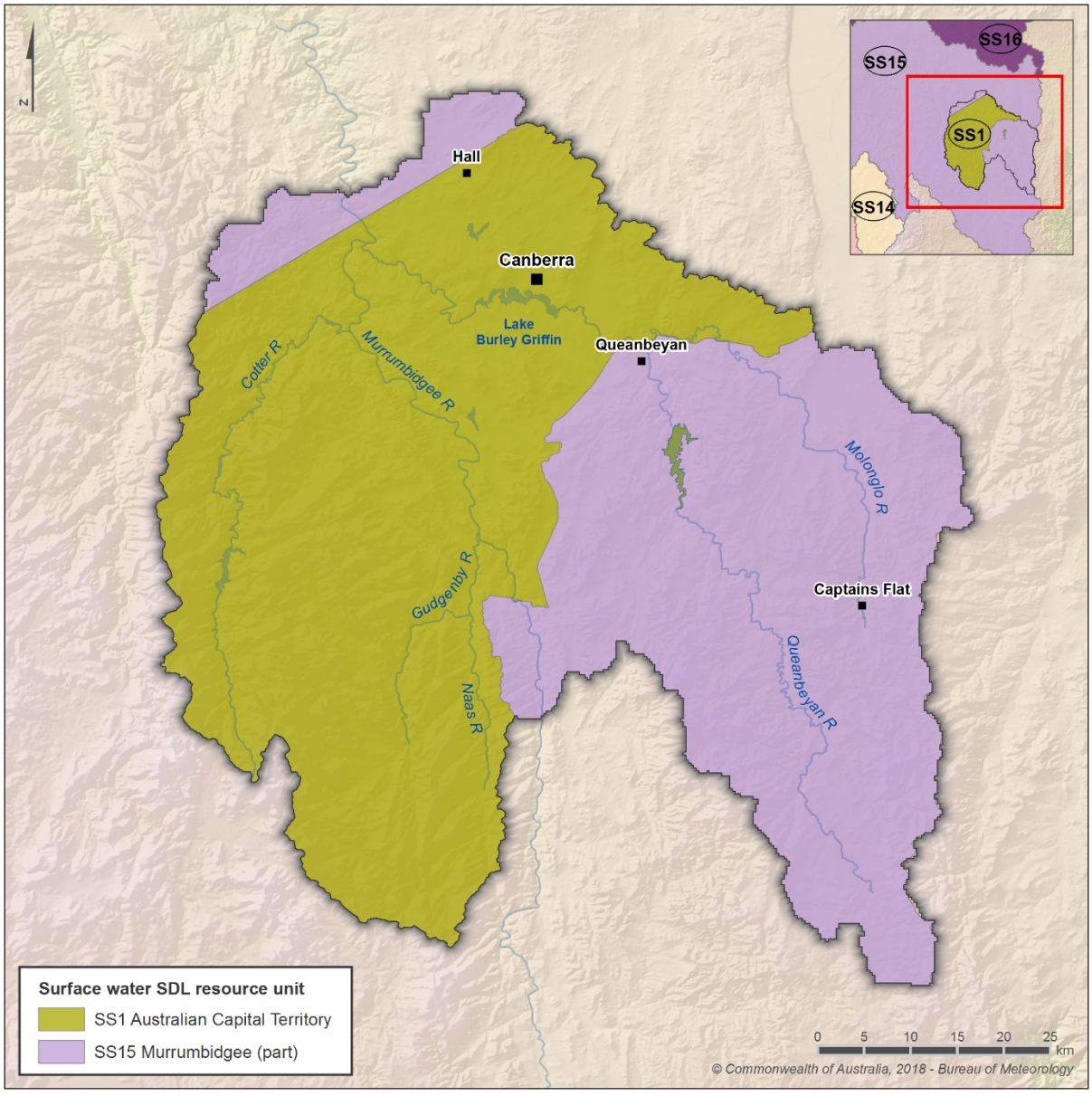


Figure R10 Surface water sustainable diversion limit (SDL) resource units in Canberra region

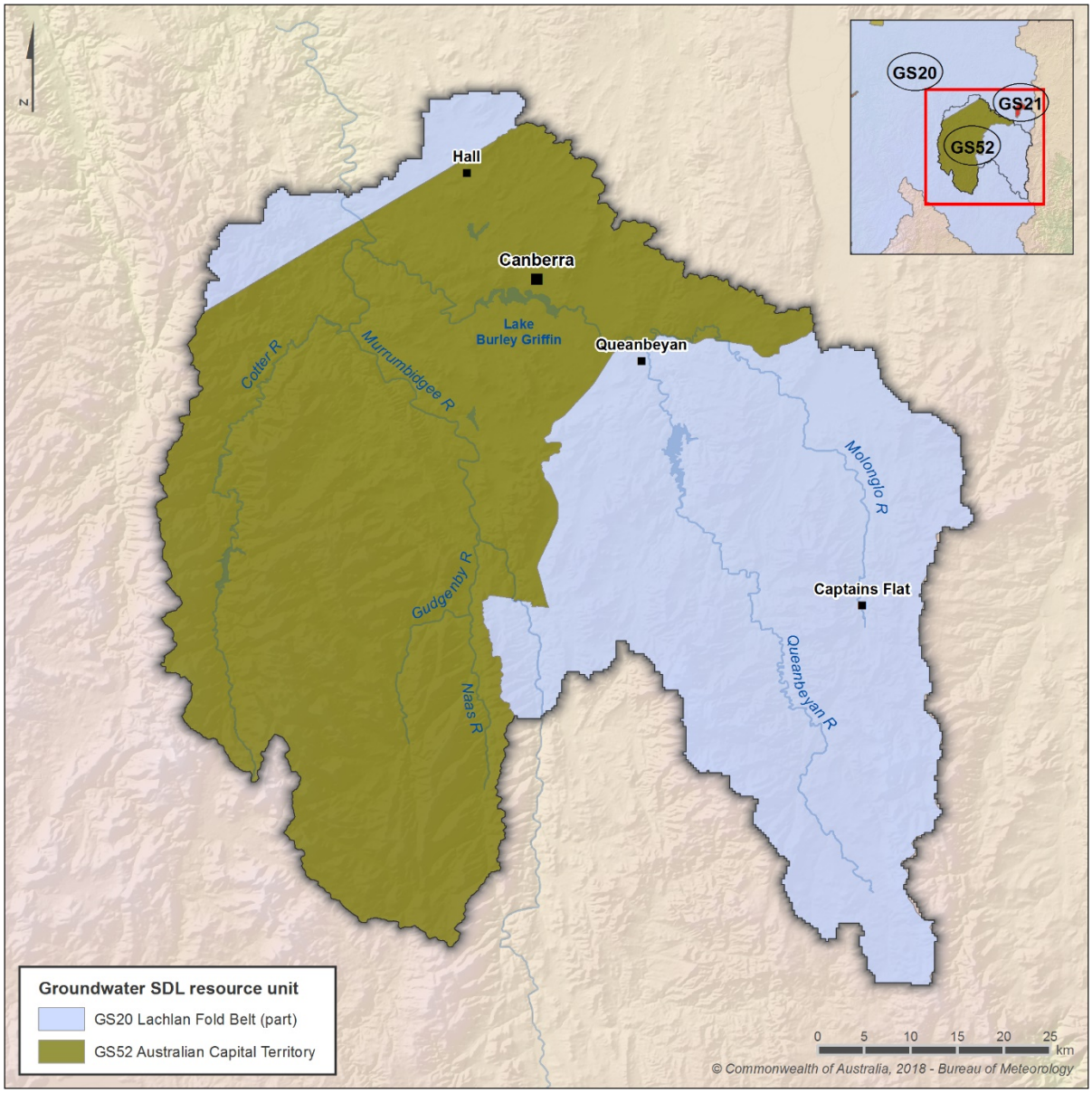


Figure R11 Groundwater sustainable diversion limit (SDL) resource units in Canberra region

WATER ENTITLEMENTS AND OTHER STATUTORY WATER RIGHTS

ACT

- A water access entitlement is a statutory instrument issued under the *Water Resources Act 2007* (ACT) and represents a share of the water resources controlled by the ACT. It is expressed as either a volume; or a percentage share of the water available in a defined water management area (WMA) . In addition, a separate licence stating the location and use of water, is required to abstract water.
- The types of water access entitlements issued by the ACT Environment, Planning and Sustainable Development Directorate are described below.

Table R3 Water access entitlements issued by the ACT Government for the Canberra region

Type of water access entitlement	Description
surface water	Specifies the volume of surface water that the holder is entitled to use from a WMA, on an annual basis.
groundwater	Specifies the volume of groundwater that the holder is entitled to use from a WMA, on an annual basis.
groundwater and surface water	Specifies as a single total the combined volume of groundwater and surface water that the holder is entitled to use from a WMA, on an annual basis. For these types of water access entitlements, an associated licence may specify the amount that can be extracted as groundwater with the remaining volume being available from surface water.
urban water utility	Specifies the volume of water that the holder is entitled to use on an annual basis, for the purpose of urban water supply to the region.

- Within the ACT, some basic water rights exist that do not require a water licence. These include abstraction of surface water for stock and domestic purposes, rainwater harvesting via a rainwater tank and various short-term water uses as detailed in the *Water Resources Regulation 2007* (ACT).

NSW

- The *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources* (New South Wales Office of Water 2012a)**,** which commenced in 2012, covers the region.
- All NSW surface water licences specify volume and purpose and are attached to the land.

WATER ALLOCATIONS

- All water entitlement holders are entitled to abstract water as specified in the licences, subject to environmental flow conditions, unless restrictions are in place by relevant State/Territory authorities. Restrictions may be placed on water abstractions when the flow is unavailable.
- For the NSW portion of the region, water allocation details are given in the *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources* (New South Wales Office of Water 2012b), under the *Water Management Act 2000*.

TRADES AND WATER RIGHTS TRANSFERS

ACT

- The *Water Resources Act 2007* allows for interstate trades; however, the required mechanisms are not yet in place for this trading to occur.
- The *Water Resources Act 2007* allows for inter–valley trades. Water access entitlements can be traded within and between WMAs; however, water licences cannot be traded.
- Water access entitlement trade between WMAs can only occur if the licence amount in the receiving WMA is not fully developed. Where trade can occur, groundwater entitlements are tradeable on the same basis as surface water entitlements.
- Icon Water holds the urban water access entitlement from ACT Environment, Planning and Sustainable Development Directorate without any charge. Trading of this entitlement or allocated water is not allowed.

NSW

- There are no interstate trades of water permitted in the NSW-administered area of the region.
- Inter-valley trading rules are defined in State legislation, water resource plans, and the Murray–Darling Basin Agreement.
- Intra-valley trading rules are defined in State legislation and water resource plans.
- Surface water trading within valleys is usually available within regulated systems.
- Groundwater trading within an aquifer is available in the developed water resource plan.

CULTURAL AND ENVIRONMENTAL BENEFIT

CULTURAL BENEFIT

- The Ngunnawal people are the Traditional Custodians of the Canberra region. Neighbouring regions include the Ngarigo, Wolgalu, Gundungurra, Yuin and Wiradjuri people.
- River corridors play an important role in travel routes, and provide varied flora and fauna which are readily available food sources. Access to rivers is important in ensuring knowledge of Country, dreaming and future land management is passed down to younger generations.
- One of the actions in the Australian Capital Territory (ACT) Government's Water Strategy 2014-44 is to "Ensure that indigenous and other cultural values are recognised in managing water planning and use", addressing the strategic objective to 'engage the community on understanding and contributing to a more sustainable city.'
- For further information refer to Aboriginal Cultural Heritage of the ACT- Ngunnawal Country (Environment, Planning and Sustainable Development Directorate (ACT) 2010) and ACT Water Strategy 2014-44: Striking the Balance (Environment, Planning and Sustainable Development Directorate (ACT) 2014).

ENVIRONMENTAL BENEFIT

Environmental water provisions

- Environmental flow requirements are defined for aquatic ecosystem categories and specific river reaches in Chapter 5 of the 2013 Environmental Flow Guidelines.
- Data for the Cotter River were available at the time of publication and are presented here as an example of the region's environmental flow provisions.

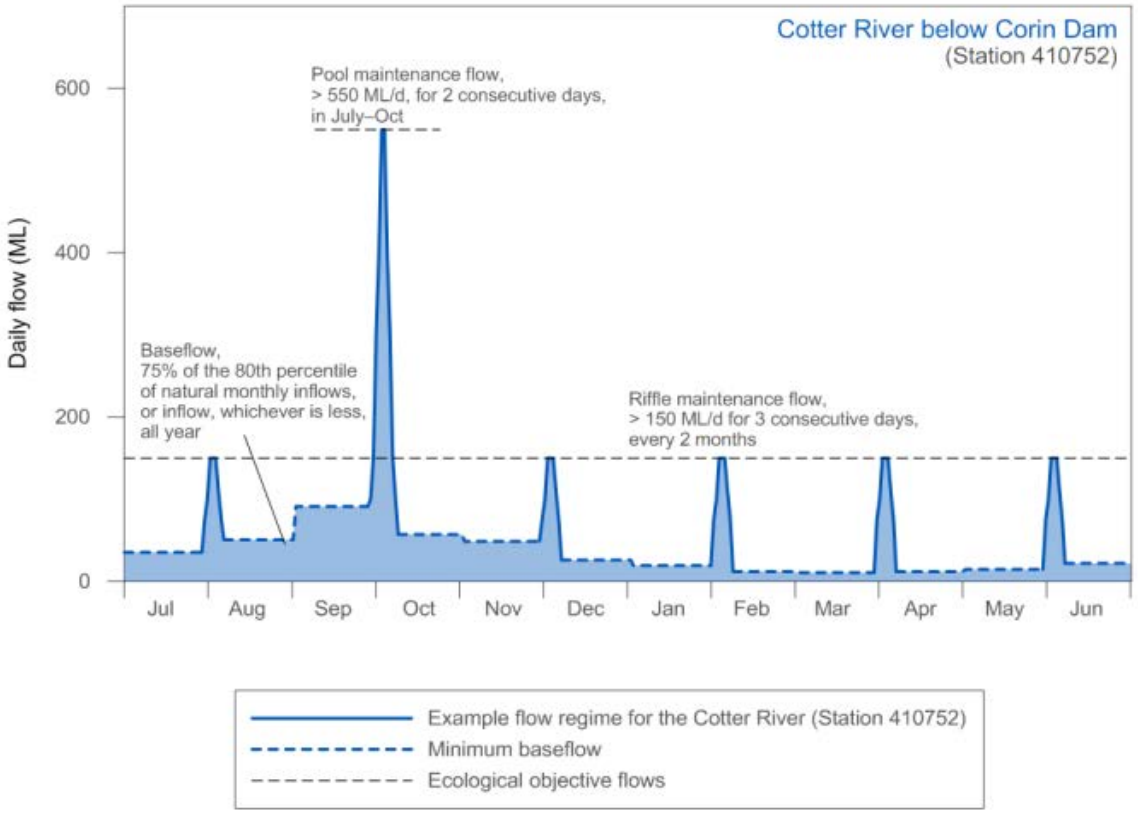


Figure E1 Example environmental water provisions for the Cotter River below Corin Dam

- The required environmental flows are maintained through a combination of strategic water releases or spills from storages and by restricting the volume of water that can be diverted from a catchment.
- The baseflow requirement is specified on a monthly basis, with fortnightly variations in the rate of release preferred compared to constant discharge for the month.
- Drawdown limits for impoundments, and protection of larger, less frequent 'channel maintenance' flows are also a part of the environmental water provisions, but are not shown on the figure above.

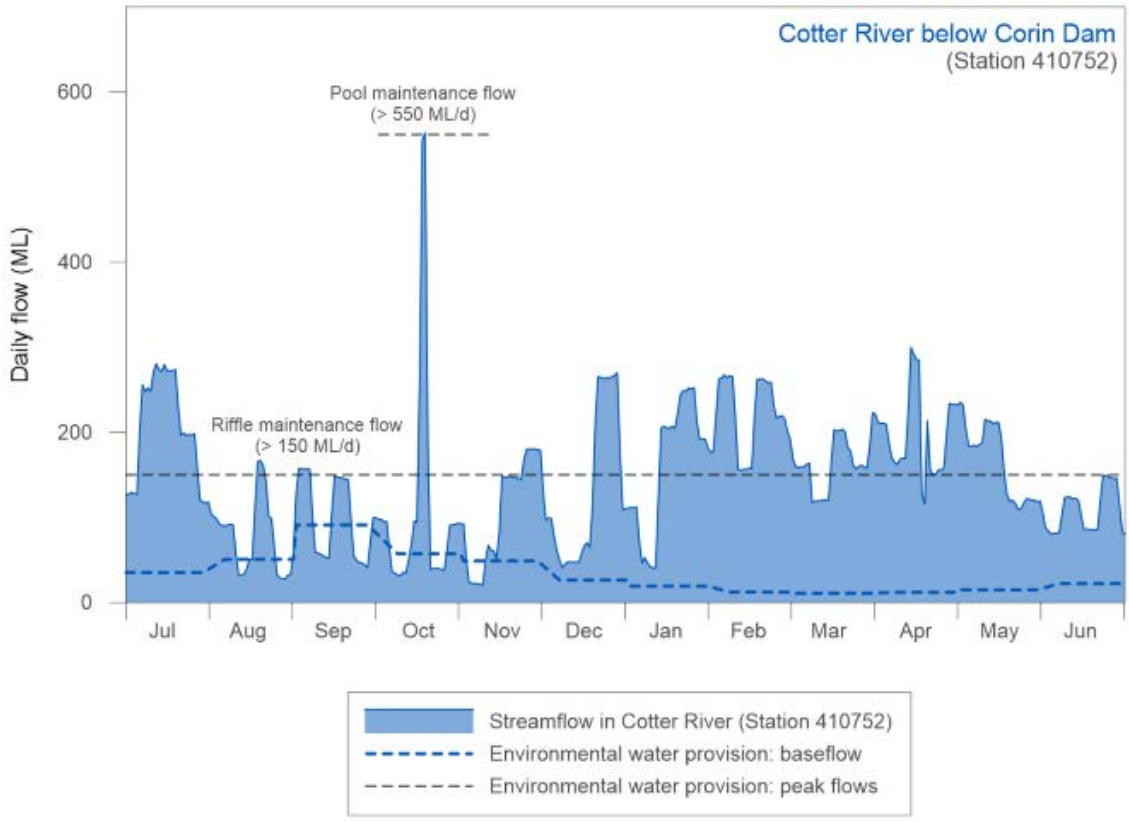


Figure E2 Example outcome: flow in the Cotter River compared with the required flow regime during the 2016–17 year

- Flows in the Cotter River below Corin Dam exceeded the monthly baseflow requirements and bi-monthly riffle maintenance requirements, and were very close to meeting the annual pool maintenance requirements for the 2016–17 year.
- For more detail on environmental flows in the region, including historical data, see the Icon Water environmental management site.

GOVERNANCE

The following statements and associated notes have been prepared according to the Australian Water Accounting Standard (AWAS):

- Statement of Water Assets and Water Liabilities
- Statement of Changes in Water Assets and Liabilities

The following components of the integrated accounts have been prepared according to the System for Environmental-Economic Accounting (SEEA):

- water assets
- physical supply and use of water
- monetary supply and use of water
- water condition/quality

This section provides governance information in relation to the parts of the integrated accounts that have been prepared according to AWAS. Further explanation of the parts of the accounts prepared according to SEEA is provided in the ABS Explanatory Note available on the ABS webpage.

ACCOUNTABILITY STATEMENT

1. This water accounting report has been prepared and presented in accordance with the ***Australian Water Accounting Standard 1***, with the following exceptions:

- No Assurance Statement was prepared because the standard for, and practice of, assurance of water accounting reports are currently not available.
- Notes on the quantification approaches and levels of uncertainty are incomplete because the knowledge base is often inadequate.
- No information is disclosed about material events that occurred after 30 June 2018, such as extreme precipitation and significant water rights purchases. This information is publicly available elsewhere.
- Asset changes for water stores (surface water, groundwater and urban water) have been included in the Statement of Changes in Water Assets and Water Liabilities, without a corresponding water store asset volume being included in the Statement of Water Assets and Water Liabilities for the following line items:

– Water table aquifer
– Underlying aquifer.

This is because water store flows could be quantified but storage volumes for these items could not.

- The volumes of water assets and water liabilities including the volumes of changes to water assets and water liabilities that failed the recognition criteria were reported in the water accounting statements with dashes ('–') in order to highlight data and knowledge gaps that may affect the water accounting statement balances.

2. The report has been compiled from the best data available, as detailed in the water accounting statement Notes, in the time available to compile it from a number of sources. The Bureau of Meteorology takes a nationally-consistent approach to report preparation and presentation, but for a few line items there may be local data of higher quality that were not used.

3. All significant and specific interpretations of the ***Australian Water Accounting Standard 1*** for the purpose of the preparation of this report are explained in the 'Water accounting policies' note. The Bureau of Meteorology is responsible for these interpretations.

Dr Robert Argent

General Manager Water

Bureau of Meteorology

19 February 2019

WATER ACCOUNTING POLICIES

Introduction

The information presented in the Canberra region water accounting report is based on collaboration between the Bureau of Meteorology and:

- Australian Capital Territory Government, Environment, Planning and Sustainable Development Directorate
- New South Wales Department of Industry
- Icon Water
- Queanbeyan–Palerang Regional Council (QPRC)
- National Capital Authority.

This report has been prepared using an accrual basis of water accounting. The water attribute being quantified is volume and the unit of account is megalitres (ML). Where a reported volume is negative, it is shown in brackets. The applicable reporting period is from 1 July 2016 to 30 June 2017, with comparative reporting periods shown for 1 July 2013 to 30 June 2014, 1 July 2014 to 30 June 2015, and 1 July 2015 to 30 June 2016.

Recognition of water assets and water liabilities

Only water that is held or managed by the State or Territory licensing authority or the urban utilities and from which a future probable benefit can be derived by stakeholders of the region is defined as a water asset.

Water liabilities are constituted by present commitments to supply water, the discharge of which is expected to result in a probable decrease of the region's water assets or a probable increase in another water commitment to supply water.

Provided its volume can be quantified in a way that is complete, neutral, and free from material error, the volume of the water asset or water liability is recognised in the Statement of Water Assets and Water Liabilities.

Water held in storages that has already been abstracted from the entitlement system is deemed not to be part of the region (regardless of the storage's size or connection to the system). This is because the attendant water right has already been exercised.

Recognition of changes in water assets and water liabilities

The increases and decreases to the reported water assets and water liabilities consist of changes that can be quantified in a way that is complete, neutral, and free from material error. These volumes are presented in the Statement of Changes in Water Assets and Water Liabilities.

Precipitation and evaporation are recognised only in relation to the surfaces of open storage volumes. They do not represent all precipitation and evaporation within the region (notably, these processes occurring from the landscape are not captured).

That portion of runoff that flows into the surface water store (storages and rivers) is quantified and recognised in the Statement of Changes in Water Assets and Water Liabilities. This runoff includes precipitation captured in the catchment, less evaporation and infiltration, and is recorded as Runoff to surface water.

Allocation announcements on regulated entitlements have been recognised as increases in water liabilities. Note that the definition of regulated or unregulated entitlements for the purpose of the National Water Account (refer to 'Glossary') may be different to the meaning applied by the jurisdiction. Please refer to the Water markets note for more information on the allocations.

Water assets and water liabilities that fail the recognition criteria

The volumes of several water assets and water liabilities identified in the Canberra region were not reported in the water accounting statements but replaced by dashes ('–') as they 'failed the recognition criteria' specified in the Australian Water Accounting Standard 1, because:

- they could not be quantified in a way that is complete, neutral and free from material error; and/or
- they were unlikely to provide a future benefit to the region or the region's stakeholders.

Water assets that failed the recognition criteria include groundwater aquifers (see Supplementary information note).

Changes to water assets and water liabilities that fail the recognition criteria

The volumes of several changes to water assets identified in the Canberra region were not reported in the water accounting statements but replaced by dashes ('–') as they 'failed the recognition criteria' specified in the Australian Water Accounting Standard 1, because:

- they could not be quantified in a way that is complete, neutral, and free from material error; and/or
- they were unlikely to provide a future benefit to the region or the region's stakeholders.

The volumes that failed the recognition criteria include diversions for other statutory rights, leakage to landscape, river and floodplain losses, inter-region groundwater flows, and groundwater recharge and discharge to landscape (see Supplementary information note).

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