ACT Government

ACT WATER REPORT 2014–15

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INTRODUCTION

Canberra occupies an important place as the largest urban centre in the Murray–Darling Basin. As a responsible member of the Murray–Darling Basin community the ACT Government is working to achieve long-term water security and be an effective steward of our water resources.

The city is coming to a watershed in terms of its management and use of water. The continuing health and prosperity of the Canberra community and the environment depend on the successful management of water resources.

The ACT Government is placing a priority on managing both water supply and water quality across all water catchments in and adjacent to the ACT. With a growing population and diverse land uses, it is vital manage ACT waterways and aquifers continue to be managed to support sustainable development and viable ecosystems.

The ACT Water Report 2014–15 continues the series of annual summaries of water resource management and water quality in the ACT. This summary report provides additional information on the management of ACT water resources and how they fit into obligations under the Murray–Darling Basin Agreement. The report details the climatic events that have influenced the supply of water to the Territory as well as the quality of water in streams and water bodies.

At a high level, the information indicates that water quality overall across the Territory's streams, lakes and other water bodies is meeting acceptable national standards, with only short-term closures to some water bodies.

This does not mean there is room for complacency. Urban lakes, particularly Lake Burley Griffin and Lake Tuggeranong, suffer from algal blooms during the warmer months that seriously diminish their amenity for users and nearby residents. Elevated nutrient levels in streams flowing into Lake Burley Griffin are contributing to algal blooms, which have significant consequences for the utility and amenity of the lake as the centre piece of the national capital. Projects such as the Basin Priority Project are guiding the selection, design and implementation of new infrastructure and water systems that will reduce the level of nutrients and pollutants entering Canberra's lakes and waterways, and improve the overall health of the Murrumbidgee River system.

The ACT Government is committed to working to improve the water quality of our urban lakes in partnership with the community and the National Capital Authority, which has responsibility for Lake Burley Griffin. There will be no 'quick fixes' and any actions to address water quality will be founded on the best available science, and that this science based on the best available information, as is presented in this report.

PURPOSE

The ACT Water Report 2014–15 (the Report) provides the Australian Capital Territory community with information on the state of the ACT's water resources from 1 July 2014 to 30 June 2015.

The Report highlights legislative, regulatory and governance changes relating to water, outlines rainfall and climatic conditions, volumes of water and its use, water quality and biological condition, Icon Water's function and performance, strategies and a measure against their targets, and related research and projects taking place in the ACT and region.

SCOPE

This report covers the reporting period's 2014–15, with reference to historic conditions where appropriate.

The Report focuses on the governance of waterways of the ACT including the management of licensing and extraction of water from Lake Burley Griffin, which was previously a Commonwealth responsibility managed by the National Capital Authority. The condition of Lake Burley Griffin is presented in the National Capital Authority's annual report. For information relating to Lake Burley Griffin, contact the National Capital Authority on 6271 2888 or visit http://www.nationalcapital.gov.au.

Information relating to drinking water quality of the mains water supply is the responsibility of Icon Water and the Chief Health Officer, and is not included in this Report. For information relating to mains water supply, contact ActewAGL on 13 14 93 or visit http://www.actewagl.com.au. See the Chief Health Officer's Report at http://health.act.gov.au/c/health?a=&did=10062776.

ACKNOWLEDGEMENT OF THE TRADITIONAL OWNERS

The ACT acknowledges and pays respect to the Traditional Owners and their Nations of the ACT. The contributions of earlier generations, including the Elders, who have fought for their rights in natural resource management are also valued and respected.

The ACT recognises and acknowledges that the Traditional Owners and their Nations in the ACT have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. The ACT understands the need for recognition of Traditional Owner knowledge and cultural values in natural resource management associated with the ACT. Further research is required to assist in understanding and providing for cultural flows. The ACT supports the belief that cultural flows will provide beneficial outcomes for Traditional Owners.

The approach of Traditional Owners to caring for the natural landscape, including water, can be expressed in the words of Ngarrindjeri elder Tom Trevorrow: "*our traditional management plan was don't be greedy, don't take any more than you need and respect everything around you. That's the management plan—it's such a simple management plan, but so hard for people to carry out.*"[1]

This traditional philosophy is widely held by Traditional Owners and respected and supported by the ACT.

1 Tom Trevorrow (2010) Murrundi Ruwe Pangari Ringbalin "River Country Spirit Ceremony: Aboriginal Perspectives on River Country".

HIGHLIGHTS

The ACT's net water diversion figures dropped to 17.3 GL during 2013-14, and 15.4 GL during 2014–15, representing a saving of up to 50% relative to 1993–2002 levels. The careful management of permanent water conservation measures together with water restrictions in drought periods have created an adaptive community that continue to use water resources responsibility and sustainably.

Under the ACT Water Strategy 2014–44: Striking the Balance, 7 of the 18 Implementation Plan 1 actions have been completed.

- **Action 1.1 - Establish new catchment management arrangements and mechanisms for stronger cross-border collaboration.**
  - Completed - ACT and Region Coordination Group established as a statutory body.
- **Action 5.2 - Undertake research and trials for improving water quality and ecosystems.**
  - Completed - Final reports available.
- **Action 7.1 - Enhance regulatory functions in relation to risk assessment, enforcement, stakeholder engagement and monitoring.**
  - Completed - Amendments to offence provisions notified.
- **Action 7.2 - Complete a review of the *Environment Protection Act 1997* to strengthen enforcement provisions within the Act and to enable consideration of both actual and potential environmental harm.**
  - Completed - Legislative amendments competed as required.
- **Action 9.2 - Monitor, assess and actively manage stormwater impacts and review asset performance and management.**
  - Completed - TCCS (formerly TAMS) has recently recruited to facilitate this process. Marsden Jacobs report, Alternate Management and Funding Models for Sustainable Operation and Maintenance of Sustainable Water Quality Assets, identified a number of improvements to existing arrangements such as developing a financial framework that records operation, maintenance and refurbishment costs for stormwater water quality assets and developing a performance management reporting framework.
- **Action 16.1 - Review the ACT guidelines for Recreational Water Quality, taking into account the latest version of the NHMRC guidelines for managing risks in recreational waters.**
  - Completed - Guidelines revised in October 2014.
- **Action 16.2 - Refine and develop new communication tools (Web, App etc) to provide public information and advice on water quality for recreational use to reduce risks to public health.**
  - Completed - Upgraded information on ACT Government and National Capital Authority websites available (2015).

In 2015 the ACT fulfilled its commitment to provide 2 GL of water to the Living Murray Initiative. The Living Murray Initiative is a major investment by the Governments of NSW, Victoria, South Australia, ACT and the Commonwealth to improve the environmental health of the Murray River. A total investment of $700 million has been made to recover water at six significant ecological sites along the Murray.

Legislation was passed that handed over the responsibility and management, but not ownership, of Lake Burley Griffin from the Commonwealth to the ACT. This change enables the ACT to manage and account for all water used throughout the Central Molonglo catchment which Lake Burley Griffin resides.

Under the requirements of the Murray-Darling Basin Plan the ACT will be required from 2019 to adjust to a total water consumption volume of 42.5 GL. Through good management and a change in the communities approach to water conservation, the ACT has already reached and is maintaining 2019 Murray–Darling Basin water consumption targets.

The rain gauge at the Canberra Airport recorded below average rainfall for 2014-15, however, rainfall throughout the whole territory was above average providing a small increase in the four storage reservoirs from the previous year.

1. LEGISLATION AND REGULATION

Since the establishment of self-government in 1989 the ACT Government has actively managed its water resources. Commonwealth legislation established the land tenure system and land use system through the National Plan, which in turn affects the use of water resources.

The *Seat of Government Acceptance Act 1909* (Cwlth) provided for the ratification of an agreement between the Commonwealth and NSW for the surrender of territory by NSW for the Seat of Government, with the Commonwealth gaining paramount rights to the waters of the Queanbeyan and Molonglo Rivers and their tributaries (in NSW) to establish the Australian Capital Territory.

The Commonwealth developed the waters of the Queanbeyan River for the purposes of urban water supply for the ACT through the construction of the Googong Dam, completed in 1979. Through the Commonwealth *Canberra Water Supply (Googong Dam) Act 1974*, the Territory Executive exercises the rights to the waters of the Googong Dam Area; this includes any necessary releases from the Googong Dam. The *Canberra Water Supply (Googong Dam) Act 1974* also requires that environmental needs be taken into account in water resources management.

Under the agreement, NSW has continuing obligations to not pollute the waterways and to protect the whole river's course from pollution before it enters the ACT.

Under the *Canberra Water Supply (Googong Dam) Act 1974* (Cwlth) the Commonwealth and now the Territory regulates the use and disposal of water from the Googong Dam Area. The Act provides that waters from the Googong Dam Area are primarily and principally for use in the ACT, although water can be supplied to places in NSW subject to Commonwealth agreement. The ACT has overall management responsibility for water supply and land management within the Googong Dam Area. It also has power to carry out works in NSW necessary for Territory water supply. Under the legislation the Googong Dam was built on the Queanbeyan River on land acquired by the Commonwealth. The Act defines the Googong Dam Area as 5000 hectares of land comprising the dam and its foreshores, within the larger catchment area identified by the *Seat of Government Act 1909*.

Ownership of the Googong Dam Area and the Googong Dam is held by the Commonwealth but the ACT maintains control under a 150 year lease arrangement established in 2008. The ACT Government has subsequently granted a sublease to Icon Water (formerly ACTEW) for the Googong Dam and related infrastructure area.

Water within the ACT is governed largely by two legislative Acts, the *Water Resource Act 2007* that manages all water resources in the ACT and the *Environment Protection Act 1997* that helps reduce and eliminate the discharge of pollutants into water.

The ACT *Water Resources Act 2007* (WR Act) is the governing legislation for managing water resources in the ACT, including the sustainable management of those water resources. The water resources include all waters of the Territory as well as the surface and groundwater on National Land (which includes Lake Burley Griffin, Majura Field Firing Range and CSIRO land under the *Australian Capital Territory (Planning and Land Management Act) 1988* (Cwlth)) and the surface water of the Googong Dam Area.

The WR Act is administered by the Environment Protection Authority (EPA). The WR Act defines access rights to surface and groundwater resources, environmental flow provisions, water licensing requirements, resource management and monitoring responsibilities and sets penalties for improper actions.

Protection of environmental flows is the guiding principle of the Act. Environmental flows are defined in the Environmental Flow Guidelines, which is a legislative instrument under the WR Act, and embody the ecological sustainable development precautionary principle. These guidelines set out the volumes and timings of environmental flows and abstraction limits in streams, rivers, lakes, and aquifers. In the ACT, water can only be used for other purposes once environmental flow requirements are met.

The WR Act provides for the establishment of a system of water entitlements and licences for water users in the ACT, enabling access specifically to water (separate from land ownership). This, in turn, leads to the potential development of a water market, a major driver of the operation of the Murray–Darling Basin Plan (Basin Plan). The ACT currently has a small internal market confined mainly to trades where water rights (e.g. access to water through a bore on the property) are sold when the related property is sold.

1.1 THE TERRITORY PLAN

The *Planning and Development Act 2007* provides for the Territory Plan. Volume 2 of the Territory Plan, General Code 1.8 Water Use and Catchment General Codes, sets the permitted uses and protected environmental values for the waterways of the ACT. The Territory Plan identifies three types of catchments: drainage and open space, water supply and conservation. For streams, lakes and rivers within each of these catchment types, the Territory Plan identifies a set of values e.g. maintenance of ecosystems, recreation and water supply. This set includes a primary value and a range of other permitted uses, which are generally compatible with, but secondary to, the primary value. These permitted uses specified in the Territory Plan can be used, with the water quality standards, to determine the water quality required for each water body.

The Water Use and Catchment General Codes are to be reviewed by the end of 2016.

Table 1: Water legislation

Legislation	Key water-related responsibilities
Water Resources Act 2007 and related instruments	The governing legislation for the sustainable management and use of water resources within the ACT. Water access rights, water sharing, environmental flow provisions, water licensing requirements, resource management and monitoring responsibilities; and sets penalties for improper actions.
Environment Protection Act 1997	Regulates development, industry for water quality purposes
Environmental Protection Regulations 2005	Water quality standards (read in conjunction with the Territory Plan)
Environmental Flow Guidelines 2013	Outlines environmental flow requirements
Utilities Act 2000	Provides for the ICRC to issue licences and determine industry codes, and is the statutory basis for the imposition of temporary water restrictions and the permanent water conservation measures scheme
Planning and Development Act 2007	Includes water-related regulations e.g. water-sensitive urban design, environmental values, plans of management and land management agreements.
*Nature Conservation Act 1980** and *Nature Conservation Act 2014*	Preserves, conserves and enhances the biodiversity of the ACT Provides action plans and research and monitoring programs for threatened species (flora and fauna) and ecosystems.
Independent Competition and Regulatory Commission Act 1997	Sets water and sewerage pricing, utility performance standards and investigates water industry matters

1.2 WATER RESOURCE ACT 2007

The ACT's *Water Resource Act 2007* (the WR Act) is the overarching governing legislation that provides a framework for the sustainable management of the Territory's water resources. The WR Act is the framework that controls how people living and working in the Territory use water directly from water bodies including groundwater aquifers. The WR Act aims to balance present day household, industrial and agricultural use of water while protecting local ecosystems by conserving the resource to meet the reasonable future needs of the community. The WR Act provides a mechanism to protect aquatic ecosystems and aquifers from damage, and reverse damage where required.

All water use of the Territory's water bodies including streams, dams or groundwater is controlled by the WR Act. The WR Act and its regulations contain arrangements for the management of the Territory's water resources. They identify, for each water management area in the ACT, how much water is required to maintain river systems and associated ecosystems and how much is available to issue entitlements for off-stream use.

While the WR Act applies to water that Icon takes from rivers and streams, it does not apply to the use of water by Icon's mains supply customers, water collected in rainwater tanks, or the on-site use of wastewater.

There were no amendments to the WR Act through the 2014–15 reporting period, but the *Water Resource Amendment Act 2013* was passed by the Legislative Assembly on 21 August 2013. The amendments are:

- Licence to take water – where water may be taken
- Offences – do bore work without licence
- Offence – do waterway work without licence
- Offence – contravening licence conditions
- Offence – water meter tampering
- Exemption from requirement for water access entitlement—road works, earthworks, construction or landscaping

Environmental flows

The most important principle of the WR Act is the protection of environmental flows throughout the Territory. The WR Act requires water to be provided to the environment prior to the allocation of water to other purposes, including consumptive use. The Environmental Flow Guidelines (Guidelines), a subordinate instrument under the WR Act, ensures the volumes and timing of environmental flows in streams, rivers, lakes and aquifers are met to maintain river systems and associated ecosystems health (known as environmental flows).

The Guidelines apply to all Territory water resources and identify the ecological values to be protected and the measures to be employed to protect them. In the Territory, this is generally achieved by limiting the amount of water that can be extracted from a waterway in a way that protects flow variability and low flows. In selected high use catchments the Guidelines specifically identify actual flow levels that must be maintained in certain conditions. The Guidelines were reviewed during 2011–12 and are required to be reviewed every five years.

Current Environmental Flow Guidelines

Water sensitive urban design

Water Sensitive Urban Design (WSUD) is a way of planning our cities to minimise storm water runoff and minimise the damage caused by runoff. It is also about wise use of that water to improve our urban environment. For the ACT it is about working with communities and industry to plan, design, construct and retrofit urban landscapes towards a more sensitive natural water cycle.

In August 2014 the ACT Government released the WSUD review report, which emphasises the importance of WSUD in our environment to manage our urban water cycle, encourages whole-of-government coordination to achieve better on-ground outcomes at reduced costs, and addresses implementation of report recommendations.

Major recommendations include significantly expanding the current measures to achieve the stormwater quality and quantity targets, including a 40% reduction in water usage in new developments and refurbishments/extensions when compared with pre-2003 levels, and providing maximum flexibility to developers in how they implement WSUD, which will help them lower development costs. The ACT Government has supported the findings and recommendations of the review. The report's recommendations complement the Territory's commitment to ensure urban development does not unacceptably impact on the health of our streams and lakes.

Canberra's Inner-North Reticulation Network is a prime example of water sensitive urban design and is highlighted on page 89.

1.3 ENVIRONMENT PROTECTION ACT 1997

The ACT's Environment Protection Act 1997 provides the regulatory framework to help reduce and eliminate the discharge of pollutants into the air, land and water. The Environment Protection Act is a framework that establishes the EPA and provides for instruments like environmental authorisation. The Environment Protection Regulation 2005 is a subordinate instrument that contains rules and standards about specific aspects of the environment, such as water quality standards. Environment Protection Policies have been designed to help the community understand the Environmental Protection Act and Environmental Protection Regulation 2005 and sets out general offences in the Act which carries substantial penalties and provides guidance on meeting legislative requirements.

For 2014–15 no amendments were made to the *Environmental Protection Act 1997*.

Water management areas

The Water Resources (Water management areas) Determination 2007 (No 1) is another instrument that assists with surface water and groundwater management in the ACT. The instrument details the areas (boundaries) used for water management in the ACT. They are either single sub-catchments or a group of adjacent, hydraulically connected sub-catchments.

The Water Management Areas (WMA) instrument puts the principles and controls contained in the Guidelines into practice by detailing the surface water and groundwater available for extraction from each WMA. The management of each WMA is dictated by the primary environmental value of the subcatchments within that WMA. Subcatchments within the ACT boundaries are assigned one of three potential primary environmental values:

- Conservation
- Water supply
- Drainage and open space

The Determination recognises the highly connected nature of surface and groundwater and includes water reserved for future use. These measures ensure the Territory's water resources are managed sustainably. WMA and the Guidelines Instruments currently comprise the ACT Water Sharing Plan.

Within each WMA, maximum surface water plus groundwater abstractions were set.

Table 2: WMA resources

Water Management Area	Total Water Resource (ML)	Environmental allocation (ML)	Total water available for extraction (ML)
Central Molonglo	24,489	18,609	7,832
Cotter	145,702	34,294	111,408
Ginninderra	19,895	11,746	5,352
Googong	103,164	4,250	98,914
Gudgenby	50,522	46,569	3,558
Lower Molonglo	15,932	10,594	3,304
Lower Murrumbidgee	17,223	15,728	29,925
Naas	38,554	35,619	2,641
Paddys	39,799	36,571	2,905
Tuggeranong	7,909	4,860	1,461
Upper Molonglo	1,274	1,160	102
Upper Murrumbidgee	27,482	24,408	2,517
Total	**491,967**	**244,422**	**272,927**

The management policies for each type of catchment are detailed in section 11.8 of the Territory Plan 2008.

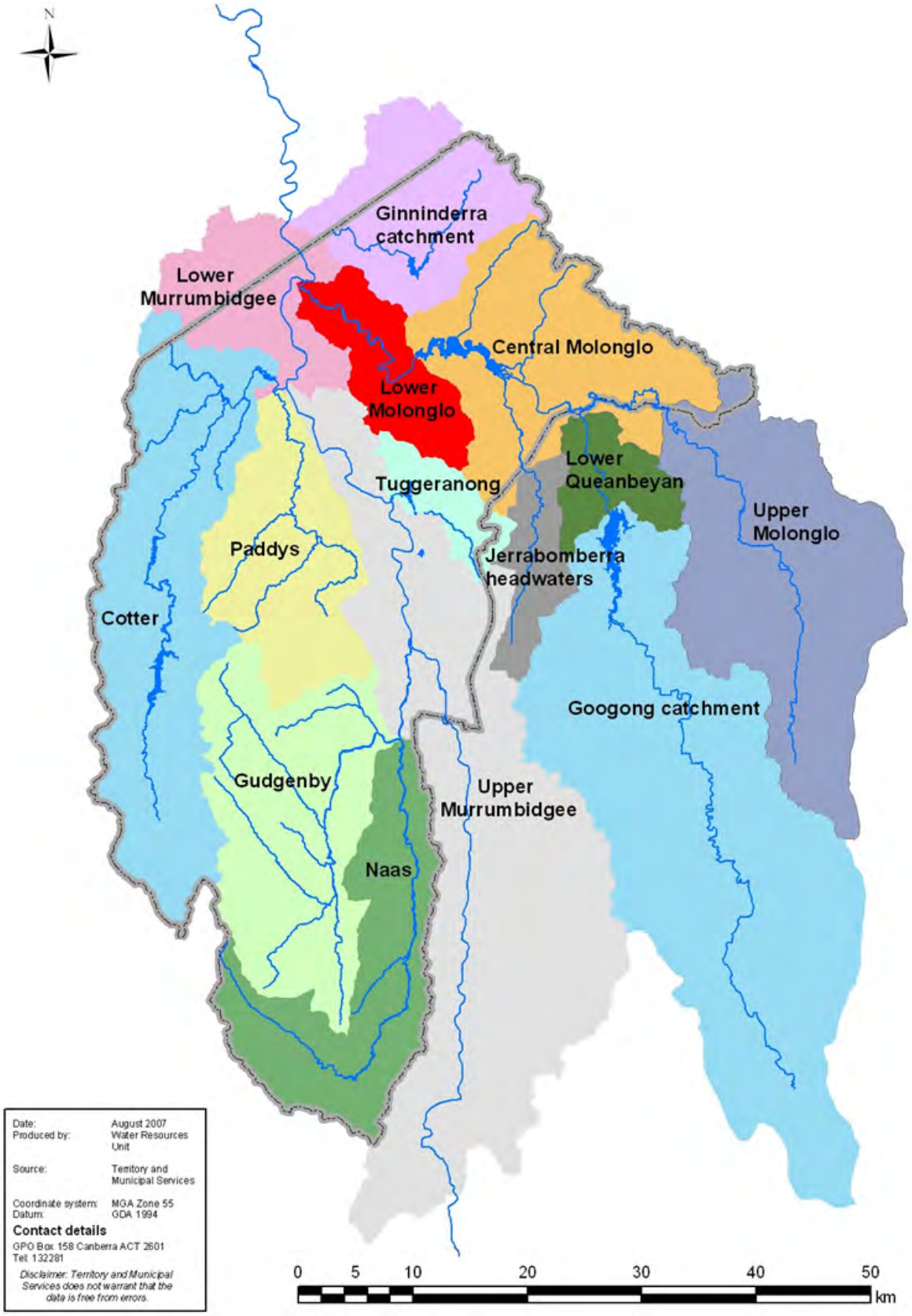
Extraction regulations

The WR Act makes it clear that control of all water use in the Territory, including from streams, dams or groundwater, is vested in the Territory. Under the WR Act it is a requirement to hold a Water Access Entitlement (WAE) before a Licence to Take Water can be issued. A WAE is a right to a share of surface water or groundwater within a water management area. A WAE is generally a tradable commodity. A licence to take water is required to physically extract the water specified by a WAE. The licence to take water states the location and conditions from which water can be taken and used. A licence to take water is not a tradable instrument in the ACT.

Icon Water holds a licence to take water and so Icon Water customers are not required to hold a licence when using water supplied by Icon Water. The taking of surface water for stock and domestic purposes, where water is collected from the lessee's property or where their property directly abuts a waterway, does not require a licence. The WR Act does not require a licence for the use of water collected in rainwater tanks, or the on-site use of waste water.

Details of legislation, environmental flows and fact sheets on specific water allocation uses can be found at http://www.environment.act.gov.au/water or by calling Canberra Connect on 13 22 81.

Figure 1: ACT Water Management Areas



1.4 WATER EFFICIENCY AND LABELLING SCHEME

The Water Efficiency Labelling and Standards (WELS) scheme was established in 2005 under the Commonwealth *Water Efficiency Labelling and Standards Act 2005* (the WELS Act). It is a cooperative legislative arrangement with all states and territories.

The objectives of the WELS Act are:

- to conserve water supplies by reducing water consumption
- to provide information for purchasers of water-use and water-saving products
- to promote the adoption of efficient and effective water-use and water-saving technologies.

The scheme aims to address these objectives by requiring registration and applying labels to water-using products for water efficiency, providing consumers with information so they can consider water efficiency in their purchasing decisions. The scheme also sets minimum water efficiency standards (WES) where appropriate.

The scheme applies to plumbing products (showers; tap equipment; flow controllers); sanitary ware (toilet/lavatory equipment, urinal equipment) and whitegoods (clothes washing machines, dishwashers).

In 2015 a second independent review of the WELS Scheme found the scheme had already achieved, and is likely to continue to meet the three main objectives.

Organisations responsible for water management

The legislation governing the waters of the ACT also direct the responsibilities of functions to various organisations. The responsibilities that are responsible for water management within the Canberra region are detailed in Table 3.

Table 3: Organisations responsible for water management in the Canberra region during 2014–15

Organisation	Responsibility	Major storages operated within the region
ACT Government, Environment and Planning Directorate (EPD)	• manage ACT water resources • approve water trades within and outside the ACT • grant water entitlements • manage and monitor environmental flows	• n/a
Icon Water	• manage urban water supply • manage and maintain water supply infrastructure • operate 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	• manage the environment • manage water quality, water pollution and water treatment • conserve and manage wetlands • secure water for the environment	• n/a
NSW Office of Water also Water NSW (new body)	• set policy and necessary legal instruments and oversee mechanisms to manage water within NSW	• n/a
ACT Government, Territory and Municipal Services	• plan and manage ACT's parks, reserves, forestry plantations and public domains	• Lake Ginninderra • Lake Tuggeranong
National Capital Authority	• manage Lake Burley Griffin	• Lake Burley Griffin
Queanbeyan City and Palerang Regional Council	• distribute urban water in Queanbeyan region • distribute urban water in Captains Flat	• n/a • n/a

2. THE GEOGRAPHIC FEATURES OF THE ACT

When reading the ACT Water Report it is critical to note the ACT broadly consists of two physiographic regions: the south-west dominated by the Brindabella Mountain Range and the Australian Alps; and the north-east portion, the Werriwa Tablelands, which comprise upland plains with separate upland hills and basins. The establishment and planning of the ACT was on the provision of adequate water resources for Australia's Federal seat of government. The location of the ACT in the Upper Murrumbidgee River and the subsequent purpose of the Territory's water use affect how and how much water resources are used. The ACT is for the most part not a rural area of the Basin. Its land use is predominantly national parkland with a large urban and administrative centre.

2.1 ACT CATCHMENT CHARACTERISTICS AND INFLUENCES

Climate

The climate is essentially continental, with hot summers and cold winters and typical of the south eastern Murray–Darling Basin. Rainfall is fairly evenly distributed throughout the year, although the winter months are slightly drier and the spring months slightly wetter. Mean annual precipitation in the ACT ranges from 950 mm in the mountains to 600 mm in the city area. In common with the rest of inland Australia, the region experiences extended drought periods, although summer rainfall tends to occur as storms, with more prolonged, but gentler, rainfall in winter.

The main catchments of the ACT are based on the Brindabella range in the west of the ACT and the Tinderry range in the south-east. The main rivers are:

Murrumbidgee River

From its main headwaters (now Tantangara Dam in Kosciuszko National Park), the Murrumbidgee River flows south-east before turning north, being joined by the Numeralla River and following a strikingly linear path to enter the ACT at Angle Crossing. Extending for about 60 km in the ACT, the river re-enters New South Wales north of Uriarra Crossing.

Cotter River

The Cotter River is a subsidiary of the Murrumbidgee River and is the major source for urban water supply for Canberra with the Cotter, Bendera and Corin dams. Close to its confluence with the Murrumbidgee River near Casuarina Sands, the Cotter is joined by Paddys River (a tributary of Tidbinbilla River).

Molonglo River

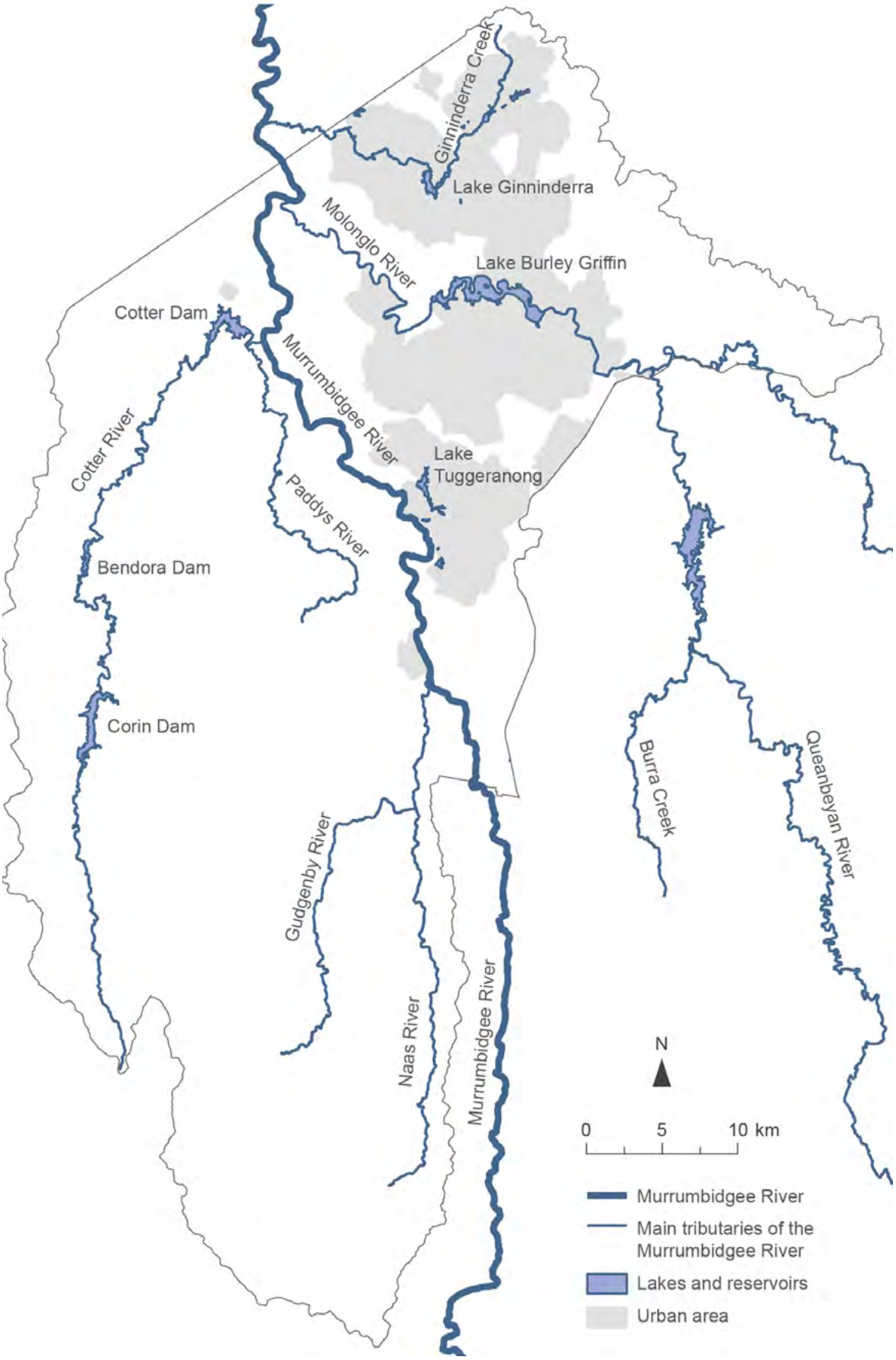
The Molonglo River joins the Murrumbidgee River near Uriarra Crossing. The river has a relatively large catchment extending east to Captains Flat with the Queanbeyan River (NSW) and Jerrabomberra (mostly NSW), Woolshed, Sullivans, Yarralumla and Weston creeks being major tributaries. The urban development of Canberra has extensively modified serveral of these streams of the ACT. Flow in the Molonglo River has been significantly altered by the construction of both Scrivener Dam and Googong Dam (on the Queanbeyan River tributary). Lake Burley Griffin (is the responsibilty of the Commonwealth Government)is part of the Molonglo River system and a number of creeks from urban areas feed into the Lake.

Queanbeyan River

The Queanbeyan River rises at an altitude of approximately 1300 m in the Tinderry Range southeast of Canberra and flows for some 90 km before entering the ACT just before its confluence with the Molonglo River. The total catchment area of the river is approximately 96,000 hectares (Queanbeyan City Council 1998). The river flows through predominantly dry sclerophyll forest in the upper catchment, with grazing becoming more common as the River approaches Queanbeyan. The mean annual flow of the river is approximately 114 GL. The Queanbeyan River flows into the Googong Dam, a major water storage system for the ACT.

Figure 2: The ACT rivers and lakes

Source: http://reports.envcomm.act.gov.au/actsoe2015/the-report/7-biodiversity/7-3-indicators/index.html



Land Use

Land use is an important determinant of the pattern and quantity of runoff as well as the nature of constituents transported by that runoff. A change in land use from rural to urban may have significant impacts on the pattern of streamflow and water quality of local waters. Urban land use is concentrated within the Canberra and Queanbeyan urban areas of the region. Much of the ACT is designated as national/nature park land use, which has in general led to the preservation of the upper Cotter River catchment for water supply. However, the Territory's urbanisation and urban expansion has led to large areas of land being modified for urban development and to increasing demands on limited water resources, including more water for domestic use, irrigation and water-based recreation. There are also community pressures to ensure the scenic and ecological values of the lakes and waterways are preserved.

Soils

Soils and vegetation have a significant role in enhancing and moderating precipitation and flow through the landscape.

Many of the soils of the upper Murrumbidgee Basin have duplex profiles, with coarse-textured surface horizons and clay rich sub-soils. The dispersive clays of these soils are easily eroded and yield high sediment and turbidity levels. This is most pronounced in the gently sloping depression subject to soil moisture saturation. The problem of erosion is aggravated by disturbance of vegetation and soil. The most erodible soils are on steeper, cleared slopes and river bank areas.

Undisturbed areas such as forested mountain slopes yield little material unless modified by logging operations or severe bushfires. Land use is the dominant factor determining the export of material such as soil, nutrients and soluble salts from catchments. Runoff from the valley systems inevitably affects water quality of the Murrumbidgee and its tributaries. The impoverished nature of the Southern Tablelands soils and moderately dispersive nature of the soils results in naturally elevated turbidity of rural streams. In the ACT, most of the rural catchments are well vegetated and as a result of evaporation exceeding rainfall not subject to waterlogging. Little of the sloping land is cleared. Gulleying and sheet erosion occurs upstream of the ACT to a much larger extent than in the ACT.

Vegetation

Vegetation is a significant determinant of water quality. It provides protection against soil erosion, intercepts precipitation and modifies soil composition. Vegetation types depend particularly on climate, topography and soils. In the ACT region, several vegetation patterns occur:

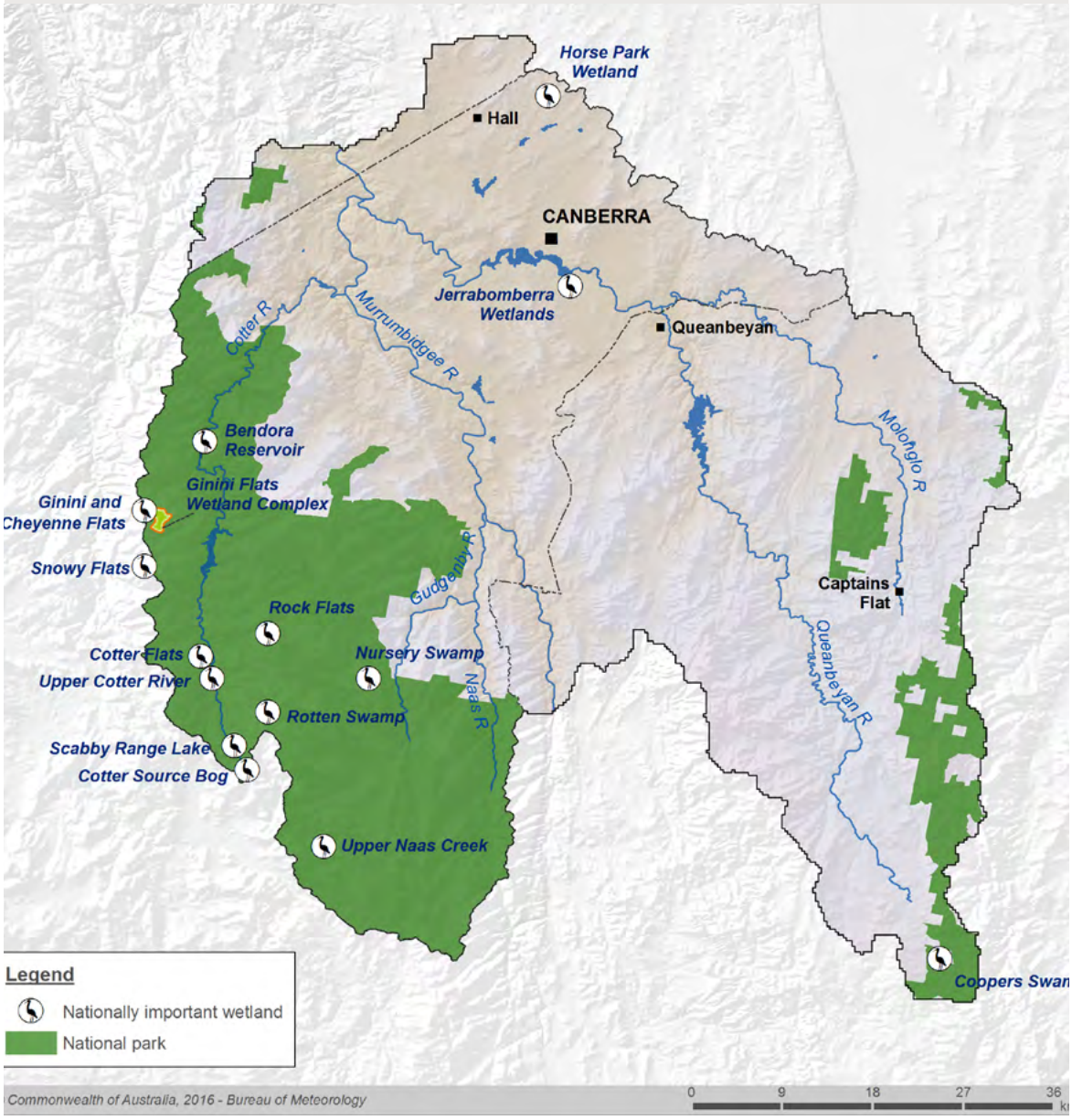
- Tall open forest (wet sclerophyll): trees above 30 m tall; found in mountain areas, occurring on cool moist slopes (excluding the most exposed ridges) and in the mountain valleys. Typical of Namadgi National Park and visible from Canberra on the Brindabella Range.
- Open forest (dry sclerophyll): trees from 10–30 m tall which form a community at lower altitudes and under drier conditions. The most extensive areas occur on the lower Cotter River and the Bullen Range and are visible from Kambah Pool.
- Woodland (savannah): scattered trees 10–30 m tall; common throughout the tableland areas at lower altitudes on warm, dry, undulating to hilly terrain. Typical of the Naas Valley, with a prominent urban example being the lower slopes of the Ainslie–Majura reserve.
- Pine plantations: extensively modified areas, generally undulating to hilly country with major concentrations in the lower Cotter Valley, Mount Stromlo and Kowen.
- Grassland: occurs naturally in relatively few locations, usually wet alluvial flats or frost pockets where conditions are unfavourable for tree growth. Natural examples are the Orroral Valley and parts of the naval radio station in Belconnen. Many grasslands result from the clearing of woodland or forests. Pasture improvement, which has largely replaced native grasses with introduced species, is characteristic of the north-eastern third of the ACT including the urban areas.
- Sub-alpine complex: occurs under the most extreme cold and exposed conditions above 1500 m on the ridges and peaks. Within the ACT this is restricted to numerous small pockets, particularly in the south-western parts of Namadgi National Park.

2.2 SIGNIFICANT AQUATIC ECOSYSTEMS

The Murray-Darling Basin Plan specifies that development of the ACT Water Resource Plan requires measures to be developed that will contribute to the achievement of specified water quality objectives that include declared Ramsar wetlands and other water dependent ecosystems.

The only Ramsar wetland site in the ACT is the Ginini Flats Wetland Complex, located in the Namadgi National Park at the top of the catchment with no upstream regulating structures. It is made up of a series of interconnected flats known as Ginini Morass and Cheyenne Flats. The Ginini Flats complex comprises a mosaic of bog, wet heath, wet herb-field, sedge-land, dry heath, and tall wet heath surrounded by sub-alpine snowgum woodland. It is used for conservation, catchment management, education and recreational activities. It is in the upper sources of the Cotter River system. The site is also part of the identified environmental assets of the Basin. The Ginini Flats Wetland has a specific management plan included in the draft ACT Sphagnum Bogs and Fens Management Plan (ACT Govt, 2015b). As the wetland is in a National Park and take (i.e. water extraction) is not allowed, the wetland is considered to be a low risk, but still has risks from climate change, pest animals, diseases, weeds, etc.

Figure 3: Nationally important wetlands



There a number of other nationally important wetlands in the ACT (Dept of Environment, 2001). Ten of the 13 wetlands listed in below (eight of which are in the Upper Cotter River and two in the Upper Naas and Gudgenby rivers respectively), are unregulated in any form and hence no take is allowed. The remaining three are impacted by urban development and impacts on the water cycle, such as Bendora Dam and Jerrabomberra Wetlands. The Ginini and Jerrabomberra wetlands have their own plans of management (ACT Govt, 2010f and 2012e).

Table 4: Nationally important wetlands in the ACT, which includes the Ramsar site Ginini and Cheyenne Flats (criteria 1, s 8.05 (2a))

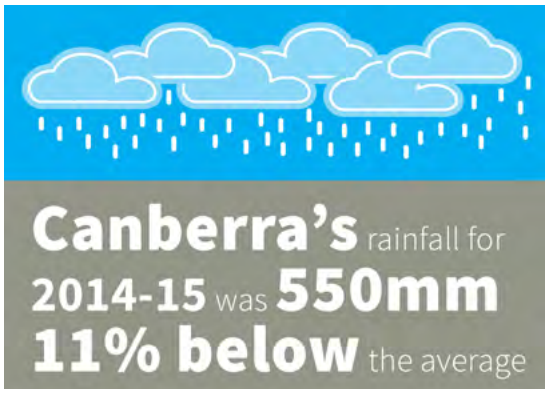
Wetland name	Area (square km)
Cotter Flats	0.41
Ginini and Cheyenne Flats	1.25
Rock Flats	0.12
Rotten Swamp	0.30
Scabby Range Lake	0.05
Snowy Flats	0.35
Upper Cotter River	6.00
Upper Naas Creek	0.53
Bendora Reservoir	0.81
Horse Park Wetland	0.40
Jerrabomberra Wetlands	1.74
Nursery Swamp	0.53
Cotter Source Bog	0.05

Source: Department of Environment (2001)

3. 2014–15 CLIMATE AND FLOW CONDITIONS

The urban area of the ACT experienced below average rainfall and inflows during 2014–15, including a particularly dry period from July to November. However, 2014–15 also experienced a wet summer, which resulted in a reduction in annual water consumption across Canberra and Queanbeyan. The Canberra region received a marginal increase in rainfall compared to the 2013–14 year.

3.1 RAINFALL



The rainfall at Canberra airport (station 70351) was 11% below the long-term average and total evaporation was 3% above the long term average.

More broadly, the total area-averaged rainfall over the Canberra region during the 2014–15 year was 824 mm, which is above the long-term area-averaged rainfall of 795 mm (period 1900–2015). Annual rainfall was more than 900 mm near the eastern and western region boundaries, and between 600–900 mm elsewhere. Rainfall peaked at more than 1200 mm in a small pocket in the southeast. This resulted in the total inflows to the four storage reservoirs totalled 148 GL, which is 5% above the average of the last 15 years. As a result the ACT's water storage reservoirs remained at a healthy 79%, a small increase on the 77% storage recorded at the end of 2013–14.

Rainfall can be quite localised throughout the ACT with readings taken at Tyson Street in Ainslie (station 70000), within 5 km of the airport gauge, receiving 152 mm of additional rain compared to ACT's official airport gauge for the 2014–15 period.

Table 5: Total rainfall at the Canberra airport (station 70351)

Total Rainfall (mm)	Long term average rainfall	Evaporation (mm)	Total reservoir capacity
550	618	1747	79%

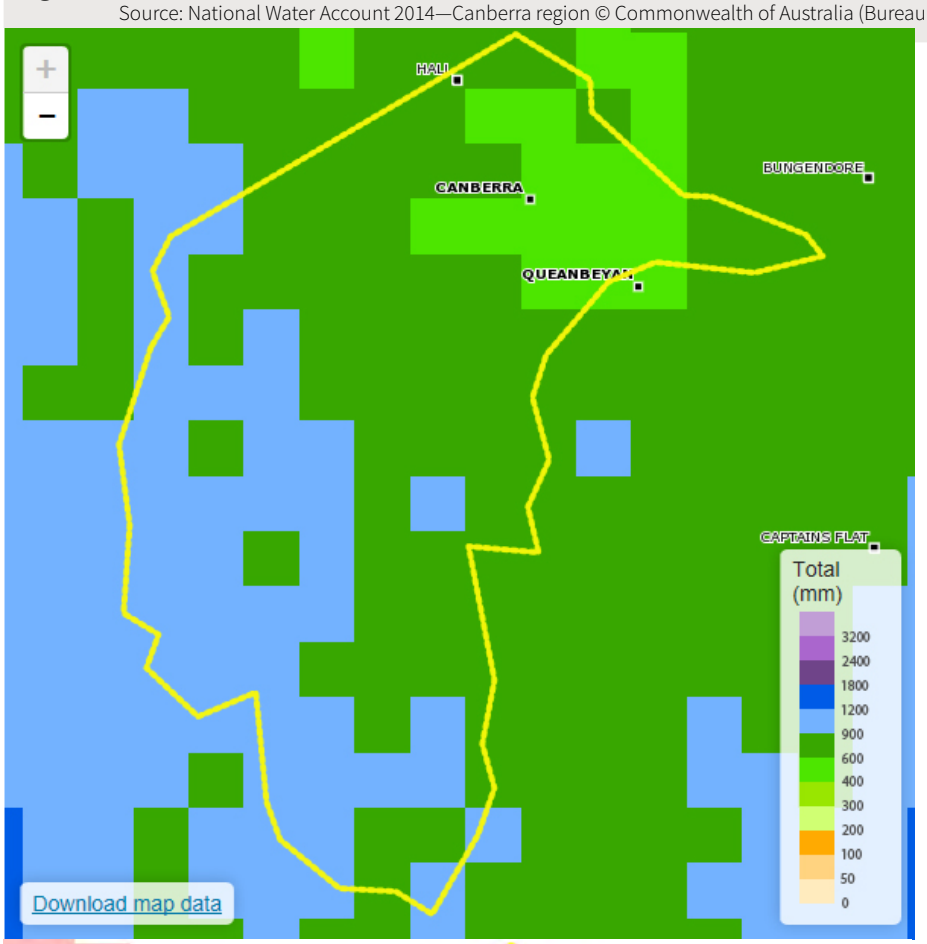
Table 6: 2014–15 rainfall comparison: Canberra Airport, Tyson Street in Ainslie

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apl	May	Jun
70000	23.4	47.8	38.4	54.8	29.2	100.4	146.8	24.4	21.2	123.2	17.6	74.8
70351	16.2	26.8	28.8	53.4	24.2	102.0	97.0	30.2	12.4	91.8	12.2	55.2
LTA*	40.9	45.2	52.2	60.8	65.1	56.2	58.2	58.0	51.6	45.2	42.8	40.9

* LTA (long term average) figures calculated from Canberra airport stations 70014 and 70351 since 1940 to present.

Figure 4: 2014–15 total rainfall and 2014–15 rainfall deciles

Source: National Water Account 2014—Canberra region © Commonwealth of Australia (Bureau of Meteorology) 2014



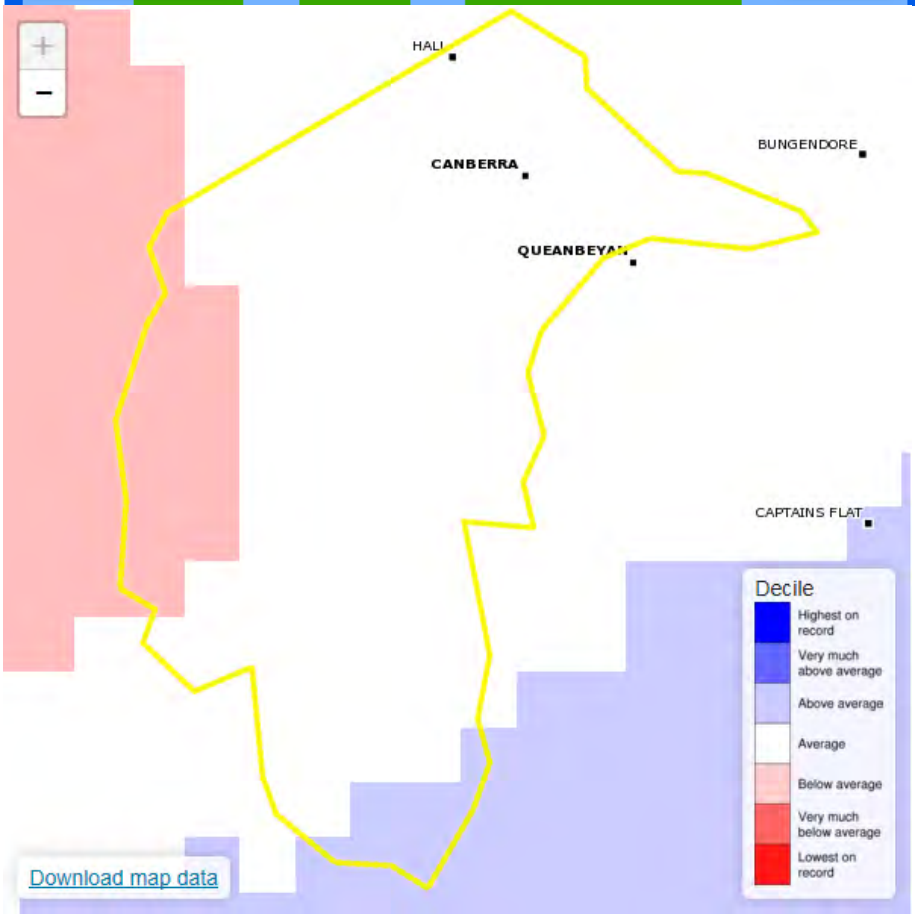
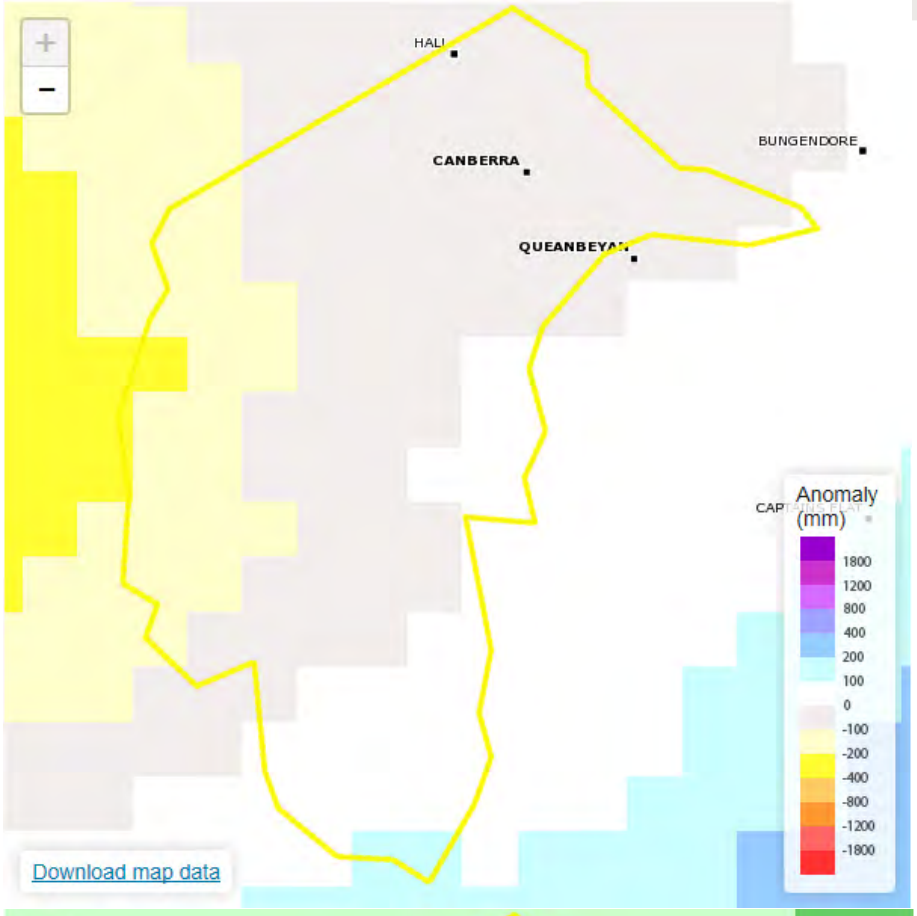
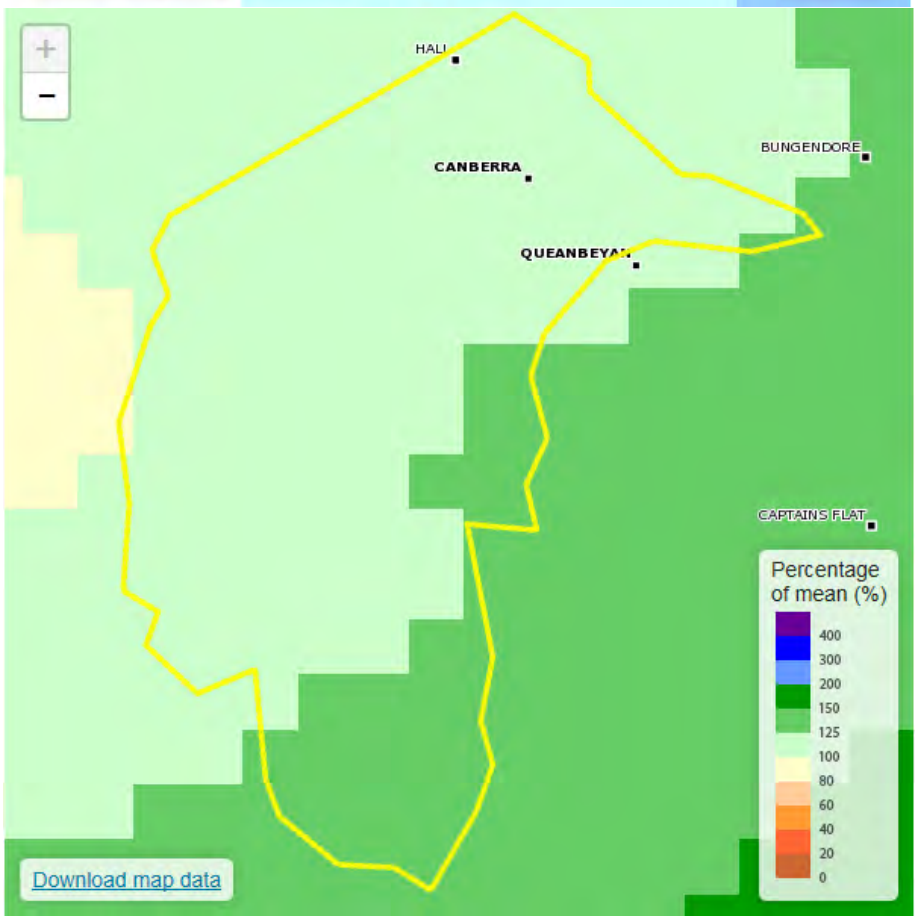


Figure 5: 2014–15 rainfall anomaly and 2014–15 rainfall percentage

Source: National Water Account 2014—Canberra region © Commonwealth of Australia (Bureau of Meteorology) 2014



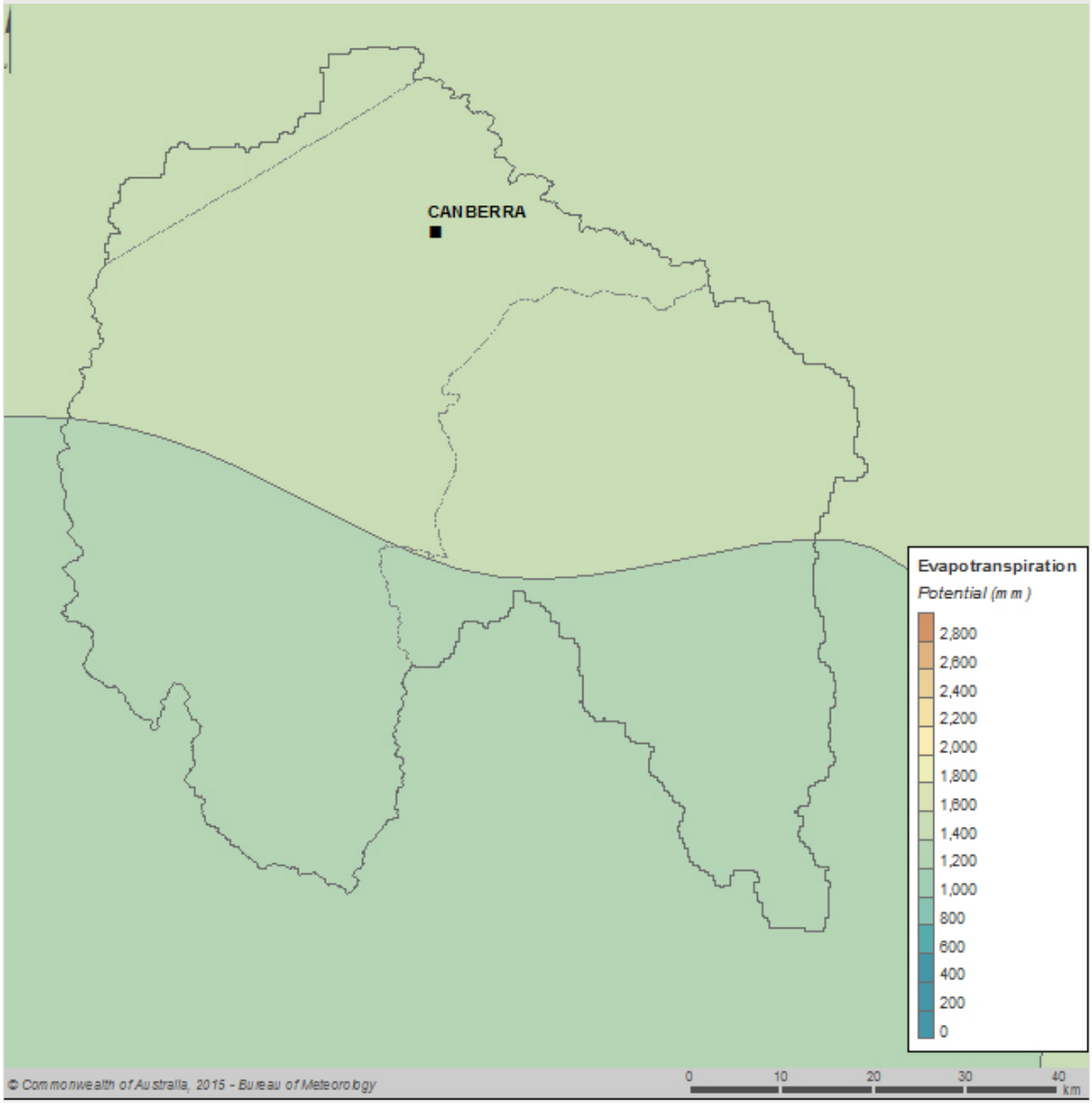


3.2 EVAPOTRANSPIRATION

Evapotranspiration is a significant water loss from catchments. Evapotranspiration is the term used to describe the part of the water cycle that removes water from an area with vegetation and into the atmosphere by the processes of both transpiration and evaporation. Evaporation occurs when liquid water is converted to water vapour and hence removed from a surface, such as a lake, soil or wet vegetation, into the air. Transpiration occurs when water in plant tissues is lost to the atmosphere, predominantly through the small opening in the leaves of plants and grasses called stomata.

The total area-averaged potential evapotranspiration over the Canberra region during the 2014–15 year was 1402 mm, which is similar to the long-term area-averaged potential evapotranspiration of 1394 mm (based on the 1911–2015 period). Potential evapotranspiration was higher in the north and lower in south of the region.

Figure 6: 2014–15 Evapotranspiration



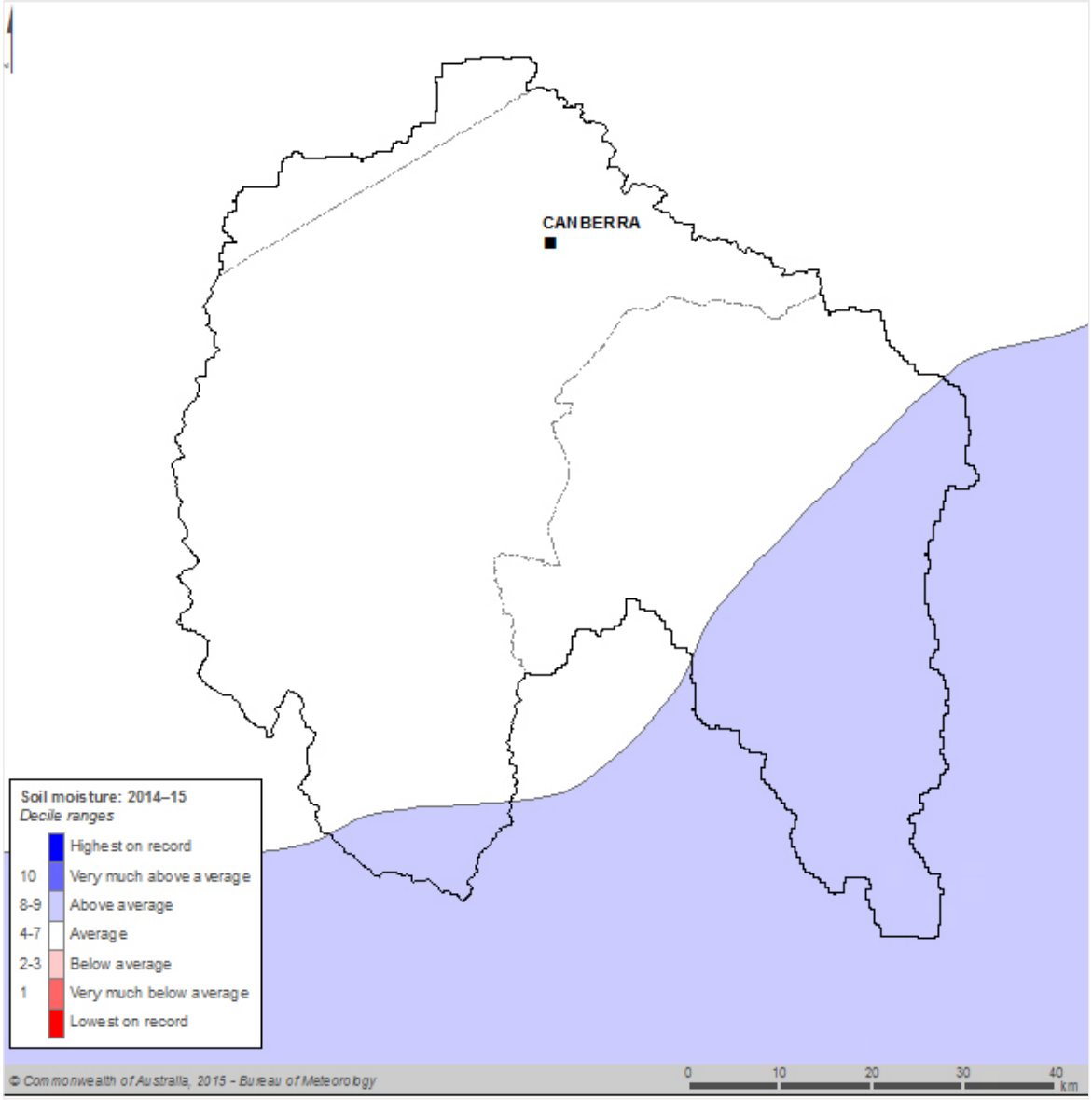
3.3 SOIL MOISTURE

Figure 7 shows that soil moisture, in the root zone (0 to 1m depth) for the 2014–15 year was average to above average in the Canberra region (compared with the 1911–2015 period).

Comparison of monthly rainfall and soil moisture deciles show the response of soil moisture to changes in rainfall and align closely for the majority of months in the 2014–15 year.

The above average rainfall and soil moisture conditions in southeast part of the region during the 2014–15 year have contributed to above average streamflow in the Queanbeyan River. Despite generally average rainfall and soil moisture conditions across the remaining part of the region, streamflow in the Molonglo and Cotter rivers was below average.

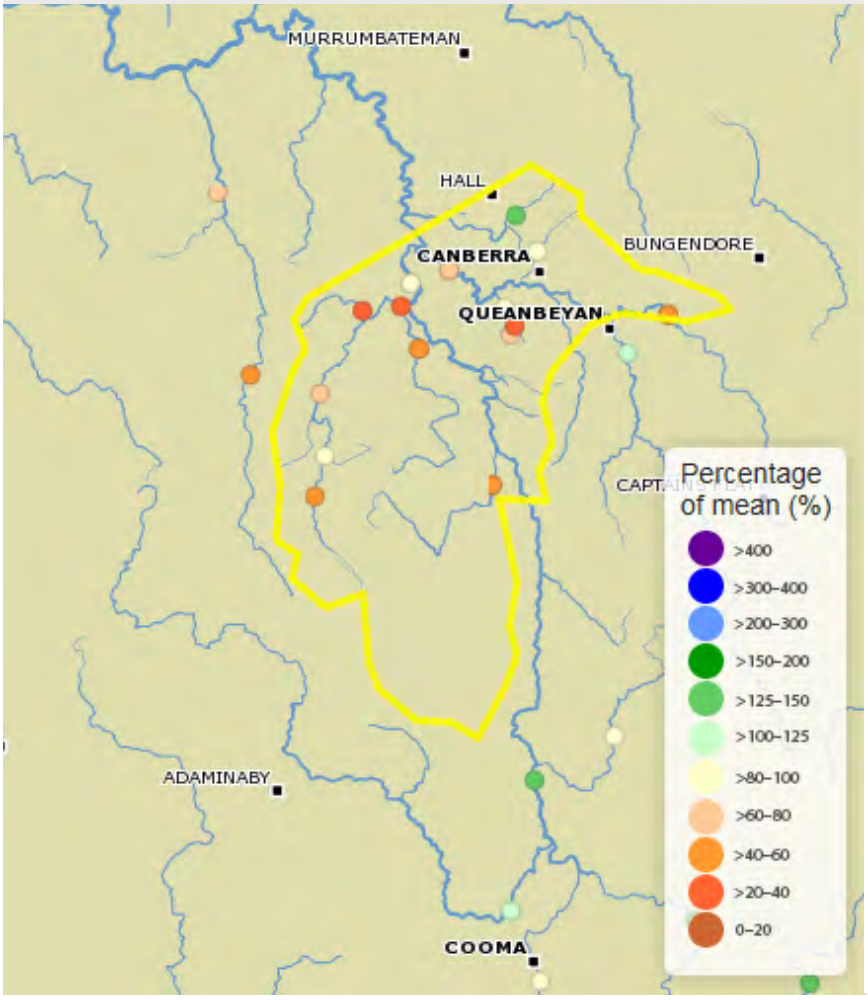
Figure 7: 2014–15 Soil Moisture



3.4 STREAMFLOW

There were no significant water events or floods in the region during 2014–15. Above average flows in the Queanbeyan River contributed to the spilling at Googong Dam.

Figure 8: 2014–15 Streamflow

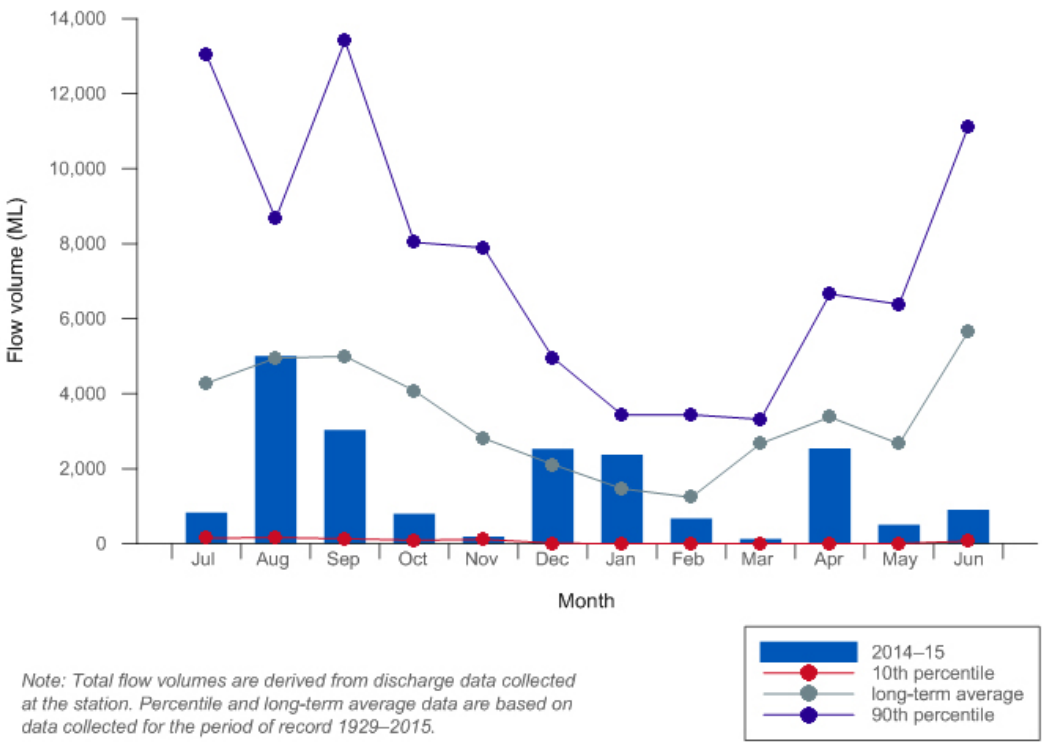


The total annual flows in the Cotter and Molonglo rivers were approximately 45–55% of the mean annual flow for these rivers. Figure 9 and 10 show that flows in the Molonglo and Cotter rivers were below average for almost the entire year. The reduced streamflow in these rivers was primarily attributed to lower rainfall and prevailing soil moisture conditions over the catchment area upstream of the relevant gauging stations.

There are three key water storages located on the Cotter River: the Corin, Bendora, and Cotter reservoirs that supply urban water for the Canberra region. Figure 8 shows the streamflow recorded in the Cotter River upstream of Corin Reservoir. These flows enter Corin Reservoir where the water is released or spilled and flows downstream to Bendora Reservoir and eventually to Cotter Reservoir.

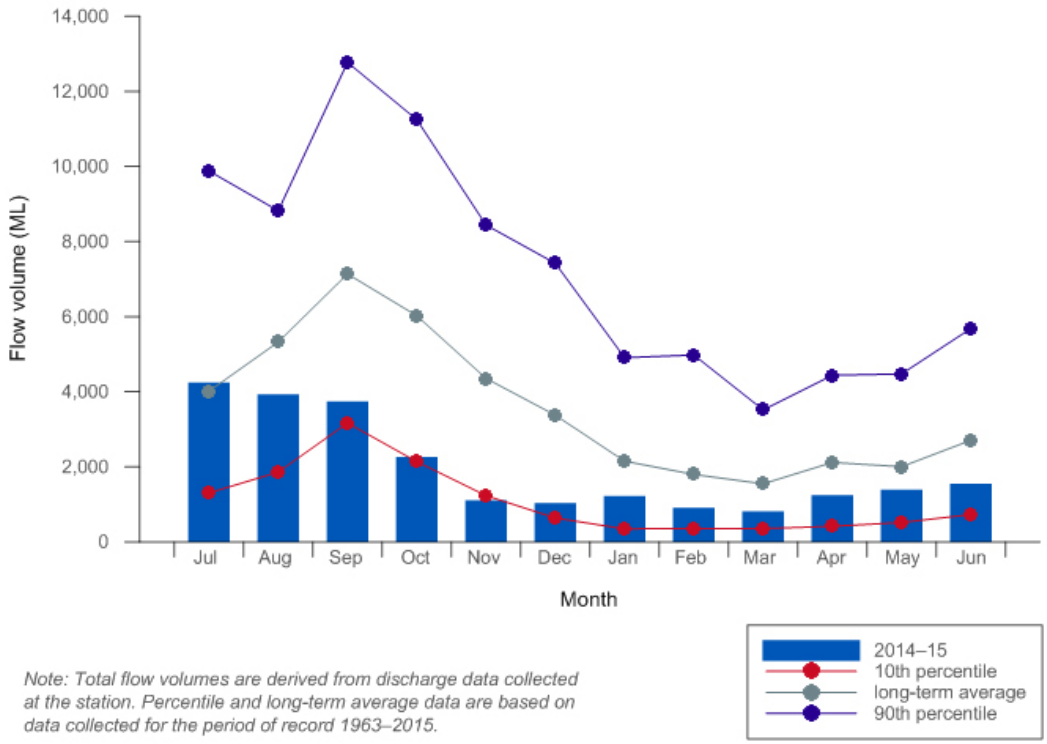
Conversely to the Cotter and Molonglo rivers, the total annual flow in the Queanbeyan River was approximately 150% of the mean annual flow. Flow in the Queanbeyan River was above average throughout most of the year, and close to or above the 90th percentile for mean monthly flows for six months of the year (see Figure 11). This is primarily attributed to higher rainfall over the catchment area upstream of the relevant gauging station. In addition, the upper reaches of the Queanbeyan River received more rainfall than the Molonglo River catchment.

Figure 9: Monthly flow for the Molonglo River: Station 410705



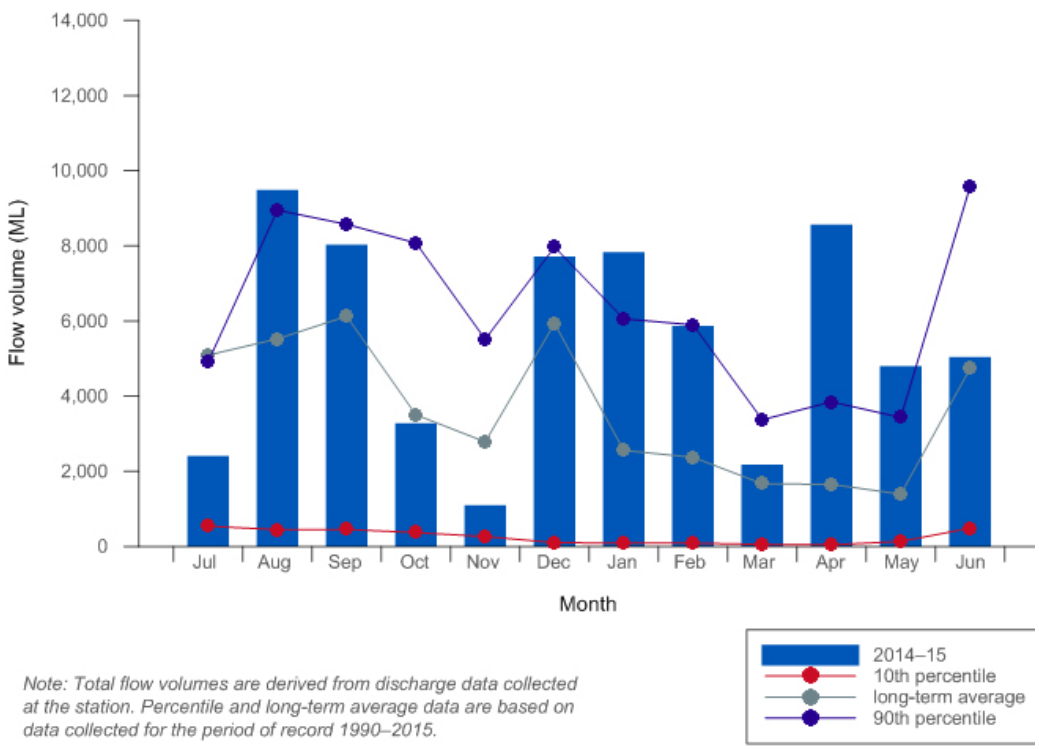
Note: Total flow volumes are derived from discharge data collected at the station. Percentile and long-term average data are based on data collected for the period of record 1929–2015.

Figure 10: Monthly flow for the Cotter River: Station 410730



Note: Total flow volumes are derived from discharge data collected at the station. Percentile and long-term average data are based on data collected for the period of record 1963–2015.

Figure 11: Monthly flow for the Queanbeyan River: Station 410781



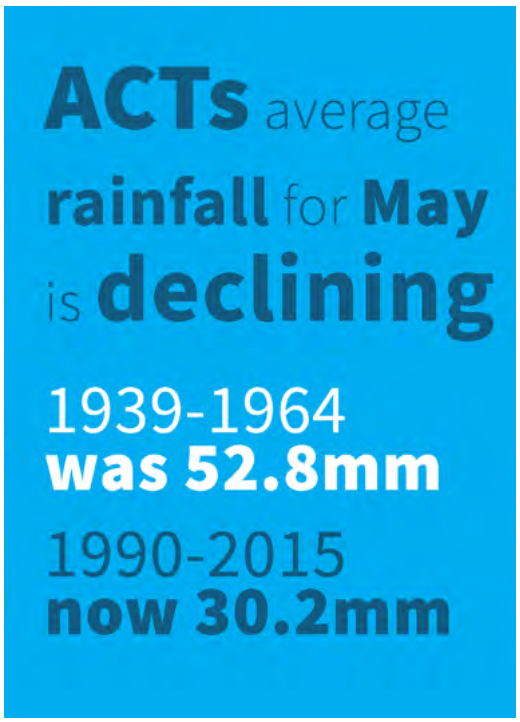
Note: Total flow volumes are derived from discharge data collected at the station. Percentile and long-term average data are based on data collected for the period of record 1990–2015.

3.5 AVERAGE TO DRIER-THAN -AVERAGE CONDITIONS ACROSS AUSTRALIA FROM El Niño EVENT

In 2014–15, national rainfall was 5% below the long term average (1960–1990). Continued rainfall deficiencies were seen across southern and eastern Australia, consistent with longer-term drying trends and the influence of El Nino, which was established in May 2015, resulting in below-average rainfall across much of eastern Australia.

The 2015 State of the Environment reported that ACT is already seeing the effects of climate change, and further impacts are predicted. In particular, we expect:

- lower rainfall, which will affect water availability and quality, water-dependent ecosystems, agriculture and recreational amenity
- higher temperatures and increased fire risk, which will affect human health and property, and vulnerable ecosystems
- more extreme weather events, which will affect property and ecosystems.



4. PLANS, STRATEGIES AND ACTIONS


FREQUENT STOPPING
UAL
CONTROL
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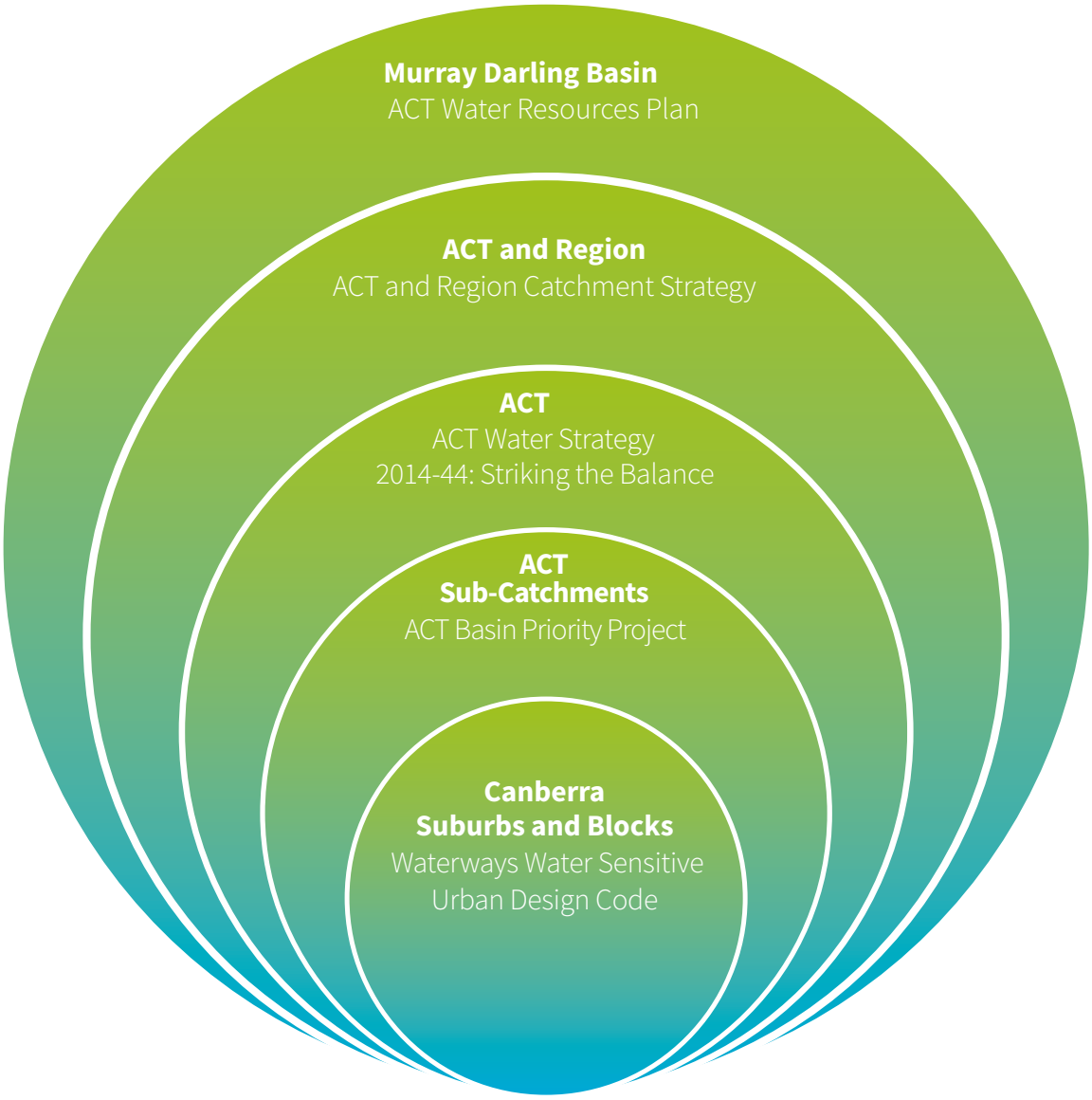
The ACT continues to be involved in a broad range of policies and activities ranging from the large scale Commonwealth's *Water Act 2007* and the Murray-Darling Basin Agreement down to reviewing the Waterways Water Sensitive Urban Design Code that focuses on our local Canberra suburb and block scale.

Figure 12: ACT water engagement



4.1 MURRAY–DARLING BASIN

The ACT is wholly situated within the Murray–Darling Basin river system. The ACT therefore has obligations under the Murray–Darling Basin Agreement and Basin Plan, which sets a limit on the volume of water that can be taken from the Murrumbidgee and Molonglo rivers unless water use is supplemented by water trading arrangements. The Basin Plan also requires the ACT to maintain the health of the Murrumbidgee and Molonglo river systems. In general, the ACT aims to ensure water leaving the ACT is of the same or better quality than water entering the Territory.

The Basin Plan establishes a limit on the volume of water each catchment within the Basin is permitted to take, or use, called a sustainable diversion limit (SDL). For surface water, the ACT's sustainable diversion limit is 52.5 GL (less the ACT's shared reduction volume of 4.9 GL) and 3.16 GL for groundwater. The SDL comes into effect for all Basin States in 2019.

Figure 13: MDB catchments

The ACT has a number of commitments under the Basin Plan which came into force in November 2012:

- Development of the ACT's Water Resource Plan, due by the end of 2016.
- Preparation of a Water Quality and Salinity Management Plan, due in 2017.
- Water Trading Rules, which came into effect across the Basin on 1 July 2014. The ACT has compliant internal trading rules for this purpose. The ACT has sought to develop interstate water trading arrangements with New South Wales to meet Basin Trading Rules.

The ACT Water Resource Plan (WRP) is a comprehensive document that sets out in detail the nature of ACT water resources, the management of water resources, the legislation, policies and plans and measures in place to address such things as water quality. In essence, a WRP demonstrates how a jurisdiction is working to manage its water resources sustainably for surface water and groundwater.

The ACT Water Resource Plan is currently being drafted to:

- set out held environmental water and planned environmental water including the rules and arrangements associated with the water
- provide for the Basin-wide environmental watering strategy
- set out how much water can be taken annually for consumptive use in a way that meets the long-term SDL, including the rules around the consumption of this water
- include a plan to manage water quality standards
- set out the circumstances when trade within and between groundwater SDL units, and trade from groundwater to surface water SDL units is allowed
- outline how water will be managed during extreme events
- show how Indigenous water values and uses have been identified and considered
- set out how interception activities including run off dams, commercial plantations, mining activities and floodplain harvesting will be managed and monitored. This needs to include any actions that can be taken to remedy any issues
- outline the risks to the resource and strategies to address them.

The WRP requires consultation with key groups and the community. Key agencies such as Icon Water and ACT water experts have been consulted on drafts of the WRP. Consultation and engagement with the ACT Indigenous people has occurred through a number of workshops and meetings. Additionally, there has been consultation with NSW with regard to the Murrumbidgee River management and its water quality and ongoing consultation and feedback continues to occur with the Murray–Darling Basin Authority.

Community consultation on the WRP is a requirement under the Basin Plan.

The ACT's performance to fulfil responsibilities under the Basin Plan has been assessed as meeting its requirements by the Department of the Environment as part of the National Partnership agreement in 2012–13, 2013–14 and 2014–15 .

The ACT has submitted its second required Statement of Assurance to the MDBA.

The ACT fulfilled commitments under the Living Murray Initiative to provide 2 GL of high security water to the MDB Authority. Further ACT progress against MDB Authority commitments are outlined in Section 9.3 under Performance Measures.

4.2 ACT WATER STRATEGY 2014–44

The ACT Water Strategy 2014–44: Striking the Balance (the Strategy) sets out how the ACT Government will manage the Territory's water resources over the next 30 years to meet our urban and environmental needs and regional responsibilities. Implementation of the Strategy will deliver continued water security, improved water quality and catchment health and a water smart community.

The previous water strategy, Think Water, Act Water (2004) increased the Territory's water security following the Millennium Drought and contamination of major reservoirs from the 2003 bushfires. Successful actions under the strategy included the construction of the Enlarged Cotter Dam and the Murrumbidgee to Tantangara pipeline, and reduced water usage through residential water efficiency programs, the implementation of water sensitive urban design guidelines, permanent water conservation measures and increased use of stormwater for purposes such as irrigation.

The new water strategy covers the full breadth of water management activities in the ACT, including catchment management, stormwater and flood management, water supply and services, water for the environment, recreational water use and public health. It provides the framework for a renewed focus on total water system management and emphasises the importance of integrated catchment management.

The strategy will provide a basis for ensuring the ACT Government can continue to support current and future growth, achieve desired environmental outcomes and be responsive to climate change.

The strategy will guide the development, integration and implementation of activities by ACT Government agencies, often with Icon Water, Commonwealth and state agencies, developers, the ACT community, natural resource management groups and other stakeholders involved in planning and water management and water use.

The strategy contains three key outcomes:

1. Healthy catchments and waterbodies
2. A sustainable water supply used efficiently
3. A community that values and enjoys clean, healthy catchments

For each outcome, the strategy identifies strategies and 18 actions (see following page) to achieve these strategies, which will be implemented through five year implementation plans. Progress against the actions is outlined in Section 9.2 under Performance Measures.

Implementation Plan 1 (2014–2018) outlines milestones for each of the 18 above actions including the lead ACT agencies responsible for the achievement of those individual actions and timelines to enable progress of the actions to be monitored and assessed. The effectiveness of implementation will be monitored through targets and indicators identified for each outcome.

Progress in implementing the strategy will be reported in each Environment and Planning Directorate Annual Report. Additionally, data will be provided to the Commissioner for Sustainability and the Environment to be reported through four yearly State of the Environment reporting. An update on progress is outlined in the 'Reporting against targets' section of this report.

Outcome 1: Healthy Catchments and Waterbodies.

Well-managed, functioning aquatic ecosystems that protect ecological values and contribute to the liveability of the ACT community.

STRATEGY 1: Achieve integrated catchment management across the ACT and region

Action 1: Strengthen coordination and collaboration for catchment management across the ACT and region

Action 2: Enhance knowledge and spatial planning for water and catchment management

Action 3: Integrate water cycle management and green infrastructure into the planning and design of urban environments

Action 4: Improve water monitoring and analysis across the ACT and region

STRATEGY 2: Protect and restore aquatic ecosystems in urban and non-urban areas

Action 5: Improve water quality and ecosystem health in the ACT and region's river, lakes, aquifers, ponds and wetlands

Action 6: Ensure appropriate management (volume, timing and quality) of environmental flows

Action 7: Strengthen compliance and enforcement for water resource management

STRATEGY 3: Manage stormwater and flooding

Action 8: Manage stormwater infrastructure sustainably

Action 9: Improve planning, monitoring and compliance for stormwater management

Action 10: Improve planning, information and regulation for flood management

Outcome 2: A Sustainable Water Supply Used Efficiently.

An integrated and efficient water supply system that provides for the optimal mix of supply options, encourages efficient use of water, and is resilient to climate variability, and supports the social, economic and environmental needs of the ACT community.

STRATEGY 4: Secure long term supplies

Action 11: Plan for long term water security

Action 12: Strengthen water trading arrangements

Action 13: Investigate the benefits and costs of more diverse water supply options

STRATEGY 5: Manage and promote a sustainable use of water

Action 14: Improve and monitor provision of water services

Action 15: Encourage water users to conserve and use water wisely

Outcome 3: A Community that Values and Enjoys Clean, Healthy Catchments and Waterways.

Work with the ACT community to continue to use water efficiently, and to ensure safe, clean water for recreation and the environment.

STRATEGY 6: Provide clean and safe water for the ACT

Action 16: Improve management of rivers, lakes and public space to promote recreational use and reduce risks to public health

STRATEGY 7: Engage the community on understanding and contribution to a more sustainable city.

Action 17: Promote community involvement in management of ACT water resources

Action 18: Ensure that indigenous and other cultural values are recognized in managing water planning and use.

5. WATER RESOURCES AND USE

The establishment and planning of the ACT was on the provision of adequate water resources for an administrative city. Considering water plays such a key role for the community and the environment, the pressures on water supply and resource use are monitored to assess the condition of our water resources.

Table 7: Water balance

	2015 (ML)	2014 (ML)
Water inflows	819,398	647,253
Water outflows	698,275	539,828
Opening water storage	259,090	216,876
Change in water storage	6995	42,214
Close in water storage	266,085	259,090

Water supply in the region is primarily sourced from storages and rivers. The major storages are the Bendora, Corin, Cotter, and Googong reservoirs. The recent enlargement of the Cotter Reservoir increased its total capacity almost 20-fold, from 3856 ML to 79,374 ML. This increase will assist in the management of frequent, longer, and more severe droughts without the need to implement high-level water restrictions for extended periods. As a result, total surface water storage capacity in the Canberra region has increased from 207,380 ML to 282,898 ML. The enlarged Cotter Reservoir, began impounding water on 1 March 2013.

The ACT continues to responsibly manage the precious and finite water resources within the Territory and greater Murray–Darling Basin. The ACT adheres to the Murray–Darling Basin Agreement 2008 and the Murray–Darling Basin Plan, which place additional requirements on the ACT and other jurisdictions in relation to water use (a limit on water diverted) and water quality.

Before the MDB Plan became legislation in 2012 each Basin State was required to accept a limit on the maximum volume of surface water that could be diverted from each of the river systems of the MDB system annually under the MDB Agreement. This abstraction limit is fixed, regardless of the amount of water available in the river system or the capacity to store water (in dams, lakes etc.). This limit is referred to as the 'Cap'. The ACT adopted the Cap rules in 2008 and agreed to manage water consumption within the 40 GL Cap available.

However, each catchment under the Basin Cap was established based on a level taken from historic use, not on what is sustainable. Therefore, the Murray–Darling Basin Authority (MDBA) designed new limits on the amount of water that could be extracted sustainably from each river system. These limits, referred to as Sustainable Diversion Limits (SDL), will replace the previous limits agreed to under the Cap. Note that the ACT SDL continued to be based on historic use rather than sustainable diversion limits in the ACT.

Sustainable Diversion Limits (SDLs)

The maximum long-term annual average quantities of water that can be taken, on a sustainable basis, from the Basin water resources as a whole, and the water resources, or particular parts of the water resources, of each water resource plan area.

The SDLs limit the volumes of water that can be taken from surface or groundwater in the Basin for uses such as town water supplies, domestic, industry and agricultural uses, at both a local and Basin-wide scale. The SDLs are defined as long-term averages, rather than a fixed amount in a given year.

SDL differs from the Cap approach in two important ways. Firstly, the SDL places a limit on the volume of both surface water and groundwater that can be diverted for use (the Cap only covers surface water diversions). Secondly, the SDL will no longer have any provision for future population growth in the ACT and Queanbeyan. As the 75% population growth factor that was included in the ACT Cap arrangement was removed from the ACT, an additional 0.5 GL was permanently added to the ACT's overall water course component under the new SDL arrangements, now totalling 40.5 GL.

Each Basin State, including the ACT, is required to incorporate these new SDL volumes into water resource plans that will transition from managing water under a Cap volume to a volume based on sustainable limits. The ACT Water Resource Plan (currently drafting) will require accreditation by the Australian Government, due by the end of 2016. After accreditation in 2016 the ACT will aim to transition and adopt SDL rules prior to 2019 when all water resource plans within the Basin become enforceable. Prior to 2019 the ACT is still legally bound to manage and report on water under the Cap.

Baseline Diversion Limits (BDLs)

Represent the Authority's determination of the limits on water use under the existing or historic water management arrangements.

1 Litre (L)

1 Kilolitre(KL)
= 1,000 litres

1 Megalitre (ML)
= 1,000,000 litres

1 Olympic swimming pool
=2,500,000 L / 2.5 ML

1 Gigalitre (GL)
=1,000,000,000 litres or
1,000 megalitres

Googong Dam – 121 GL
Sydney Harbour – 562 GL

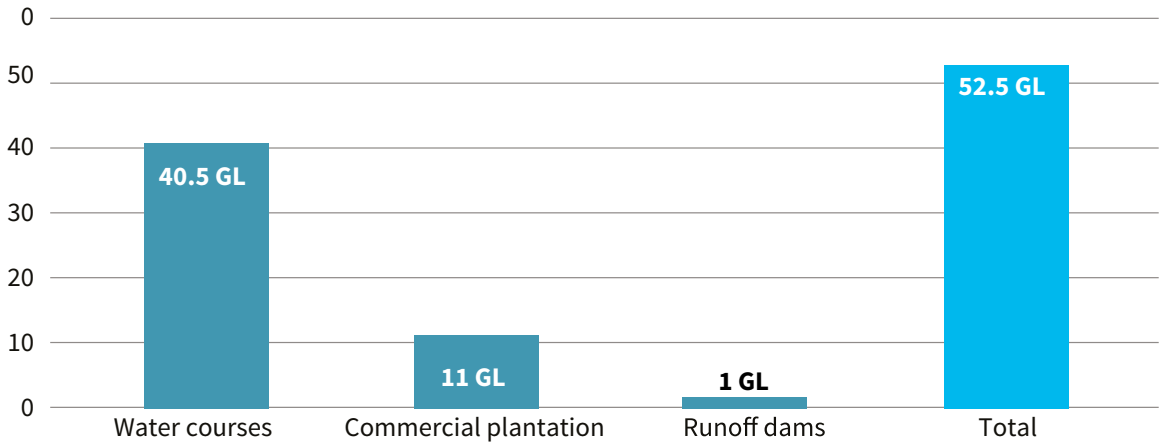
Accreditation of the ACT's Water Resource Plan will move the ACT from a 42 GL Cap volume for surface water, which included potable supply and non-potable supply, to a Baseline Diversion Limit (BDL) volume of 52.5 GL per year. The Basin Plan sets a sustainable diversion limit (SDL) for each catchment and aquifer in the Basin, as well as an overall limit for the Basin as a whole. The SDLs are like a new 'Cap' on water use but also include a separate SDL for groundwater.

The 52.5 GL BDL volume is made up as follows:

- **40.5 GL**
  Water courses
- **11 GL**
  Commercial plantation (areas of land in which perennial woody plants are planted primarily for commercial purposes) net take
- **1 GL**
  Runoff dams (a dam or reservoirs that collects surface water flowing overland)

The Cap only provided a limited measure to control available water use and it became necessary to establish a comprehensive framework to address sustainable water planning and management and cater for water for environmental needs across the Basin. This led to the development of the Murray–Darling Basin Plan (2012) under the *Water Act 2007* (Cwlth).

Figure 14: Baseline Diversion Limit volumes



By calculating environmental water requirements and establishing a long term average SDLs across the Basin, the MDB Authority discovered it was necessary to remove another 972 GL from the Southern Basin SDLs. This amount was divided between the 12 SDL resource areas in the southern Basin (Murrumbidgee (NSW and ACT), New South Wales Murray, Lower Darling, Victorian Murray, Kiewa, Ovens, Goulburn, Broken, Campaspe, Loddon, South Australian Murray, Eastern Mount Lofty Ranges). Due to the 972 GL of shared reduction, the ACT's BDL was reduced by 4.9 GL, which also reduced the ACT's SDL from 52.5 to a revised total of 47.6 GL. This SDL total of 47.6 GL was legislated in the Murray–Darling Basin Plan (2012).

In 2015 the ACT fulfilled its commitment to provide 2 GL of water to the Living Murray Initiative (LMI) from outside the ACT (the LMI provides a total of 500 GL of water for the Iconic sites along the Murray River). At the time the ACT contributed 2 GL to the LMI, the MDBA recognise that the ACT contribution will necessitate an increase of the ACT's SDL from 47.6 GL to 49.6 GL. See the table below.

The 49.6 GL figure is the volume of available water the ACT will incorporate into its Water Resource Plan for accreditation, subject to further discussion with the MDBA.

Table 8: ACT surface water volumes governed by the MDBA

	Cap reporting & compliance until WRP accredited	As in Basin Plan 2012		ACT Water Resource Plan accredited (proposed)	
ACT (Surface Water)	**Long-term Cap (GL)**	**BDL (GL)**	**SDL (GL)**	**SDL (GL)**	**Annual Permitted Take (GL)**
Water Course	42.0	40.0	40.0	40.0	40.0
Population growth		0.5	0.5	0.5	0.5
Run-off dams		1.0	1.0	1.0	1.0
Commercial plantations		11.0	11.0	11.0	11.0
Total	**42.0**	**52.5**	**52.5**	**52.5**	**52.5**
The Living Murray Initiative	-2.0	-	-	2.0	2.0
Shared Reduction amount	-	-	-4.9	-4.9	-
Total	**40.0**	**52.5**	**47.6**	**49.6**	**54.5**

Table 9: ACT groundwater volumes governed by the MDBA

	Cap reporting & compliance until WRP accredited	As in Basin Plan 2012		ACT Water Resource Plan accredited (proposed)	
ACT (Groundwater)	**Long-term Cap (GL)**	**BDL (GL)**	**SDL (GL)**	**SDL (GL)**	**Annual Permitted Take (GL)**
Groundwater		1.70	3.16	3.16	3.16

The Annual Permitted Take shown in the table above includes 4.9 GL of water from outside the ACT, provided to the Commonwealth to fulfil the ACT's shared reduction amount described above.

The SDL for groundwater is 3.16 GL per year. The demand for additional groundwater licences will dictate the transition from the BDL of 1.7GL to the groundwater SDL.

The Basin Plan is to be reviewed in 2026.

Once the ACT's WRP is accredited it will become a legally binding document and will be enforce until 2026. A review of the Basin Plan will be undertaken between 2025–26.

The ACT is required to report annually to the MDB Authority on the amount of water consumed against the legislated volumes in the Murray–Darling Basin Plan.

The ACT is also required to report annually to the Bureau of Meteorology on the National Water Account, which presents a picture of water resources management over the previous reporting year. The National Water Account provides information about water stores and flows, water rights and water use and reports on the volumes of water traded, extracted and managed for economic, social, cultural and environmental benefit.

The ACT relies mainly on surface water. Prior to the last four years, prolonged low streamflow conditions led to an increase in groundwater use; however, it is still low in comparison to surface water use. A small amount of recycled wastewater has also been used in the Territory.

5.2 SURFACE WATER

The Murrumbidgee is the largest river that flows through the Canberra region. All rivers and creeks in the region drain into this river. Three of the main rivers which begin in the Canberra region and flow into the Murrumbidgee River are the Molonglo, Cotter and Queanbeyan rivers.

There is marked seasonality in the rainfall of the region and streamflow does vary seasonally, with flows being lowest in autumn and highest in winter and spring. Potential evaporation increases in summer cause the catchments to dry out. In autumn and winter, the catchments typically become partially saturated, leading to higher runoff in spring.

The ACT recorded a total net surface water diversion (surface water used) of ~17 GL during the 2014–15 period. This result provides a slight decrease of water use within the Territory of 1.965 GL as compared to last year. The management of ACT water reflects a community that has changed behavioural practice for the amount of water used within each household. The ~17 GL net consumed represents only 42% of the water available to the ACT under the current 40.5 GL for water course available under the SDL. This adjustment by the community provides more flexibility for the Territory through extended dry periods such as the Millennium Drought. Note, the ACT has contributed a further 2 GL in 2015 to the LMI that needs to be reflected in the MDB Authority accounting. When the MDB Authority accounting processes are finalised the ACT will manage, and report on, a new water course SDL volume of 42.5 GL.

The vast majority of water used within the ACT is through entitlements held by Icon, which is distributed throughout the community. A small amount of water entitlements are held directly through private entitlements. The volume of Commonwealth water drawn from Lake Burley Griffin was ~.47 GL (35%) of the 1.36 GL entitlements issues within the Central Molonglo catchment.

The careful management of permanent water conservation measures together with water restrictions in extreme drought conditions have enabled the ACT to continue to responsibly manage water use during periods of drought and towards MDB Plan targets that come into place in 2023. The ACT's net water diversion figures dropped to 17.3 GL during 2013–14, and 15.4 GL during 2014–15, representing a saving of up to 50% relative to 1993–2002 levels.

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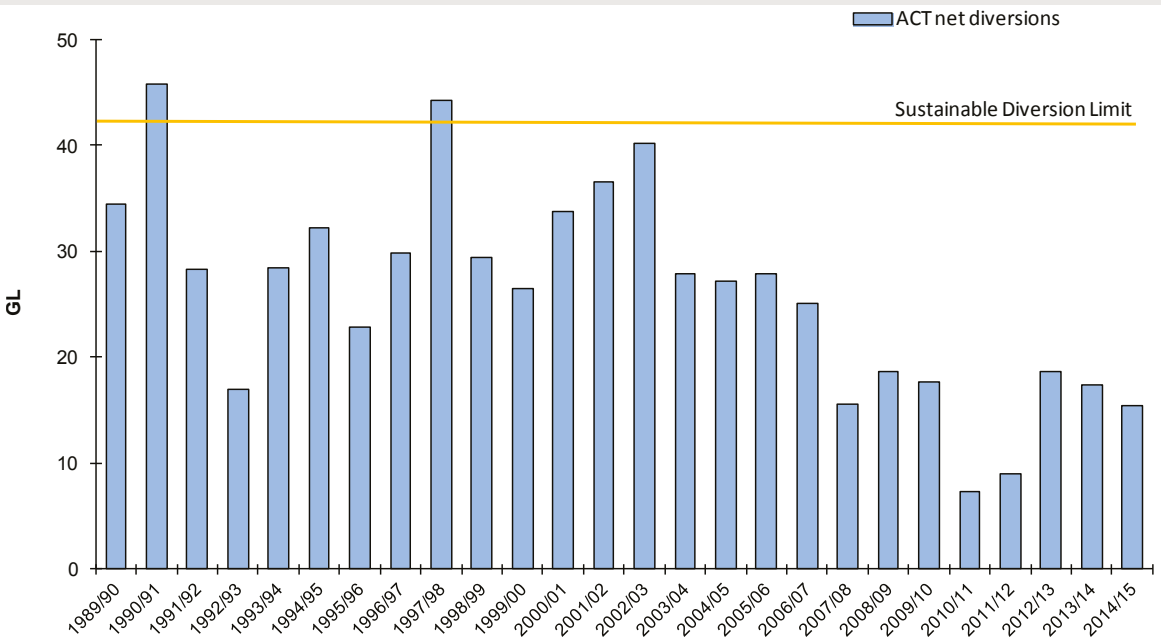
Table 10: 2014–15 surface water account

Surface Water	GL	Annual Entitlement GL	Annual Diversion GL	%
Diversions				
Icon diversions		71.000	47.447	66
Private diversions		2.116	1.180	57
LBG diversions		1.582	0.518	28
Combined SW/GW diversions		2.402	0.922	38
Commonwealth diversions		1.424	0.473	33
Total Diversion		77.100	50.067	65
Returns				
LMWQCC return			29.650	
QSTP return			3.293	
Total Returns			32.943	
Net Diversion				
(Diversions – Returns)	40.5		17.125	42
Interceptions				
Runoff dams	0.1		0.1	100
Commercial plantations	1.1		6.5	59
Baseline Diversion Limit	52.5			
Sustainable Diversion Limit	47.6		23.725	50

Figure 15: 1989–2015 ACT net water diversions



5.3 GROUNDWATER

The ACT 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 can be a locally significant source of water, but are generally highly connected to their local surface water resources. Groundwater is a minor component of total water use in the ACT.

The ACT, groundwater is managed as a combined resource with surface water as part of the water management areas.

The ACT recorded a total net groundwater diversion of ~0.6 GL consumed during the 2014–15 period. This result provides a slight increase in groundwater use within the territory of 0.16 GL as compared to last year. The ~0.6 GL consumed represents only 20% of the water available to the ACT under the 3.16 GL Sustainable Diversion Limit.

Table 11: 2014–15 groundwater account

Groundwater		GL	Annual Entitlement GL	Annual Diversion GL	%
Diversions	Private diversions		1.036	0.546	53
	Commonwealth diversions		0.566	0.079	14
	Total Diversion		**1.602**	**0.625**	**39**
Baseline Diversion Limit		1.70			
Sustainable Diversion Limit		**3.16**		**0.625**	**20**

The 1.42 GL of Commonwealth surface water entitlements are drawn from the catchments of Central Molonglo (LBG), Paddys and Ginninderra. The Commonwealth surface water use was .473 GL (33%) of the total water available. Similarly, the Commonwealth groundwater entitlements total 0.566 GL and water use was .079 GL (14%).

5.4 RECYCLED WATER

Three wastewater reuse schemes operate in the ACT. The majority of the water recycled at Lower Molonglo Water Quality Control Centre (LMWQCC) is recirculated within the treatment process.

Table 12: ACT recycled water locations

Scheme	Purpose
LMWQCC Effluent Reuse	Irrigation and for LMWQCC operations
Fyshwick	Irrigation of sports fields
Outward Bound	Irrigation of sports fields

The Lower Molonglo Water Quality Control Centre (LMWQCC) is the largest sewage treatment plant in Canberra. The plant treats about 90 ML/day of wastewater before discharging it to the Molonglo River or providing it for irrigation purposes at nearby vineyards and golf courses.

The Fyshwick sewage treatment plant collects and treats industrial and domestic sewage from Fyshwick and surrounding suburbs. Treated wastewater from this plant is then discharged back into the sewer or delivered to the North Canberra Water Reuse Facility where it undergoes secondary treatment before it is used for irrigation purposes.

A sewer mining facility at Southwell Park, which is the process of tapping into a wastewater system and extracting wastewater, which is then treated and used as recycled water can supply recycled wastewater for irrigation purposes when operational.

5.5 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 water taken from the shared pool of water resources and, as such, is not included as part of the region's water assets.

Farm dams hold approximately 7000 ML or 3% of the total surface water storage capacity in the Canberra region. The majority of farm dams in the region are filled by rainfall-runoff capture; a smaller portion are filled by groundwater extractions, surface water diversions or recycled water transfers. Runoff harvesting by farm dams is assumed to reduce streamflow in the Canberra region by approximately 2%.

The water held in farm dams is primarily used for stock, domestic, and agricultural purposes.

5.6 ENTITLEMENTS

The ACT Environment Protection Authority (EPA) is responsible for the management of entitlements within the ACT. There was no change in the number or volume of entitlements by Icon Water and only a small difference of private entitlements compared to the previous year.

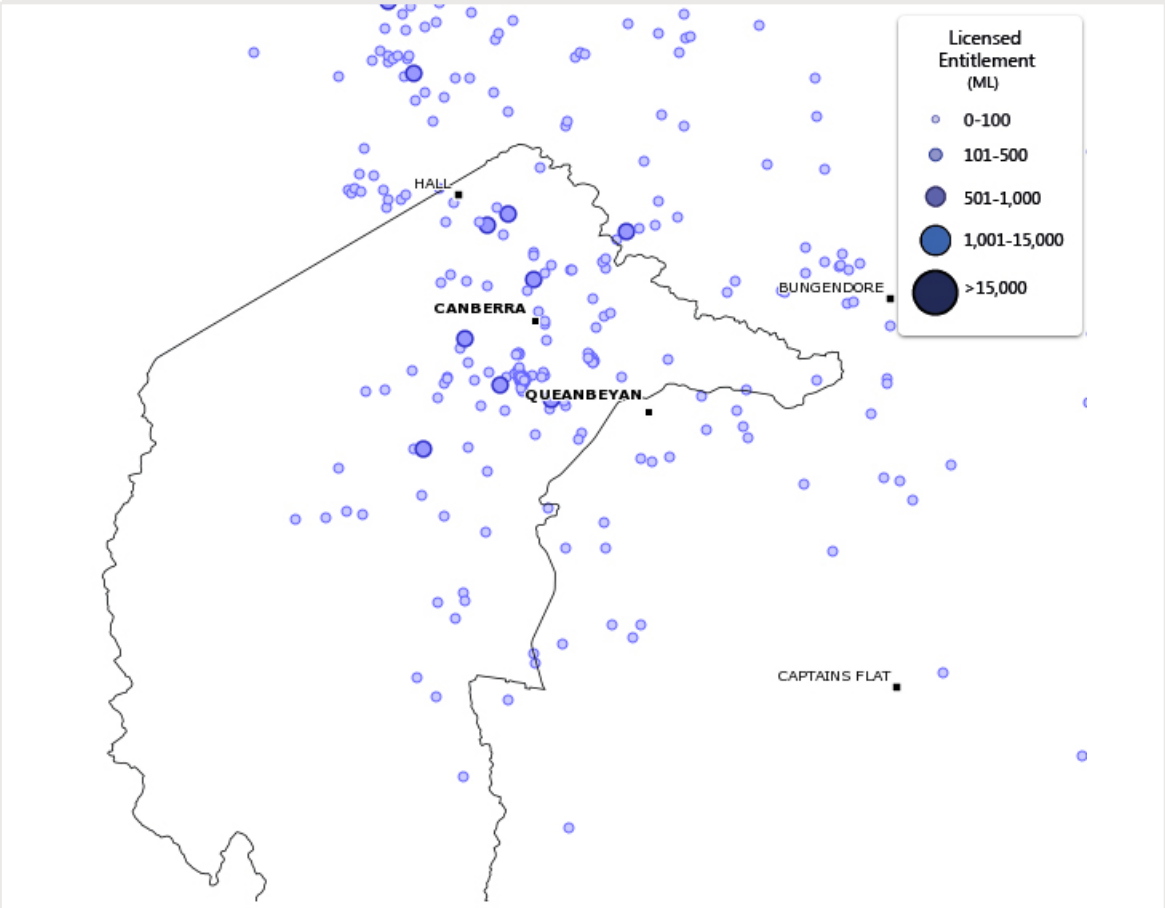
Lake Burley Griffin is Commonwealth territory and the management of those waters has historically been managed by the National Capital Authority on behalf of the Commonwealth. In 2013 legislation was passed that handed over the responsibility and management, but not ownership, of Lake Burley Griffin from the Commonwealth to the ACT. These changes required the EPA to issue a number of water entitlements to Commonwealth entities during 2014–15 to bring them in-line with ACT water management practices. The NCA provided water use data from 1 July to 17 December 2014 and the ACT EPA from 17 December 2014 to 30 June 2015.

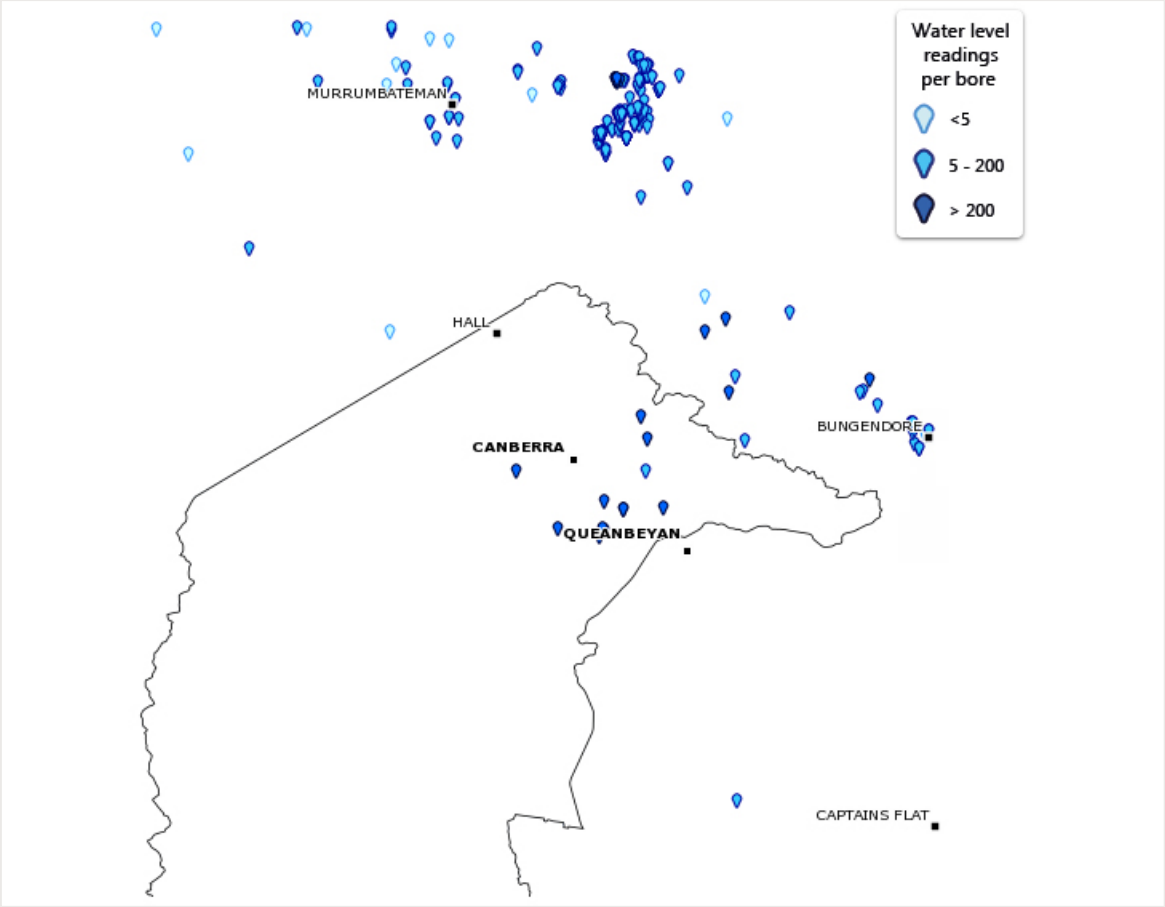
Entitlements that are mixed allocations of surface water and groundwater are no longer issued by the EPA and will be phased out over time through transfer or sale of property. The change during 2014–15 for these mixed allocation entitlement was a reduction of three entitlements with a volume of 20.5 ML.

Table 13: 2014–15 entitlement account

Entitlements		Entitlements issued for 2014-15	Entitlement volume GL
Surface water	Icon entitlements	7	71.00
	Private entitlements	83	2.116
	Commonwealth entitlements	8	1.484
	Total Entitlements	**98**	**74.60**
Groundwater	Icon entitlements	0	0
	Private entitlements	165	1.03
	Commonwealth entitlements	6	0.56
	Total Entitlements		**1.59**
SW/GW	Private entitlements	30	2.40
	Total Entitlements	**34**	**2.46**

Figure 16: 2014–15 groundwater entitlements and 2014–15 groundwater levels





5.7 TRADE

The 2014–15 period saw a small number of entitlements exchanged within the ACT which increased the number of entitlements held from 79 to 83; however, the entitlement volume attached to those decreased by 87 ML.

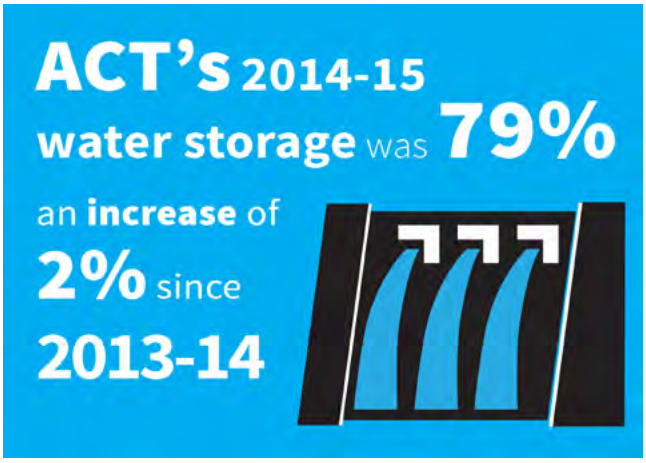
Table 14: 2014–15 ACT water trade account

Trade (within ACT)		Entitlements exchanged 2014-15	Entitlement volume GL
Surface water	Icon	0	0
	Private	+4	-0.87
	Commonwealth	N/A	N/A
	Entitlements exchanged	**+4**	**-0.87**
Groundwater	Icon	0	0
	Private	+1	-0.009
	Commonwealth	N/A	N/A
	Entitlements exchanged	**+4**	**-0.009**
SW/GW	Private	-3	-0.205
	Entitlements exchanged		

Table 15: 2014–15 interstate water trading

Interstate Trade		Entitlements exchanged 2014-15	Entitlement volume GL
Surface water	Icon	0	0
	Private	0	0
	Commonwealth	N/A	N/A
	Entitlements exchanged	**0**	**0**
Groundwater	Icon	0	0
	Private	0	0
	Commonwealth	0	0
	Entitlements exchanged	**0**	**0**

5.8 STORAGE



Storage increased slightly during the year even with below average rainfall and inflows. At 30 June 2015 the total storage volume was 220.8 GL, which equates to 79% storage capacity.

The calculation of dam storage levels has changed following the completion of the Enlarged Cotter Dam. The capacity of the ACT's four dams—Googong, Corin, Bendora and the new Enlarged Cotter Dam—combines to a total of 277.839 GL, an increase of 35%. The increase in dam storage provides the ACT with at least 15 years of water security under current conditions and uses.

In 2014–15, ACT's water storage reservoirs remained at a healthy 79%, a small increase on the 77% storage recorded at the end of 2013–14. Despite an 11% reduction recorded at Canberra Airport the Canberra region received above average rainfall which increased the total inflows to the four storage reservoirs totalling 148 GL, which is 5% above the average of the last 15 years.

Figure 17: 2014–15 water storage

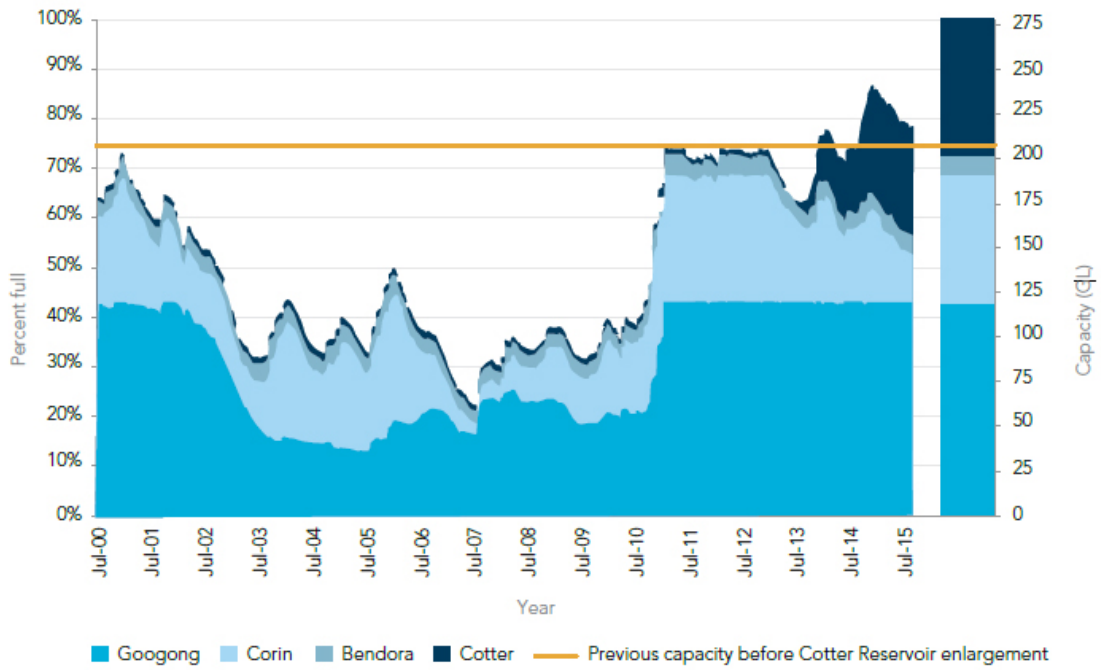


Table 16: Reservoir storage

Major storage	Total storage capacity (ML)	Dead storage capacity (ML)
Bendora Reservoir	11,543	97
Corin Reservoir	70,897	110
Cotter Reservoir	79,374	3,178
Googong Reservoir	121,084	1,675
Total	**282,898**	**5,060**

Table 17: Lake storage

Minor storage	Total storage capacity (ML)	Purpose
Lake Ginninderra	3,700	Pollution control, landscape & recreation
Lake Tuggeranong	1,800	Pollution control, landscape & recreation
Lake Burley Griffin	33,723	Landscape and recreation
Total	**39,223**	

5.9 PERMANENT WATER CONSERVATION MEASURES

There were no water restrictions imposed throughout the years 2011–2014 and no water restrictions imposed during the 2014–15 period. Therefore, the ACT's mandatory regime of Permanent Water Conservation Measures continues to apply.

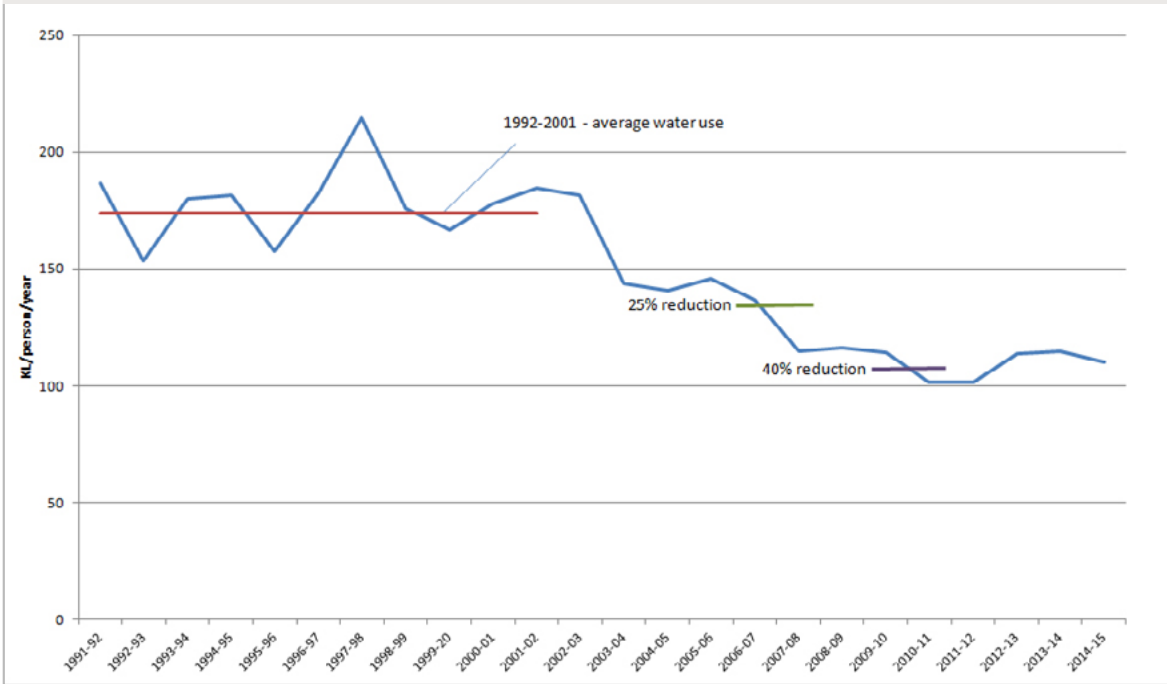
Permanent Water Conservation Measures (PWCM) are common sense rules that allow the community to continue to save water for the future and use water efficiently. The rules govern how water can be used on gardens and lawns, during pool filling, car washing, and cleaning.

The PWCM are currently in place and are mandatory and enforceable. Anyone found in breach of the measures may be liable for fines starting at $200 for an individual or $1,000 for a corporation.

The measures apply to Icon Water's potable water ('drinking' or 'tap' water). Non-potable sources are not restricted. In short, sprinklers and other irrigation systems, including drip irrigation, may only be used to water lawns and plants after 6pm and before 9am on any day. A hand-held hose fitted with a trigger nozzle, a bucket or a watering can may be used to water lawns and plants at any time. At all times lawns and plants may only be watered without causing pooling or runoff. A bucket and mop or a high-pressure low-volume cleaner may be used to clean paved areas at any time.

For full details go to the Icon Water website at https://www.Iconwater.com.au

Figure 18: ACT Region Water consumption including Queanbeyan



5.10 ENVIRONMENTAL FLOWS

We rely on our waterways for a range of functions including biodiversity and conservation, irrigation and domestic water supply. Waterways need to be healthy to provide these functions. The natural flows in ACT streams are highly variable. Rivers and streams naturally have periods of both very low and very high flows. Flows in our streams also vary seasonally with the higher flows usually occurring in the spring months. The Environmental Flow Guidelines need to identify those components of flow from this variable flow regime necessary to maintain stream health. One way to do this is to specify environmental flows that mimic the flows that would occur naturally. In more heavily used systems such as water supply catchments it may be necessary to protect specific components of the flow regime to keep aquatic ecosystems healthy. In highly modified ecosystems, the environmental flows needed to ensure critical processes occur and provide habitat may be very different to the natural flow regime that occurred before development.

The core principle of the WR Act is to set out the protection of environmental flows throughout the territory. The subordinate environmental flow guidelines set out the volumes and timings of environmental flows and the amount of water that can be abstracted from streams, rivers, lakes and aquifers. In the ACT, water can only be used for other purposes once environmental flow requirements are met.

Environmental flows are provided by either providing releases or spills from dams, or by putting restrictions on the volume of water that can be abstracted from a water management area. In the ACT the volume of water available for abstraction within each water management area is limited to the volume remaining after environmental flow volumes have been provided.

Held environmental water

The ACT did not hold any environmental water during the 2014–15. However, the ACT's contribution to The Living Murray (2 GL) and the SDL Shared Reduction Amount (4.9 GL) are fulfilled by providing water entitlements to the Commonwealth. These are means to provide water for the environment.

Planned environmental water

Environmental flows are a mandatory requirement under entitlement licence held by Icon Water in the Cotter catchment to enable flushing of sediment from pools between Corin Dam and Bendora Dam and between Bendora Dam and the Cotter Dam. The flushing of sediment from hollows allows endangered fish to live and breed. An environmental flow of 1.1 GL was planned and released over a one week period in July 2014 between and throughout these two reaches.

Similarly, Icon Water is required under licence to provide environmental baseflows from the four dams to achieve ecological objectives. The licence held by Icon stipulates 12.8 GL of environmental flow be released from Corin Dam during 2014–15 to maintain and improve river health, 19.1 GL from Bendora Dam, 15.0 GL from Cotter Dam and 4.2 GL from Googong Dam. For 2014–15, Icon meet all environmental watering requirements under licence.

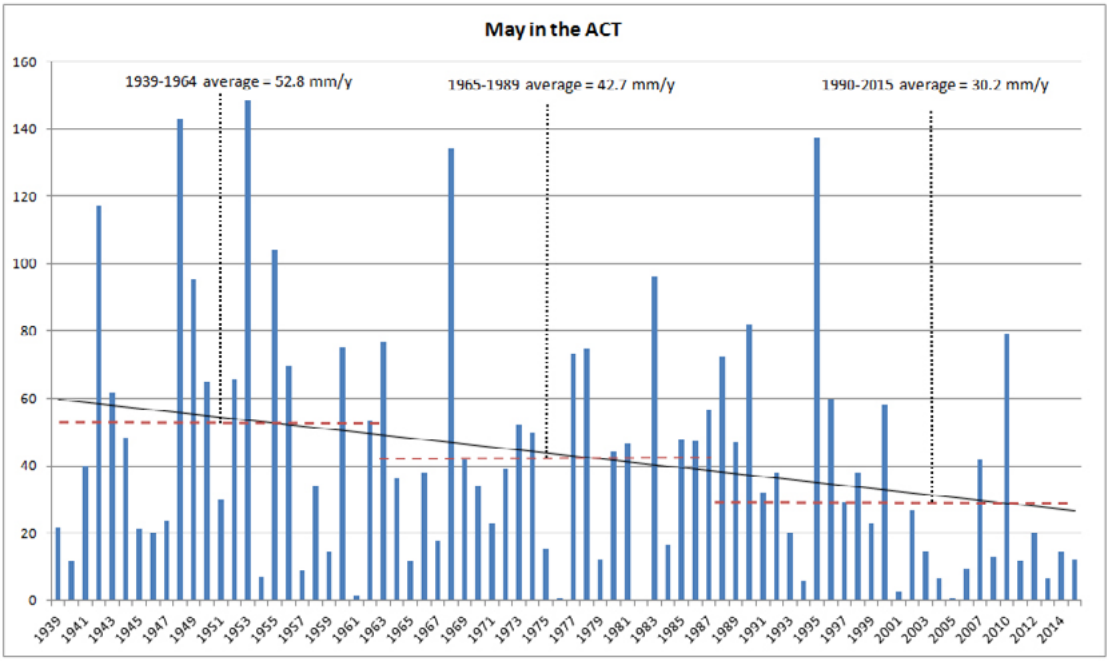
5.11 WATER SECURITY

There are no short or medium term risks to the ACT's water supply. However, when considering the impacts of climate change on the environment there is a serious level of risk to increased water stress or scarcity over the long term. (50 to 100+ years)

The water resources and water consumption of the ACT region are highly influenced by climate variability. The spatial and temporal variability of temperature, evaporation and rainfall largely determine the level of urban water supply security (i.e. reliability). Future climate scenarios are fundamental to the level of the ACT's future water security. This was evident when south-eastern Australia experienced seven years of severe drought between 2002 and 2009. The duration and impacts of this Millennium Drought were unprecedented in the ACT's historical climatic record since Federation. For one year in 2006 stream flows reduced 90% but averaged around 60%, and water storages fell to low levels (approximately 30% of capacity) Severe water restrictions (Stage 3) were imposed for almost 4.5 years across the period 2003 to 2010. Stage 4 restrictions, which require no outside watering, were nearly enacted; however a storm in 2007 averted this stage.

The light soaking autumn rainfall the ACT historically receives has decreased significantly, with an almost 40% reduction observed over the period 1997 to 2010 as compared to the long-term average. Over the same period, spring and summer rainfalls remains stable; however, there are early signals that these localised storms are increasing in rainfall intensity. This change continued through the 2010–2011 wet years.

Figure 19: ACT's long term rainfall record for the month of May



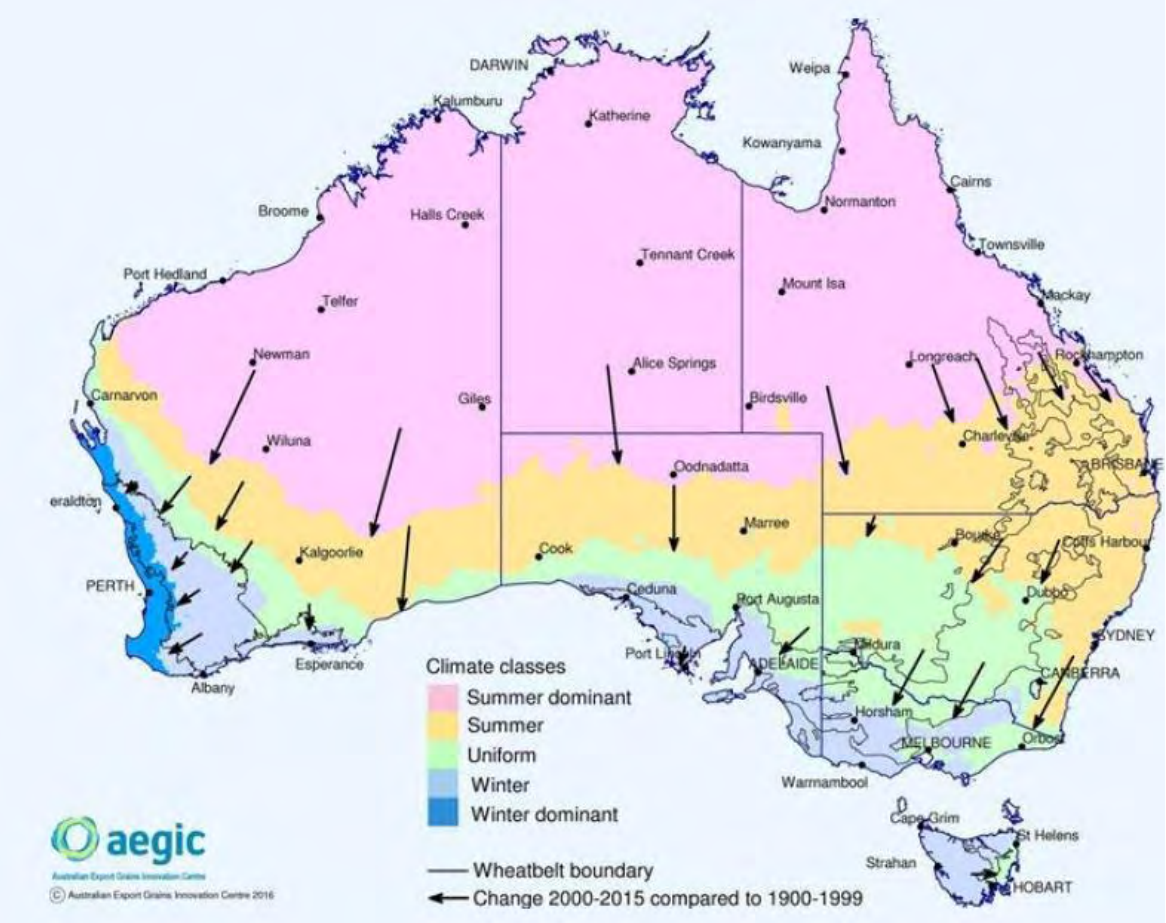
Considering the lessons from the Millennium Drought and the changing seasonality of rainfall, there are expected to remain long-term water related risks as a result of increasing population growth combined with periods of reduced rainfall. If the climate emerges drier than projected it will further compromise the ACT's water supply security. The likelihood to this scenario happening is 'Possible' and would lead to 'Major' to 'Severe' consequences, such as the water supply system not able to meet the ACT's unrestricted demand for water.

The ACT has mitigated short to medium-term water supply security risks by recently completing two major construction projects:

1. Construction of an enlarged Cotter Dam, completed in October 2013 at a cost of AUD$410 million, has increased the ACT's water storage capacity by 35%
2. Construction of the Murrumbidgee to Googong Water Transfer Pipeline, completed in September 2012 at a cost of AUD$140 million

The ACT's long-term water security is managed through day-to-day permanent water conservation measures to ensure supply through extended dry periods. The utility established these water conservation measures by basing modelling on 2030 climate change impacts. Prior to water conservation measures, Canberra's annual water consumption averaged between 60–65 GL. Since water conservation measures have been in place, overall gross water diversion figures dropped to 48.7 GL during 2013-14, and 47.1 during 2014-15, representing a 25% saving relative to 1993-2002 levels.

Figure 20: Wheatbelt boundaries 1990 to 2015



Even when the ACT has mitigated short to medium water security needs, consideration of the future effects from a changing climate need to be considered for water security and the infrastructure that manages the water throughout the territory. For example, analysis by the Australian Grains Export Innovation Centre report that over the last 15 years a major shift in rainfall amounts and distribution has occurred across the country and the rainfall zone boundaries have moved south by as far as 400km. These changes will need to be incorporated into the management practices of our regional farming community but also by ACT water managers.

In very extended dry periods, when storage levels are low, water can be pumped from two pump stations located on the upper Murrumbidgee River. For even more protracted dry periods, when the river's natural flows are low, extra water can potentially be sourced through water trading and through the arranged releases from Snowy Hydro Limited's Tantangara Reservoir as part of a portfolio of water rights that Icon has already acquired. Building supply system resilience is a risk management measure. In this context, resilience includes the following:

A diverse range of independent water sources and demand management measures, such as accessing more reliable water catchments or less rainfall dependant sources, or implementing a range of unrelated but concurrent demand management measures.

3. System interconnectivity to take advantage of any excesses in the system, such as gridding of water sources (the Cotter Googong Bulk Water Transfer is one example of interconnectivity already in place).
4. Planning flexibility, allowing implementation of the responses best suited to actual emerging futures. There is an expectation that parallel severe drought contingency plans will be prepared. Drought contingency plans comprise more short-term emergency response plans that will ensure basic water needs for a community can be met for the duration of a very severe drought. The drought contingency plans include short-term fast responses which may differ from more sustainable longer term options that may be difficult to implement quickly.

5.12 WATER PRICING

The price of water in the ACT is set independently of the utility, Icon Water. The price of water services and also sewerage services provided by the utility is set by the Independant Competition and Regulatory Commission (ICRC). The ICRC have developed a methodology to determine the basis of water pricing for the ACT. At present there is a fixed charge of $102.56 and a volumetric charge of $2.64 KL that changes for a usage of 0-200 KL/annum to $5.29 for usage over 200 KL/annum.

The ACT Government also imposes a water abstraction charge of 54c/KL. This charge covers the environmental management costs of water management and the scarcity value of water.

6. WATER QUALITY

6.1 LAKE CLOSURES

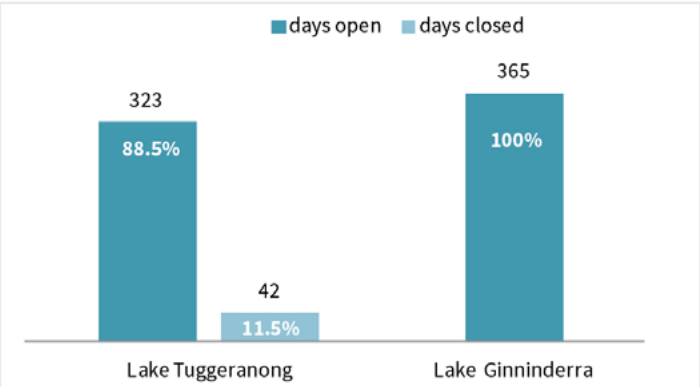
The phytoplankton contained in the lakes perform two vital roles in aquatic systems––they mop up free/excess nutrients, especially nitrogen and phosphorous, and they release large quantities of oxygen into the water column. In closed systems such as lakes and artificial wetlands the significant phytoplankton population rises and falls in seasonal pulses and as a response to nutrient levels. While those populations have several other components (diatoms, dinoflagellates, green and golden-green algae) the cyanobacterial or blue-green algal fraction is the most likely to produce offensive and potentially toxic population explosions—blooms. These responses are further indications of water quality.

The conditions that support the occurrence of algal blooms can be circumvented in small water bodies by stabilisation of basement sediment. In large water bodies such stabilisation is more difficult. Aeration of the water column to minimise temperature stratification, and consequent changes in pH and nutrient availability, may provide some remediation. On-going actions to improve the health of the catchment including in-stream and riparian revegetation and pollution reduction are much more effective in the long term.

Phytoplankton is reported in numbers per millilitre (cells/mL). The standard for Cyanobacteria for lakes in the ACT is based on danger to human health through contact. Populations of Microcystis, Anabaena or other known toxin producing cyanobacteria, greater than 20,000 cells/mL, bring about the closure of that water body to primary contact activities.

The major urban lakes, with the exception of Lake Burley Griffin, which is a Commonwealth responsibility, are sampled eight months of the year during August, October to March, and May. The ACT Government also monitors Burrinjuck Reservoir as activities in the ACT could potentially impact on this reservoir. Monitoring of blue-green algae in Canberra's lakes is undertaken mostly, but not exclusively, during the summer months by EPA officers and encompasses the recreation zones of the lakes and the Molonglo River. The ACT Health Population Health Division undertakes bacterial monitoring of lake and river recreation areas during peak use times.

Figure 21: 2014–15 lake closures



In 2014–2015, Lake Tuggeranong was closed for primary contact from 18 December 2014 to 28 January 2015 (total of 42 days) due to the presence of blue green algae.

6.2 BIOLOGICAL ASSESSMENT

In addition to monitoring the physical and chemical condition of the ACT's waters, an assessment of the status of the aquatic ecosystem is undertaken. Assessment of ecosystem health is based on the macroinvertebrate monitoring undertaken using the AUSRIVAS protocol. It involves collecting samples of stream invertebrates from stream edge sites in the ACT region during spring and autumn.

An AUSRIVAS predictive model is used to assess these sites. The condition of the site, as determined by the model, provides a measure of a stream's biological health. Thirteen sites are sampled and are selected as either reference or test sites. The selection of test sites was based on potential and known impacts from rural degradation, urban runoff, discharge of treated sewage effluent, trace metal contamination, habitat degradation, sedimentation events and river regulation. The three reference sites were selected from those sampled during development of the ACT component of the National River Health Program.

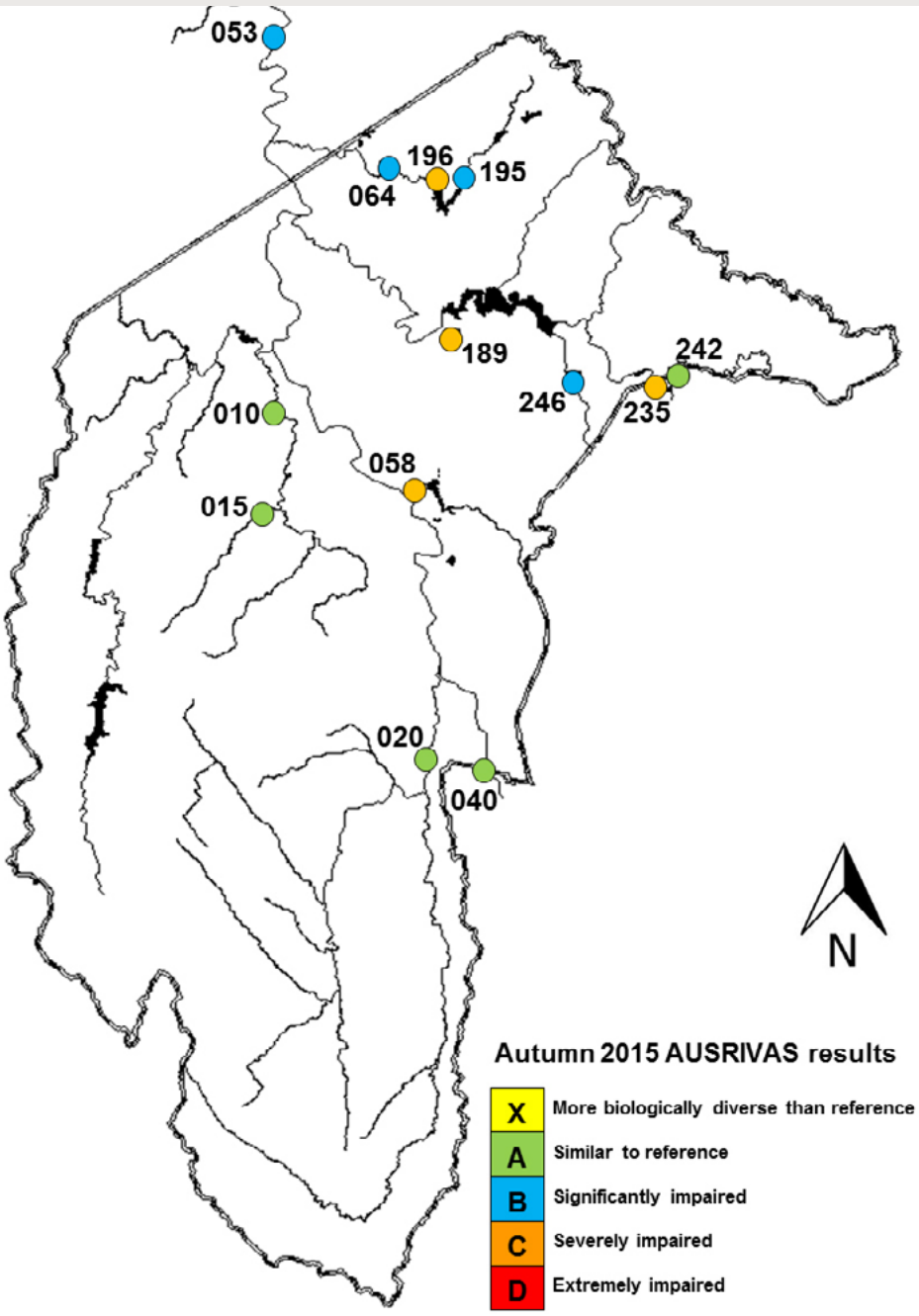
Water chemistry analysis such as pH, total phosphorus and dissolved oxygen provides a snapshot of the water quality at the time when the sample is taken. Biological assessment, in this case the sampling of waterbugs (benthic macroinvertebrates), can indicate much about the water quality over time and show what kind of environment the water and its waterway provide for animals to live in.

Macroinvertebrate biological assessment is based on a comparison between a tally of the range of waterbugs found at a site with those predicted to occur there. If all those animals expected at a site actually occur there, the site is judged to be in good condition. Conversely the absence of expected animals indicates a site has been disturbed. The rating scale for AUSRIVAS outputs is presented below (Figure 21).

In autumn 2015 dissolved oxygen was generally low across all sites, with the concentration at some sites below the guidelines' concentration. The conductivity at site 189 (Yarralumla Creek) is regularly above the guideline level because of groundwater and urban run-off influences during baseflow. However, in the autumn 2015 assessment conductivity was well below the guideline level because of a fresh rainfall flow in the 24 hours before sampling occurred. This rainfall event also resulted in above guideline turbidity levels at some urban sites.

The amount of sites assessed as biologically impaired in the autumn 2015 remained stable from the spring 2014 assessment; however, the degree of impairment at some impaired sites was less than in spring 2014. The greater relative abundance of environmentally sensitive Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa at reference sites 010 (Paddys River), 015 (Tidbinbilla River) and test sites 020 (Gudgenby River), 053 (Murrumbidgee River), 242 (Molonglo River) and 246 (Jerrabomberra Creek) contrasted with other sites in heavily modified urban catchments that had lower EPT relative abundances. Therefore, sites with environmentally sensitive macroinvertebrate communities continue to persist in the ACT region, whereas heavily modified urban catchments with associated changes to habitat and water quality support macroinvertebrate communities with lower abundances of sensitive taxa.

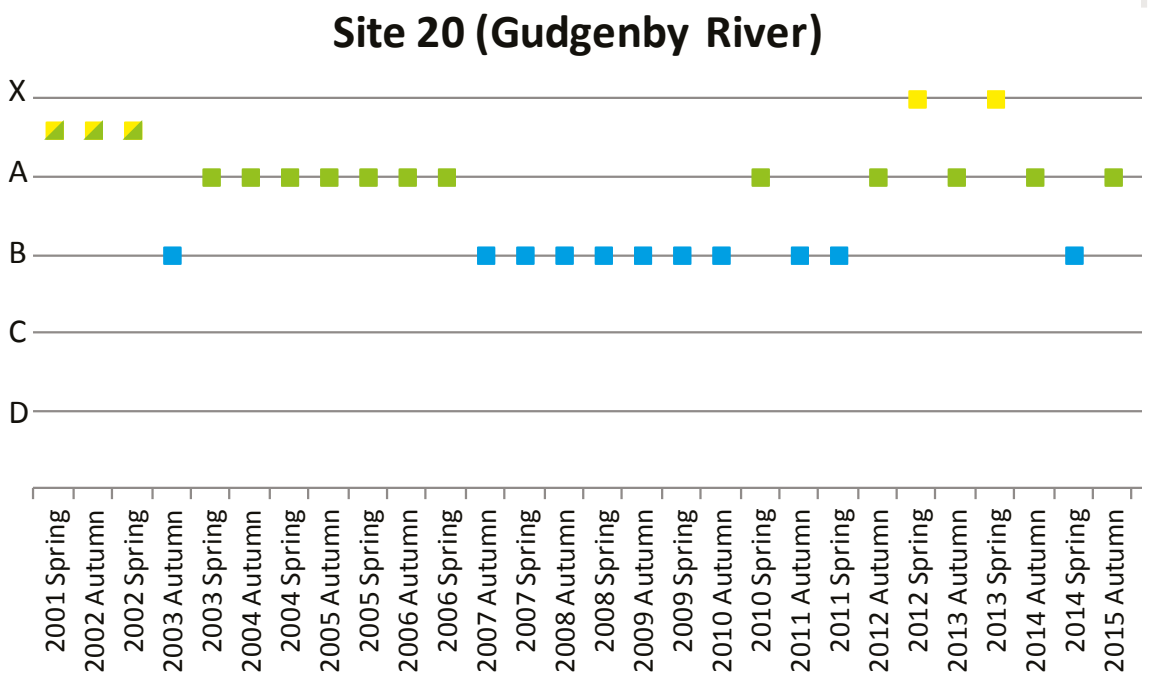
Figure 22: AUSRIVAS sites

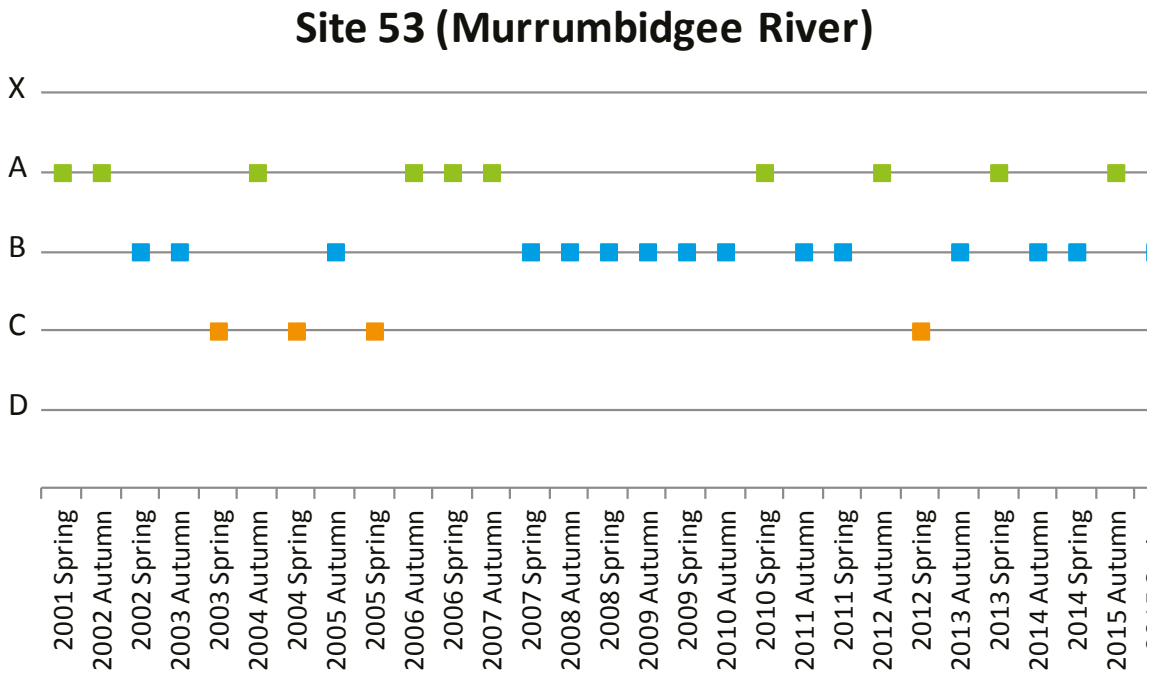


6.3 SITES THAT IMPROVED IN BIOLOGICAL CONDITION

Test sites 020 (Gudgenby River) and 053 (Halls Crossing, Murrumbidgee River) improved in biological condition since spring 2014 from band B to band A. Both sites have shifted between band A and B over previous assessments, therefore the current assessment is within natural variation for both sites. Previously, in spring 2014 the macroinvertebrate community at site 020 was likely impaired by high flows preceding sampling. The return to stable flow conditions in autumn 2015 has resulted in a biological condition consistent with previous assessment outcomes at this site.

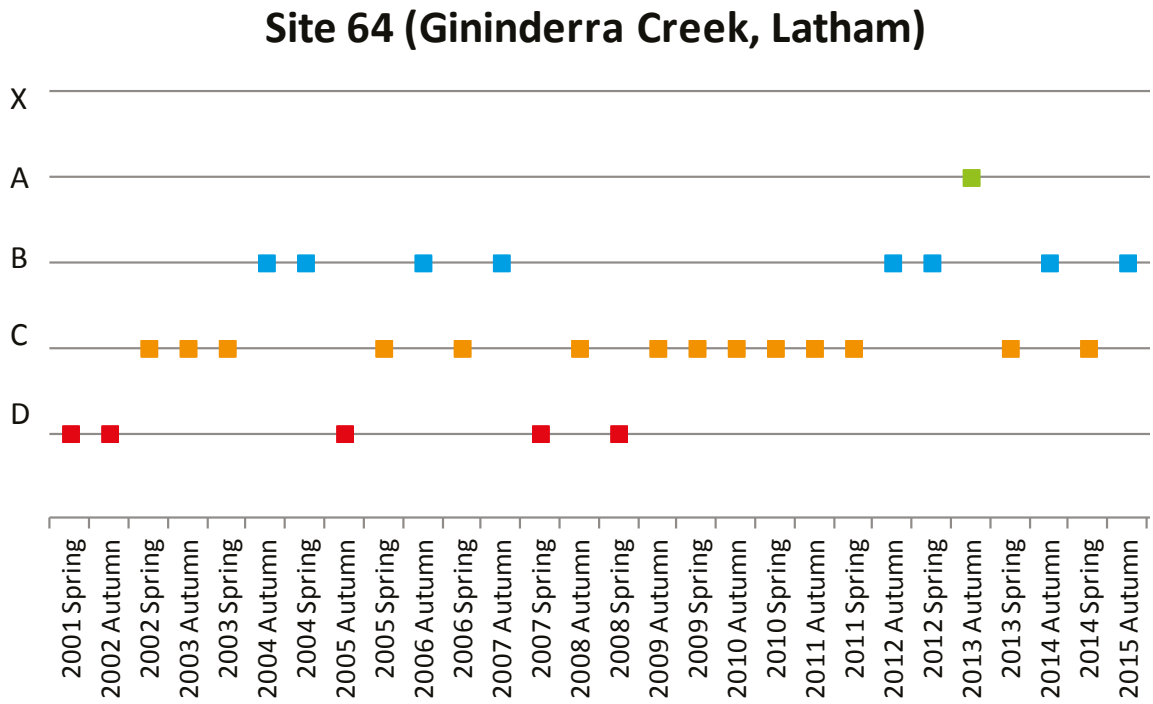
Figure 23: Sites 20 - Gudgenby River and 53 - Murrumbidgee River

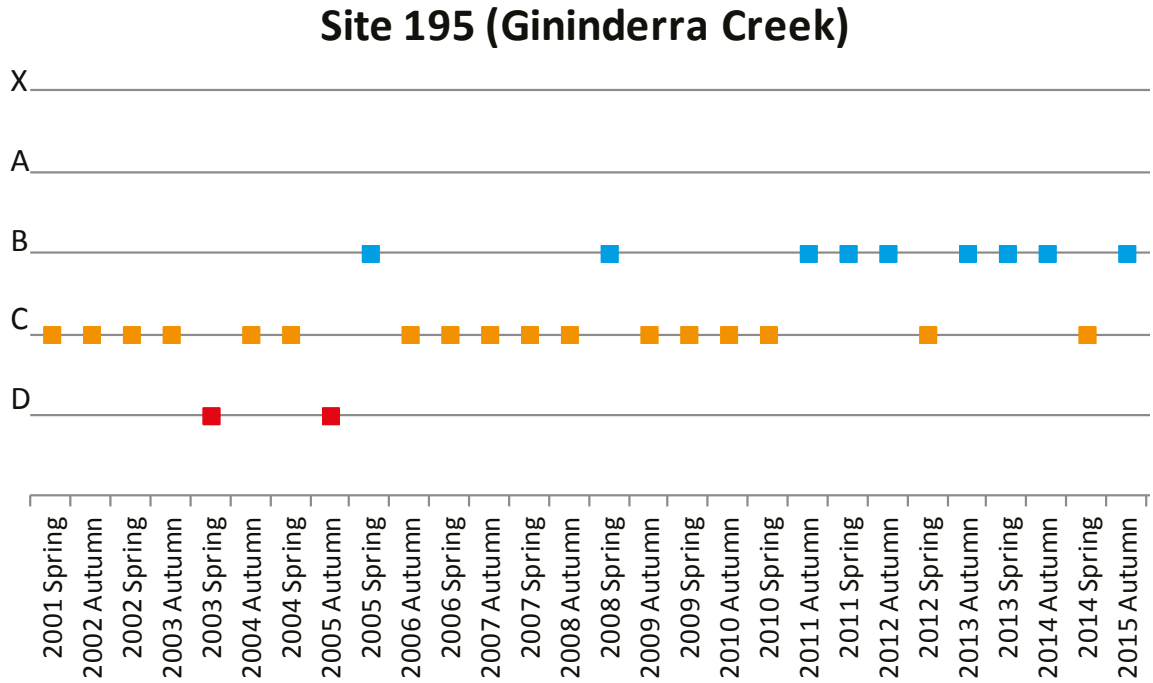




Test sites 064 and 195 (Ginninderra Creek) and 189 (Yarralumla Creek) all improved to band B in the autumn 2015 assessment. Historically these sites are regularly significantly (band B) or severely (band C) impaired as result of run-off from urban areas. Therefore the current assessment is within natural variation for these sites. These heavily urbanised sites are likely to remain biologically impaired under the ongoing pressures of urban run-off and instream and riparian modification.

Figure 24: Sites 64 and 195 on Ginninderra Creek

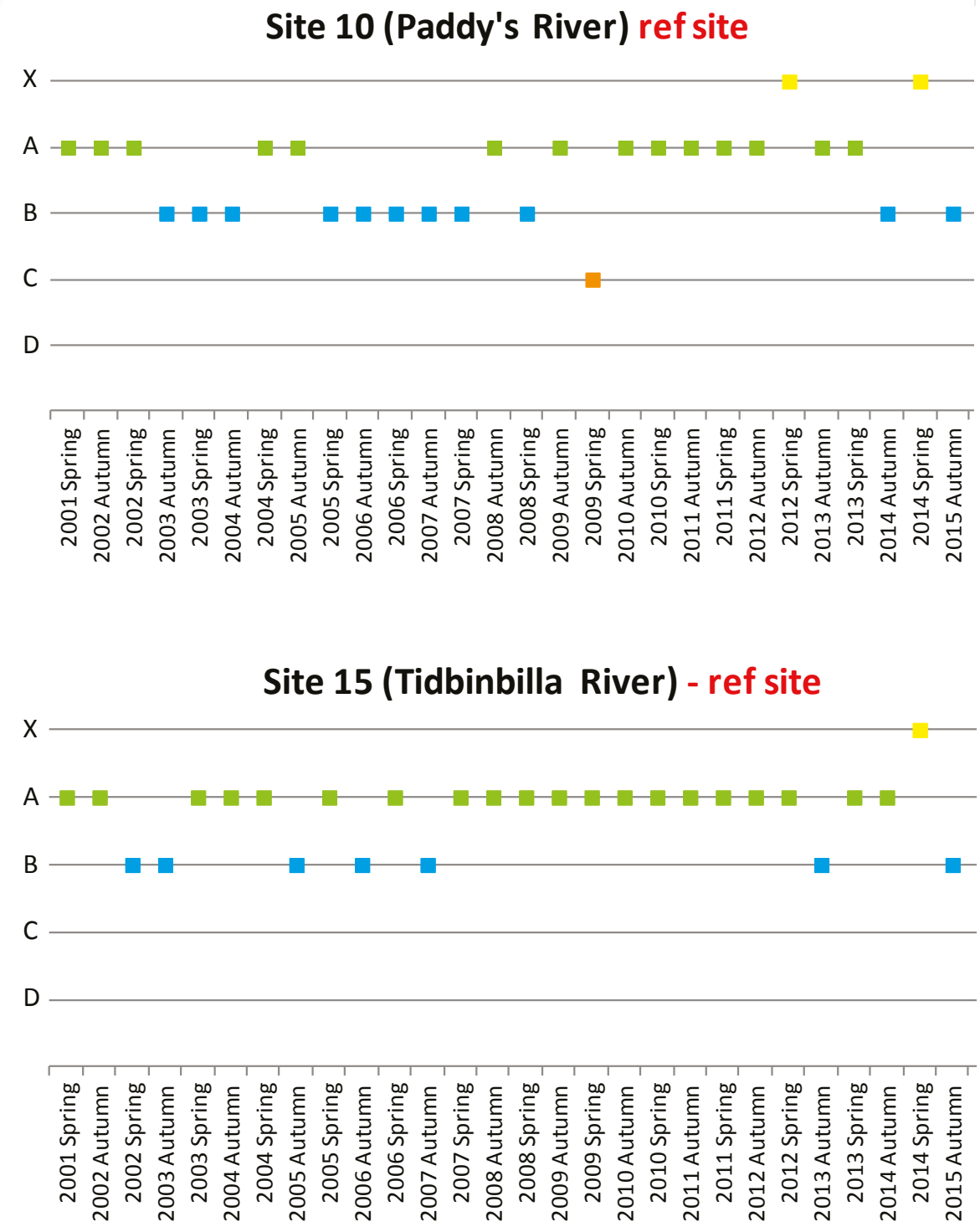




6.4 SITES THAT DECLINED IN BIOLOGICAL CONDITION

Reference sites 010 and 015 both decreased in condition to significantly impaired (band B) from greater than reference (band X). Since autumn 2012 assessments at both of these sites have varied between band X, A and B. Therefore the autumn 2015 result at both of these sites is not outside of the variation experienced over the last three years and it is expected these sites will return to band A under favourable habitat and water quality conditions.

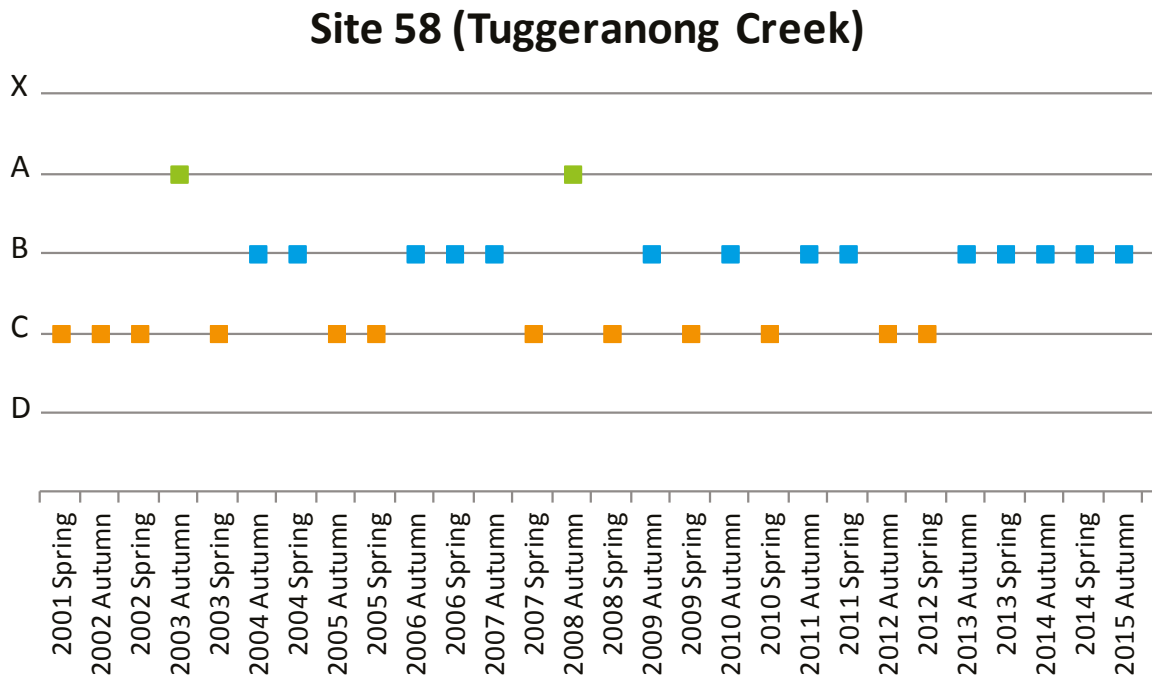
Figure 25: Site 10 Paddy's River and 15 Tidbinbilla River



6.5 SITES THAT MAINTAINED A STABLE BIOLOGICAL CONDITION

Test sites 058 (Tuggeranong Creek), 196 (Ginninderra Creek), 235 (Queanbeyan River) and 246 (Jerrabomberra Creek) remained within band B in autumn 2015. The band B assessment at these sites in autumn 2015 is consistent with previous assessments and the level of catchment modification to which they are exposed (e.g. cleared land and urban runoff).

Figure 26: Site 58 Tuggeranong Creek and 196 Ginninderra Creek



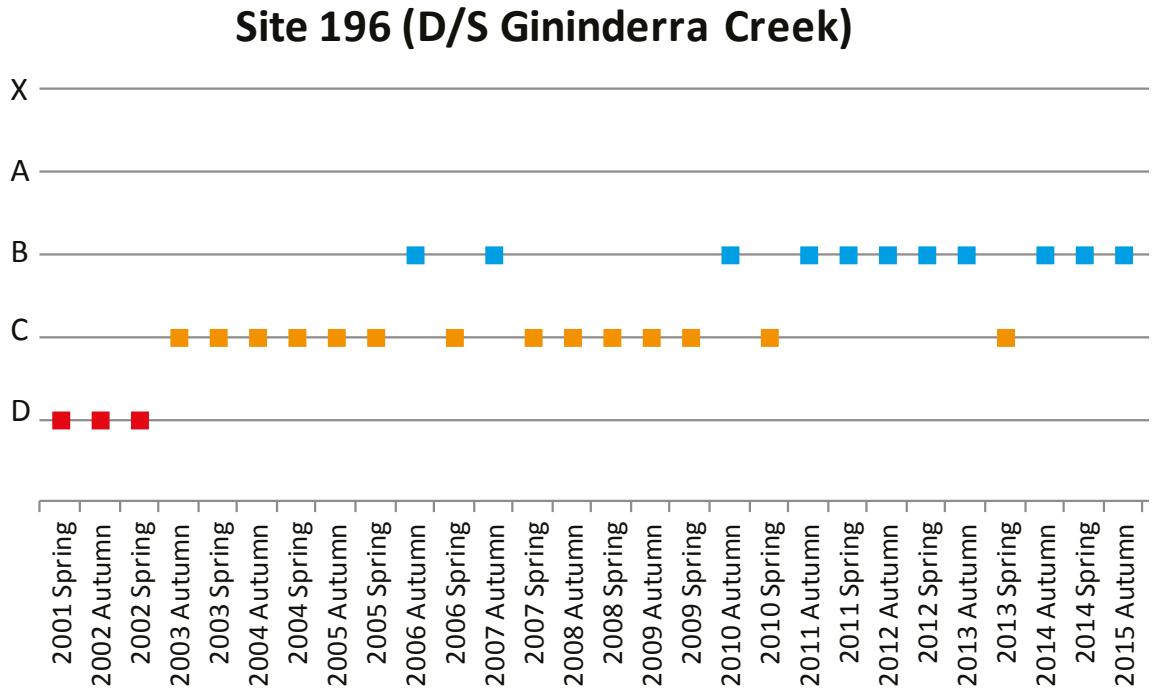
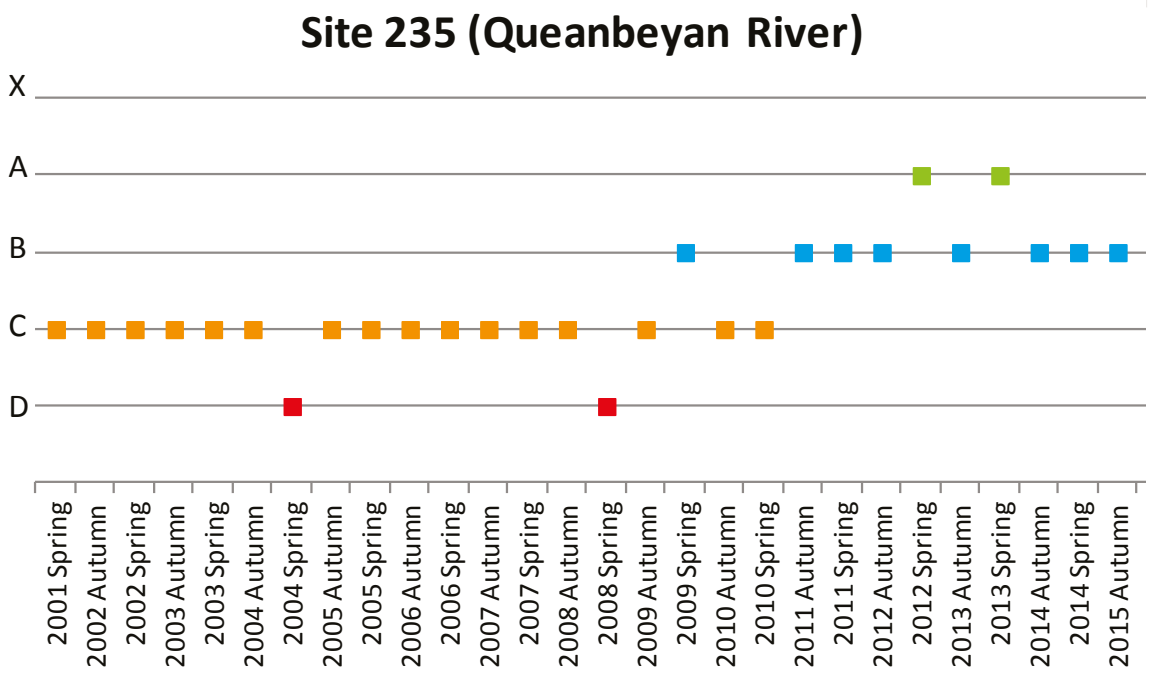
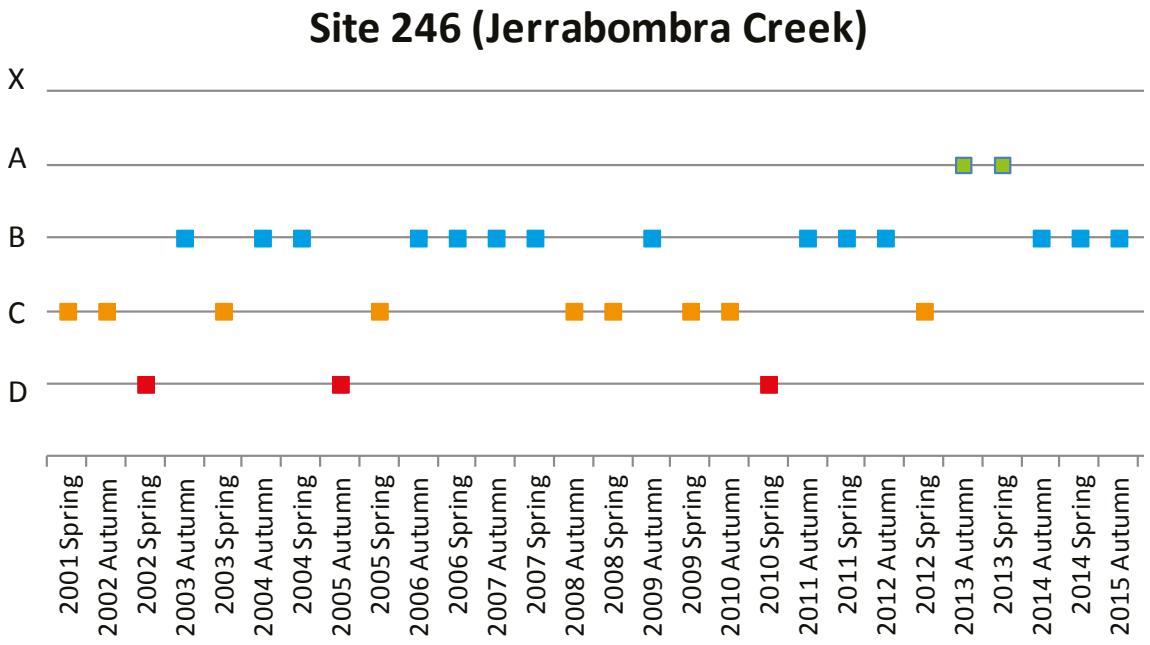


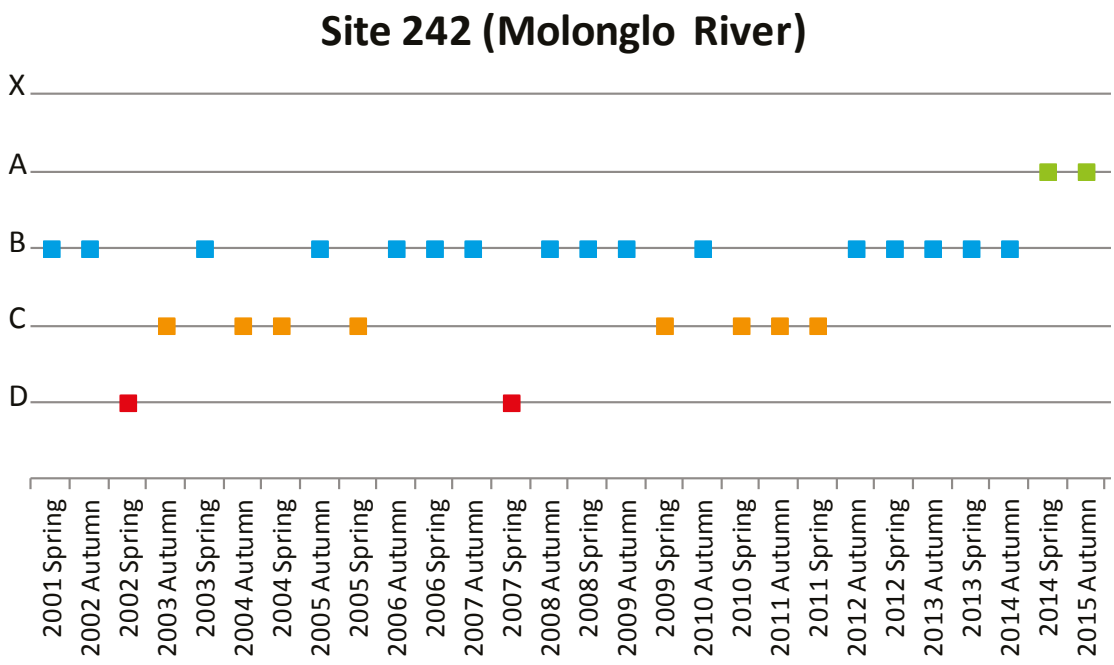
Figure 27: Site 235 Queanbeyan River and 246 Jerrabombra Creek





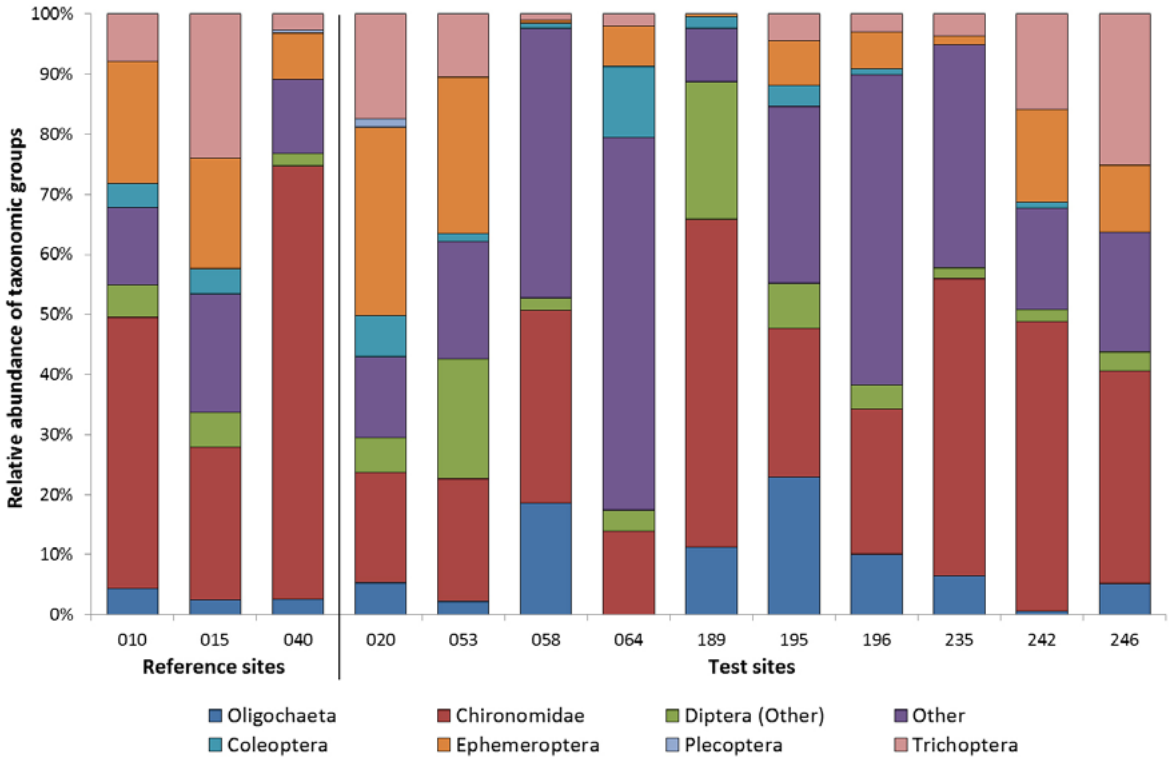
Site 242 on the Molonglo River has remained within band A since the spring 2014 assessment. The development of dense macrophyte beds has likely continued to provide good habitat conditions at this site.

Figure 28: Site 242 Molonglo River



A full explanation of the AUSRIVAS biological assessment method for the ACT is available from www.ausrivas.canberra.edu.au and the full biological assessment reports are available on request from EPD.

Figure 29:



6.6 THREATENED SPECIES

Threatened species in the ACT are currently listed as either vulnerable or endangered. The following, drawn from the ACT State of the Environment report, presents a number of vulnerable and endangered species that relate to river health and biodiversity which are partly managed through environmental flow guidelines.

A native species is eligible to be included in the endangered category on the threatened native species list if it is not critically endangered, but it is facing a very high risk of extinction in the wild in the near future.

Macquarie Perch (endangered)

The Australian Government Species Profile and Threats Database reports that, in the ACT, Macquarie Perch (Macquaria australasica) is restricted to the Murrumbidgee, Paddys and Cotter rivers. It was previously known to occur in the Molonglo River, but was last recorded in the river in about 1980.

The Macquarie Perch has evolved in riverine systems and requires access to flowing water to breed. This has meant that lack of access to the Queanbeyan River following filling of Googong Reservoir has led to the near-extinction of an impoundment population of Macquarie Perch. The Queanbeyan River/Googong population was translocated above the Googong Reservoir– it survived for a while, but after the drought it has not been recaptured and is presumed extinct.

Adult Macquarie Perch usually remain within the Cotter Reservoir and had previously not been observed in the Cotter River during an annual cycle. However, there is now a resident population of the species in the river.

The mechanisms underpinning the adult occupation of Cotter Reservoir, and the avoidance of river habitat for much of the year, are poorly understood. Potential reasons include dominance of alien salmonids in the river upstream, differential predation by avian predators in the river relative to the reservoir, thermal conditions, in-stream barriers as a result of a relatively steep gradient riverbed coupled with low and regulated flows, or angling pressure.

Sampling during a three-year period (2010–2012) shows that, from a total of 5554 fish from 13 species captured, Macquarie Perch was the most abundant species captured in Cotter Reservoir.

Silver Perch (endangered)

The once-strong Silver Perch (Bidyanus bidyanus) population in Burrinjuck Reservoir (NSW) collapsed in the 1980s. There was a concomitant collapse of that population's annual summer migrations into the ACT reaches of the Murrumbidgee River. This collapse was captured in data from a fish-monitoring trap on the Murrumbidgee River at Casuarina Sands, in which Silver Perch captures declined from 252 specimens in 1984 to 4 in 1988 and none in 1989. (Severe drought also impeded fish movement in the first three years of the trap's operation.) Since 1990, no Silver Perch have been recorded in the ACT reaches of the Murrumbidgee River in fish surveys and monitoring. Similarly, monitoring at two sites in Burrinjuck Reservoir in 2004 failed to locate any specimens. Silver Perch is now functionally extinct in the ACT (L Evans, Senior Aquatic Ecologist, Conservation Research, EPD, pers comm, 17 June 2015).

Trout Cod (endangered)

Trout Cod (Maccullochella macquariensis) died out in the Canberra region in the 1970s. Conservation stocking has been undertaken in a number of waterways as part of the National Recovery Plan for Trout Cod in an effort to re-establish the species in its former range.

Historically, Trout Cod occurred throughout the entire length of the lower Murrumbidgee River and 200 km of the upper Murrumbidgee; the species was last recorded from the river in 1976. In an attempt to restore Trout Cod populations, both the upper and mid-reaches of the Murrumbidgee River have been stocked. In excess of 326,000 Trout Cod fingerlings have been stocked across eight sites in the upper Murrumbidgee River since 1988. Regular monitoring at some sites has demonstrated survival and growth of stocked individuals, but no recruitment or establishment of self-sustaining populations has occurred. Detection of stocked individuals 3+ years old at riverine sites has been unsuccessful, except at one site where 3-year-old Trout Cod are being regularly recorded.

Angle Crossing received the greatest stocking effort (99,500 fingerlings over nine years to 2005), and the collection of a single small fish in 2011 (six years after stocking ceased) may be an indication that some breeding by stocked fish has occurred. Stocking of 8740 fingerlings over two years in Bendora Reservoir on the Cotter River has resulted in recruitment from stocked fish more than a decade after stocking, and these recruits now dominate the population.

Murray River Crayfish (vulnerable)

An initial survey of the Murray River Crayfish (Euastacus armatus) in 1988 revealed that, despite evidence of distribution throughout the length of the Murrumbidgee River within the ACT, catch rates were patchy and low in comparison with other parts of its range. In response to these findings, the ACT Government banned fishing of Murray River Crayfish in 1993 and put in place a monitoring program. The low number of crayfish captured longitudinally through this monitoring indicates that the species remains at risk.

Two-Spined Blackfish (vulnerable)

Two-Spined Blackfish (Gadopsis bispinosus) are restricted to the Cotter River Catchment within the ACT, and systematic monitoring of the species is undertaken each year.

The monitoring found low numbers of this species in 2009–2012 at both regulated sites (subject to government-controlled Environmental Flow Guidelines) and unregulated sites (upstream of Corin Reservoir). This is likely to be due to drought, followed by extreme high flows during the breeding season.

The 2013 sampling found that numbers had increased. In 2014, nine Cotter River sites were surveyed. A total of 215 blackfish were caught: 106 from the six sites in the regulated section of the Cotter River and 109 from the three sites in the unregulated section. Two reference sites from outside the Cotter River Catchment were also sampled, where 25 blackfish were caught from Mountain Creek and three from Micalong Creek.

Under the 2013 Environmental Flow Guidelines, there are two management indicators for Two-Spined Blackfish populations:

- The first indicator value (40% or more of population at regulated sites being either age 0+ or 1+) was achieved in 2014: 47 of the 106 (44.3%) Two-Spined Blackfish captured from the regulated reach were aged 0+ or 1+.
- The second indicator value (greater than 80 individual blackfish at regulated sites) was also met in 2014, with 106 captured from sites within the regulated reach.

The summarised conclusions from the Two-Spined Blackfish monitoring program in 2014 are as follows:

- The mean number of Two-Spined Blackfish recorded in the regulated reach in 2014 was lower than 2013 but higher than 2012.
- Two-Spined Blackfish resilience to previous flood events is evident, but patterns of response are not consistent among reach types.
- The average abundance of young-of-year (those fish hatched within the current year) appears to have declined; more young-of-year were captured in the regulated than unregulated reach, although the majority of the young in the regulated waterway came from one site (M Beitzel, Aquatic Ecologist, Environment and Planning Directorate [EPD], pers comm, 31 August 2015).

In addition to the 2014 monitoring results for the nine sites presented above, a 2012 study conducted primarily to ascertain the effects of the enlarged Cotter Dam on Macquarie Perch found, for the first time in more than 30 years, Two-Spined Blackfish to be present in the Cotter Reservoir. It is believed the captured individuals may have been displaced by high flow and/or colonised the backed-up waters of the Cotter Reservoir during the 2011 floods. This provides some indication of how the species may respond to the enlargement of the Cotter Dam.

As part of assessing the potential impacts on threatened fish from the construction, filling and operation of the enlarged Cotter Dam, sampling for a three-year period (2010–2012) captured 5554 fish from 13 species. Two-Spined Blackfish was the most abundant species captured in the Cotter River.

6.7 SALINITY

Salinity refers to the concentration of dissolved salts in water or soil. While salt is a natural feature of our landscape, high salinity can affect aquatic ecosystems and vegetation, and damage infrastructure. The ACT monitors and reports to the MDB Authority, which assesses Basin-wide records against objectives and targets to ensure the Basin's water remains suitable for environmental, social, economic and cultural uses.

For 2014–15, the median and the peak EC salinity levels (134 and 232 respectively) at Halls Crossing are both within the agreed baseline. The total ACT salt load impacts are larger than the previous year and the baseline conditions. The increase above the annual tonne is 6%.

Table 18: Conditions for 2014–15 only

Site	Salinity EC (uS/cm)		Salt Load			Discharge
	Median (50%ile)	Peak (80%ile)	Salt Load (t/yr)	Median (50%ile) (t/month)	Peak (80%ile) (t/month)	Average Daily (ML/day)
Halls Crossing	134	232	70,488	4,114	7,113	1,694
Lobbs Hole	48	85	26,349	1,467	2,601	1,056
Oaks Estate	11	25	8,613	365	900	252
QSTP	2	3	836	64	86	9
LMWQCC	37	40	13,837	1,147	1,214	81
Total ACT impcat	73	119	34,690	2,089	3,729	377

The salt load has increased and the average daily discharge has also increased. This is a result of the significant rainfall/storm events during 2014–15. It is also noteworthy that the volume of salinity coming into the ACT via the Murrumbidgee River has increased.

The salt measured at the Lower Molonglo Water Quality Control Centre is largely calcium bicarbonate and nitrate rather than sodium chloride. The high proportion of calcium reduces soil sodicity and the sodium absorption ratio.

Additionally, large scouring and sediment movement has recently been identified over a number of kilometres in Blue Gum Creek (deep in Namadgi National Park), which leads into the Paddy's River and the Murrumbidgee. This tributary is not regularly monitored for EC, leaving Halls Crossing to pick up any EC produced from this area which could account for higher load passing through Halls Crossing and not any of the other main catchments of Lobbs Hole, Oaks Estate or Queanbeyan Sewerage Treatment Plant. The issue in Blue Gum Creek is being investigated as a catchment management issue and has also been identified as a gap in our monitoring regime.

Figure 30: Salt load through the Murrumbidgee River system

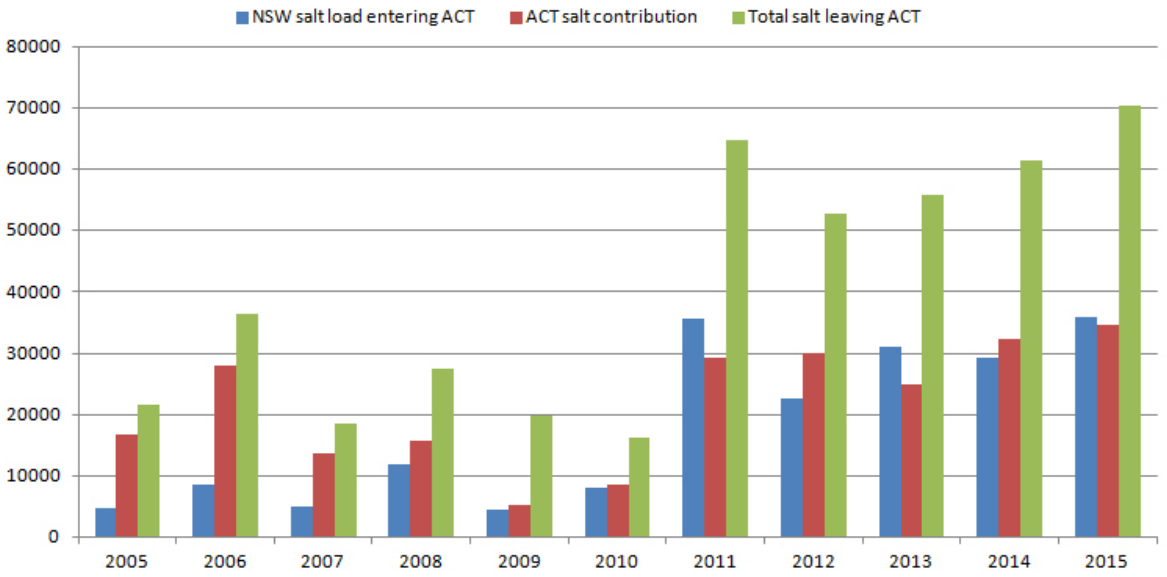
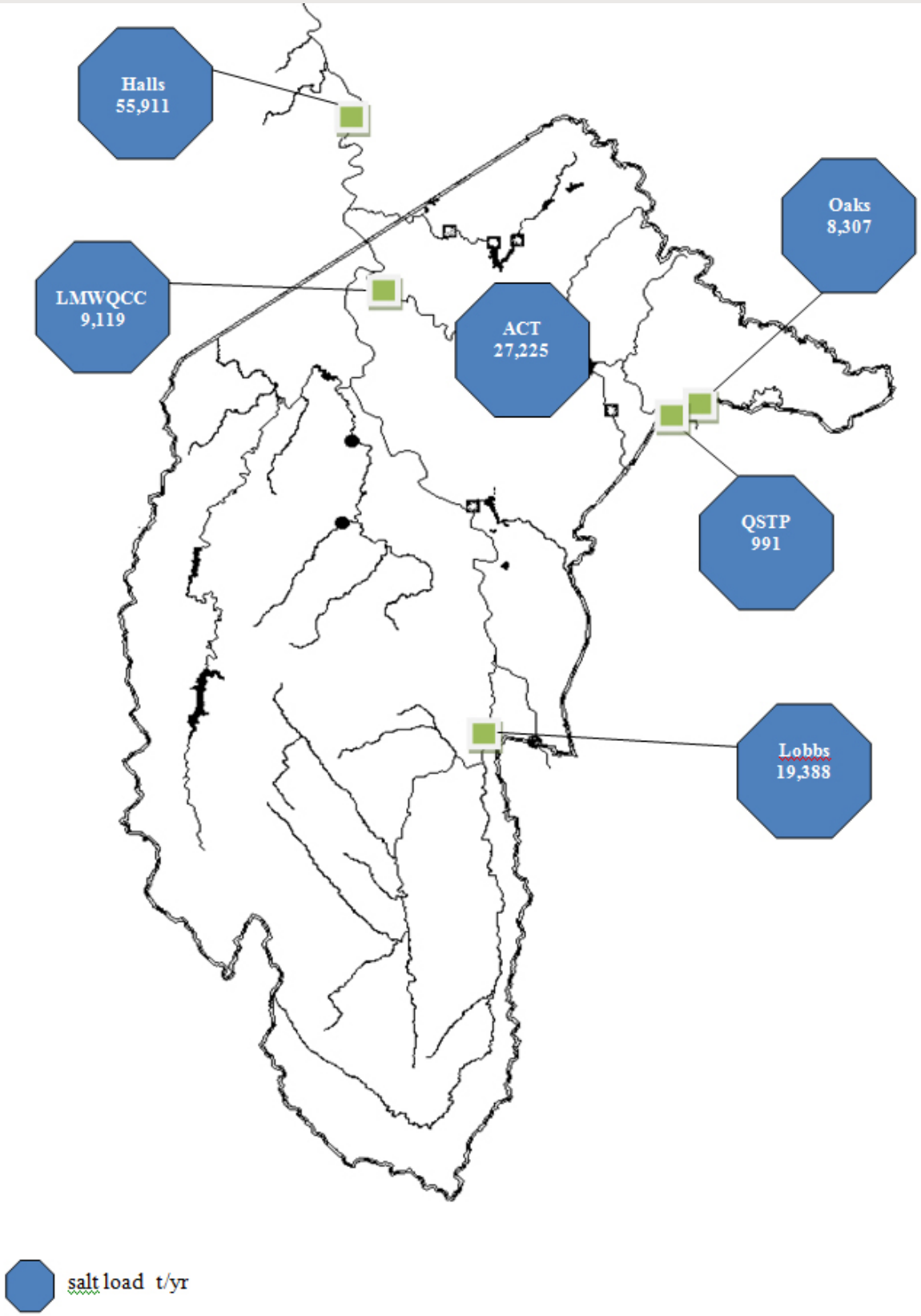


Figure 31: ACT salinity balance



7. ENVIRONMENTAL PROTECTION

7.1 ENVIRONMENTAL PROTECTION

There is a body of environmental protection legislation and policies to regulate and help reduce the discharge of pollutants into our waterways. The main statute is the *Environmental Protection Act 1997* and related Environmental Protection Regulation 2005. The legislation is administered by the Environmental Protection Authority which also released the Water Quality Environment Protection Policy in April 2008. The objective of the policy are to provide information to the community and to maintain and where appropriate enhance, the ACT's water quality as measured by standards, by minimising or eliminating water pollution.

The Senior Manager of Environment Protection Policy holds the statutory position of Delegate of Lakes, which is responsible for administering provisions of the *Lakes Act 1976* including responsibility for works approval on the lakes and lake warnings and closures due to pollution incidents.

The Molonglo Reach water ski area remained closed to the general public. The Territory and Municipal Services Directorate undertook a risk assessment of the water ski area and determined a single power boat operated by a competent person may use the main basin area. A licence under the Lakes Act was issued to the ACT Waterski Association for use of the main basin for training and competition purposes only. Two other licences were issued for the Molonglo Reach area to marine repair businesses.

Three licences were issued to commercial boat operators using the Kingston Foreshore Harbour. The licences incorporated conditions that reflect requirements under the Commonwealth's Marine Safety (Domestic Commercial Vessel) National Law 2012, which regulates the safety of all commercial vessels. The licences are modelled on and consistent with the licences issued by the NCA for use of Lake Burley Griffin, which is regulated by the NCA. The ACT negotiated with South Australia and the Australian Maritime Safety Authority to administer the Commonwealth legislation in ACT regulated water consistent with the regulation for the NCA on Lake Burley Griffin (Commonwealth water).

Two licences were issued for Lake Ginninderra, one to the ACT Waterski Association to facilitate the continuation of the trial use of a designated area for training purposes and one to a marine licence training business.

7.2 COMPLIANCE

Licensees are regulated in accordance with the EPA's enforcement policy through an educative process, with a progressive increase in punitive outcome. People are given advisory notices and warnings when potential compliance issues arise; however if the matter is serious, punitive measures may be considered in the first instance. This process can prevent serious harm or breaches of the WR Act.

Overall, there was an approximate 50% decrease in enforcement activity in 2014–2015, which again indicated a positive shift towards compliance by the regulated community. The downward trend in enforcement activity indicates successful implementation of the National Framework for Compliance and Enforcement systems for Water Resource Management. Compliance measures cover activities such as: under works in a waterway without a licence; not in accordance with a licence conditions; taking of water without a licence and above licence volume.

Table 19: 2012–15 EPA actions

Enforcement action	2012–13	2013–14	2014–15
Written caution (advisory)	83	23	14
Written formal warning	6	22	3
Direction	0	1	4
Infringement notice	0	0	3
Prosecution	0	0	0
Total	**89**	**46**	**24**

8. PROGRAMS, PROJECTS AND RESEARCH

The need for residential water efficiency programs was reduced with the breaking of the Millennium Drought and the improvement in Canberra's water security due to investment in projects such as the Enlarged Cotter Dam and the Murrumbidgee to Googong pipeline. In the ACT's 2014–15 Budget the Government decided to close the ToiletSmart program. This program closure refocuses funding to areas of greater priority.

8.1 ACTSMART BUSINESS ENERGY AND WATER PROGRAM

Initiated from the previous ACT Water Strategy, Think Water, Act Water, the Actsmart Business Energy and Water Program, which provides advice and financial assistance for efficiency upgrades to small businesses in the ACT to help them reduce energy and water consumption, commenced on 1 July 2012.

The program is open to businesses in the ACT with electricity bills up to $20,000 per annum and/or up to 10 full-time equivalent staff. Businesses receive an energy and water assessment of their business premises conducted by an Actsmart assessor, resulting in a tailored energy and water action report. The report recommends upgrade opportunities as well as no-cost and behaviour change recommendations. Businesses are able to claim a rebate of 50% of costs of approved upgrades up to $5000, resulting in reduced energy and water consumption, and GHG emissions.

The Actsmart Business program extends the $5000 rebate to water efficiency savings identified in the assessors report to the business.

http://www.actsmart.act.gov.au/what-can-i-do/business/business-energy-and-water-program

8.2 ACTSMART GOVERNMENT ENERGY AND WATER PROGRAM

The Actsmart Government Energy and Water Program has been providing tailored assistance and advice to ACT Government agencies to identify energy and water efficiencies since September 2012.

The program provides a site assessment that results in a comprehensive report prepared by a Government Energy and Water Assessor. This report can be used to support applications for loan funding through the Carbon Neutral Government (CNG) Fund to perform efficiency upgrades to reduce costs and carbon emissions.

http://www.actsmart.act.gov.au/what-is-the-government-doing/climate-change/government-energy-and-water-program

8.3 TOILETSMART PENSIONER PROGRAM

The ToiletSmart program assisted ACT homeowners to replace their single and older dual flush toilets with 4-star water-efficient dual flush toilet suites. In 2014–15 this program was only available to holders of Pensioner Concession Cards, thus focusing on helping those residents most in need of assistance. Eligible pensioners received one free dual flush toilet suite replacement, a free water audit and one free water-efficient showerhead. The program closed on 24 September 2014.

8.4 OUTREACH ENERGY AND WATER EFFICIENCY PROGRAM

Outreach helps low income households improve the energy and water efficiency of their homes, reduce their energy and water consumption bills, and contribute to reducing GHG emissions. Working through community welfare organisations, Outreach provides energy-efficient essential home appliances, assessments, education and retrofits to eligible households.

Outreach provides eligible low income households with some or all of the following assistance, depending on their needs:

- energy and water efficiency assessments of their homes
- new energy and water-efficient appliances to replace old, inefficient appliances
- retrofits of energy and water efficient products and repairs in their homes, such as draught proofing
- energy efficiency advice and information.

The program was delivered through the following community welfare organisations for their eligible low income clients experiencing financial hardship, as well as clients referred from a wider network of community organisations in the ACT:

- Belconnen Community Service
- Communities@Work
- YWCA of Canberra.
- Northside Community Service
- St Vincent de Paul Society

A panel of providers of energy efficiency services was engaged to perform the assessments, education and retrofits in clients' homes, and provide training for energy efficiency officers, other staff and volunteers of community welfare organisations that implement the program. Outreach also works with Housing ACT to ensure the most efficient delivery of improvements for its tenants

Table 20: 2014–15 Outreach Program participation

Outreach program	Program commenced	2014–15 participation	Total program participation
Low income households assisted	2010	1840	6478
Energy efficient refrigerators and freezers installed to replace old inefficient appliances	2010	312	2094
Energy and water efficient washing machines installed to replace old inefficient appliances	2010	0	971
Energy saving kits, heated throw rugs and other energy and water efficient items provided	2011	1158	5344
Number of households receiving in-home energy and water assessments and education	2011	872	3952
Home energy and water retrofits	2011	312	1648
Appliances provided through NILS subsidies	2015	25 refrigerators 24 washing machines 0 reverse cycle air conditioners	25 refrigerators 24 washing machines 0 reverse cycle air conditioners

8.5 BASIN PRIORITY PROJECT

The ACT Government has signed a funding agreement of up to $94 million with the Federal Government of the ACT Basin Priority Project (BPP) to improve long term water quality in the ACT and broader Murrumbidgee River system.

The Project will be delivered via a two-phase process. The first phase centres on implementing a comprehensive ACT-wide water quality monitoring program. This specifically includes:

- delivery of a broad 'ACT-wide' water quality monitoring framework
- delivery of a specific water quality monitoring framework for six priority catchments
- undertaking a review, audit and analysis of existing water quality infrastructure and their performance
- producing feasibility plans and designs for recommended water quality intervention infrastructure.

Data collection, feasibility studies, analysis and future modelling, to be delivered as part of Phase 1, will be used to inform and guide Phase 2 of the project. Phase 2 will involve the construction of infrastructure interventions capable of delivering substantial water quality improvements. Phase 2 is to be completed by June 2019. There will also be an ongoing monitoring component to gauge the efficacy of the new infrastructure.

The ACT Government met all milestones set out in the project schedule for completion by 30 June 2015 and is on track to complete the remaining milestones required to achieve Australian Government approval of funding for phase two, design and construction of water quality infrastructure.

8.6 ABOUT THE PROJECT

- The BPP was set up in 2014 to protect and improve the quality of water entering the Murray–Darling Basin through the Murrumbidgee River system.
- The project is guiding the selection, design and implementation of new infrastructure and water treatment systems that will reduce the level of nutrients and pollutants entering Canberra's lakes and waterways, and improve the overall health of the Murrumbidgee River system.
- The first phase of the five-year project that involves gathering and assessing detailed information and community feedback about our waterways and a wide range of potential water management options.
- Australian Government require a business case recommending priorities for the next phase of the project.
- The second and final phase involves investing in new infrastructure, as well as programs to raise awareness about water quality issues and how residents, businesses and visitors can help look after our waterways.
- The BPP covers six key water catchments—the established catchments of Tuggeranong and Yarralumla, the developing catchments of Upper Molonglo, Lower Molonglo and West Belconnen, and the industrialised Fyshwick catchment.

8.7 ABOUT THE ISSUES

- Canberra's lakes and waterways are under increasing pressure, largely due to urban development, past land and water management regimes, climate change, and a general lack of awareness about the kinds of activities that effect water quality.
- In particular, stormwater pollution affects water quality, posing risks to public health and aquatic life. It is also threatening the many social, economic and environmental benefits that our lakes and waterways generate.
- Importantly, water quality issues in the ACT are causing problems beyond our borders. They are reducing water quality downstream in the Murrumbidgee River system and, more broadly, are having a significant impact on our Iconic Murray–Darling Basin.
- The BPP plays an important role in achieving targets set out in the ACT's Water Strategy, announced in 2014. The strategy sets out how the ACT Government will manage the Territory's water resources over the next 30 years.

8.8 BASIN PRIORITY PROJECT WATER QUALITY MONITORING AND ASSESSMENT

A key output of the BPP is the development of an ACT-wide water quality monitoring framework, including design of an improved ACT monitoring network. The framework identified gaps in existing knowledge, established a baseline for both monitoring water quality in the priority catchments, and for adaptive management of water systems and associated infrastructure both during and beyond the term of the BPP. The framework is available from the EPD website www.environment.act.gov.au/water/act-basin-priority-project

MUSIC models have been constructed for each of the BPP catchments and ELCOM-CAEDYM three dimensional models have been constructed for Lake Tuggeranong and Lake Burley Griffin. The models enable a representation of the existing condition, stormwater flows and pollutant loads. The models also allow an assessment of the effectiveness of any potential treatment options. Lake models take the outputs from the MUSIC model runs and show the resulting in-lake conditions and changes to outflows from the lakes to downstream waters. The MUSIC models have been augmented beyond standard WSUD practice; for example, the inclusion of metals for the Fyshwick catchment and nutrient speciation for the lake models (i.e. phosphorus and nitrogen broken up into bio-available and inorganic fractions). This augmentation means more realistic and useable outputs can be obtained from the scenario runs.

Another key activity within the BPP was the detailed measurement of urban stormwater events and characterisation of water quality across the six priority catchments.

8.9 BPP WATER QUALITY DATA COLLECTION

Event-based monitoring across the six catchments was undertaken and involved the collection of 862 water quality samples from 58 sites from over 20 storm events. These samples were for the range of analytes listed in the table below.

Table 21: Analytes list

Aluminium	Dissolved Oxygen	Reactive Phosphorus as P
Ammonia as N	E.coli (Colilert)	Selenium
Antimony	Electrical Conductivity @ 25°C	Silver
Arsenic	Enterococci	Sodium
Barium	Fluoride	Strontium
Beryllium	Hydroxide Alkalinity as CaCO3	Sulfate
Bicarbonate Alkalinity as CaCO3	Ionic Balance	Suspended Solids (SS)
Biochemical Oxygen Demand	Iron	Total Alkalinity as CaCO3
Boron	Lead	Total Anions
Bromide	Magnesium	Total Cations
Cadmium	Manganese	Total Coliforms (Colilert)
Calcium	Mercury	Total Dissolved Solids (Calc.)
Carbonate Alkalinity as CaCO3	Molybdenum	Total Nitrogen as N
Chloride	Nickel	Total Organic Carbon (as NPOC)
Chromium	Nitrite	Total Phosphorus as P
Cobalt	Nitrite as N	Turbidity
Copper	Phosphate as P	Zinc
Dissolved Organic Carbon (as NPOC)	Potassium	

Event-based water quality samples were identified as the critical data gap in understanding the size of the pollutant load that ACT urban catchments deliver to waterways. The use of specialised auto-samplers was necessary to capture samples from flashy stormwater drain flows that can rise and fall within an hour at any time of night or day, which is much too fast for a person to get to the drain and take samples. An example of the type of data gathered by these samplers during a single storm event is in figure 31. Of note is the variability of the pollutant concentrations across a two hour period.

The complete sample set and data represents one of the most comprehensive urban water quality data sets in Australia. This data will enable refinement of the conceptual and analytical models used by research and industry and build the long-term reference data for the National Water Quality Management Strategy and National Water Quality Guidelines. The data set is available from the EPD website http://www.environment.act.gov.au/water/act-basin-priority-project/research-and-monitoring/monitoring-reports.

Analysis of the catchments and infrastructure with new data identified there was uncertainty regarding the sediments fractionation (and associated pollutants) in GPTs, ponds and lakes. The BPP monitoring points the direction for research into urban waterway processes so that infrastructure is more targeted to the sediments having most effect on the condition of our waterways.

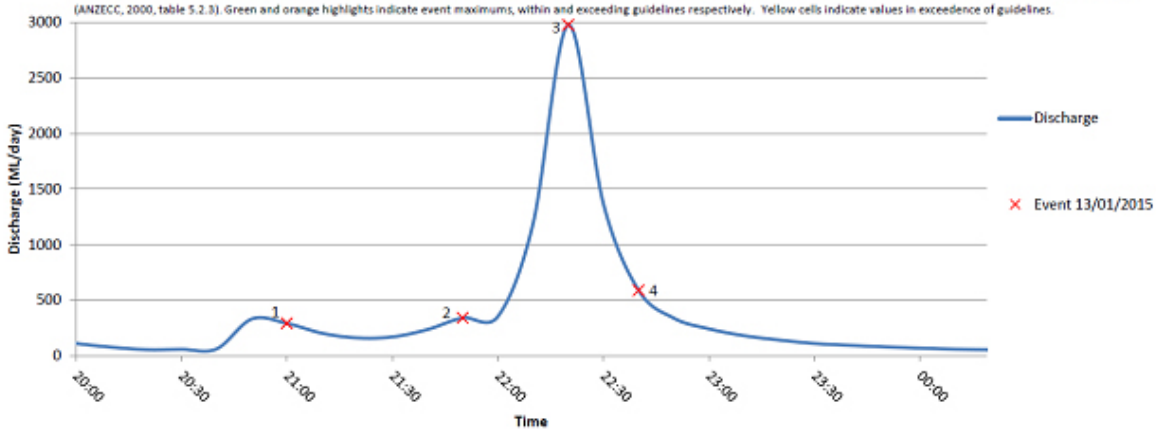
Figure 32: Hydrograph from 13 January 2015 storm event

YARRALUMLA - 410745 Yarralumla Ck at Curtin

Austosamples 13 January 2015 - Flow based

Sample point	Bottle number	Date	Time	pH	EC (µS/cm)	Turbidity (NTU)	Total Aluminium (µg/L)	Total Zinc (µg/L)	Nitrite + Nitrate (mg/L)	Ammonia (mg/L)	Reactive Phosphorus (mg/L)	TSS (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
				6.5-8	30-350	2-25	200	5000	0.015	0.013	0.015		0.25	0.02
1	Bottles 1 - 5 C	13 Jan 15	21:00	7.38	68	17.5	1070	170	0.285	0.017	0.019	56	1.02	0.119
2	Bottles 7 - 8 C	13 Jan 15	21:45	7.42	49	8.7	660	135	0.208	<0.002	0.022	26	0.66	0.080
3	Bottles 12 C	13 Jan 15	22:18	7.07	28	38.1	2020	116	0.075	<0.002	0.018	203	0.67	0.126
4	Bottles 13 - 14 C	13 Jan 15	22:40	7.31	52	27.7	1980	112	0.200	0.003	0.021	104	0.69	0.101

Yellow text in header bar are the trigger values as per ANZECC water quality trigger values (ANZECC, 2000, table 3.3.2). Values for Aluminium and Zinc are taken from guidelines for recreational purposes (ANZECC, 2000, table 5.2.3). Green and orange highlights indicate event maximums, within and exceeding guidelines respectively. Yellow cells indicate values in exceedence of guidelines.



Work has begun on further analysing the datasets and deriving new parameters for such tools as the MUSIC modelling software program that is used to design water quality treatment infrastructure. For example, MUSIC default nutrient (event and baseflow) and pollutant decay values used in ACT will be updated and may be split across regions within the ACT. The recalibration of water quality models from the new data will have a noticeable effect of water quality treatment designs and give greater confidence in the impact that WSUD assets have in improving water quality. To ensure the maximum value in the water quality analyses, eWater will assist with the derivation of modelling parameters. Given that eWater maintain the modelling standards across Australia (under the National Hydrological Modelling Strategy) there will be flow on benefits to other jurisdictions from this exercise.

Updated and finer resolution bathymetry surveys (10 m grid) of Lake Tuggeranong and Lake Burley Griffin have been performed. The higher resolution data will enable the modelling of the water quality processes in each lake to be more accurate for determining the volume and timing of pollutants moving from the catchments to each water body before discharge reaches the Murrumbidgee River.

8.10 BPP COMMUNITY SURVEY

The Basin Priority Project engaged the University of Canberra to conduct a broad community survey as part of the business case 'Improving Long-Term Water Quality in the ACT and Murrumbidgee River System' to inform and develop a community education and public awareness program. The survey explored the attitudes, values and behaviours of residents of the ACT and nearby NSW Local Government Areas regarding their use of waterways, lakes and wetlands and factors affecting water quality.

The survey was carried out in mid-2015, utilising an internet-based survey platform. Approximately 4500 valid surveys were received from residents living within the study region. The survey responses were representative of gender but included a slight age bias, with under-sampling of those aged under 30 and oversampling of those aged 55 to 74. There was relatively good representation of most Canberra suburbs and local government areas in the region, with some suburbs under- and over-represented in responses. The survey is publicly available on the EPD website www.environment.act.gov.au/water

A summary of the survey outcomes:

- Poor water quality in lakes was perceived as one of the top three environmental issues in the ACT and region (feral animals and invasive weeds were the others), with concern for water quality in local lakes being greatest among residents of the Tuggeranong catchment.
- Residents of the study region had perceptions about the causes of water quality problems that were somewhat different to those of water quality scientists. Respondents were most likely to consider packaging waste (e.g. bottles, plastic bags) a big problem for local water quality (62% of residents), followed by blue green algal blooms (60%) and pest fish species (59%).
- Water scientists considered leaf litter and grass clippings entering the stormwater system to be one of the key factors causing water quality issues, together with several other factors, but Canberra's residents were less aware of the problems that can result from leaves and clippings entering stormwater drains, with only 38% considering this a problem.
- Residents of the ACT and surrounding LGAs had views that were relatively consistent with the advice of water scientists regarding signs of poor water quality in the region.
- Most residents support improving stormwater infrastructure using principles of water sensitive urban design, as long as it does not cause significant disruptions or negative impacts for residents.
- A number of practical changes in how residents manage their homes and gardens can contribute to improving water quality in the region; for example, better managing organic matter, establishing rain gardens and increased use of composting and mulching.
- There is less scope to achieve additional change through increasing use of rainwater tanks, due to the high level of existing uptake, and the fact that key barriers to doing this are cost and lack of space. Similarly, achieving better garden landscaping requires greater intervention in the form of providing advice or subsidising costs.

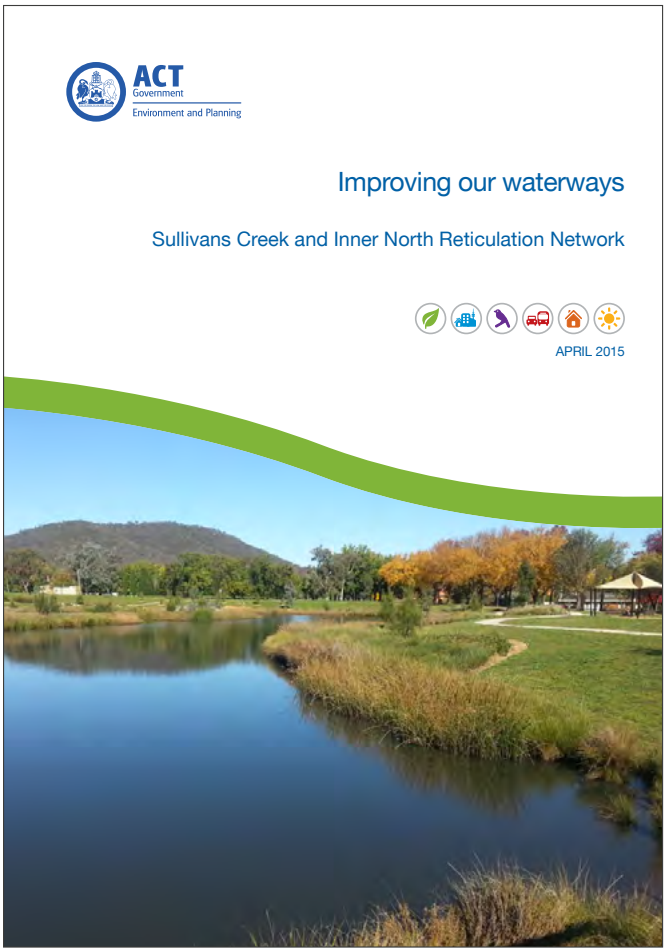
8.11 STORMWATER HARVESTING AND MANAGED AQUIFER RECHARGE

Using stormwater harvesting and managed aquifer recharge is a water sensitive urban design approach that captures urban stormwater during rain events, cleans the water through wetlands and then injects the treated water into underground aquifers. The flexibility of the system allows for the collection of water when rainfall occurs and provides the option to recover the water for use during the peak irrigation season in summer. Using aquifers provides a secure store that holds water underground for future needs without incurring the impact of large evaporative losses that take place in traditional surface water dams. This practice is an adaptive approach that reduces the Territory's vulnerability to a changing climate.

Constructed with financial support from the ACT and Australian governments, the Sullivan's Creek and Inner North Reticulation Network is Canberra's first neighbourhood-scale stormwater harvesting and managed aquifer recharge system. The scheme captures and treats urban stormwater from Watson, Hackett, Downer, Dickson, Ainslie, O'Connor and Lyneham and directs it into constructed wetlands before pumping it though a reticulation network. The treated water can then be pumped into the aquifer for future use or used to irrigate the following local urban green spaces: Gungahlin Cemetery; EPIC; Canberra Racecourse; Yowani Country Club; Southwell Park; Lyneham Primary School; Lyneham High School; Downer Neighbourhood Oval; Dickson District Playing Fields; Dickson College; and Hackett Neighbourhood Oval.

The construction of the network was completed in late 2013. To enable water to be supplied to the urban green spaces or the aquifer a number of regulatory changes were made in 2014, including an amendment to the Utilities Act 2000. Final commissioning and testing of the infrastructure has been carried out. Additional testing of the aquifer has been undertaken including the injection and extraction of 28.5 and 30.5 megalitres respectively. The initial trail of the managed aquifer recharge suggests that the scheme is viable.

A five year trial of network operation will determine economic, social and environmental impacts. Pricing of the stormwater for irrigation was agreed by government, and will be included in the evaluation of the project. The evaluation results will inform the government's decision making regarding the implementation of other stormwater harvesting networks in the ACT.



8.12 WATERWATCH

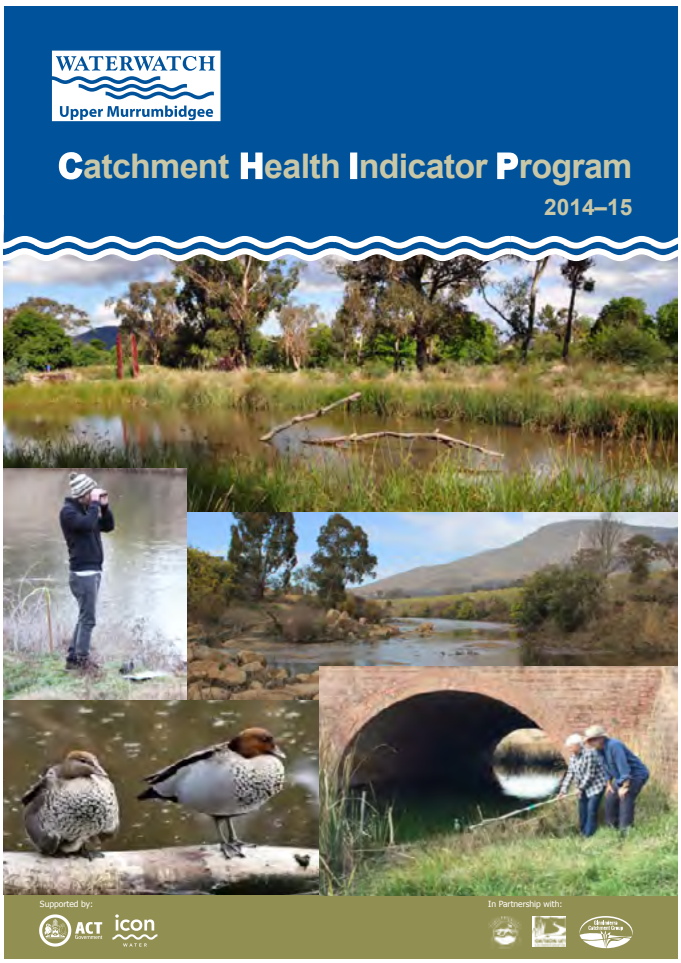
In 2014 Minister Corbell announced funding of $270,000 with the support of the Commonwealth funded BPP to support the continuation of the community Waterwatch program. The Waterwatch program is an environmental education and awareness program that aims to encourage and support the community to take responsibility for improving the quality of water in the Upper Murrumbidgee Catchment.

Upper Murrumbidgee Waterwatch (Waterwatch) works with the community to monitor, raise awareness, educate, restore and protect our local waterways. Waterwatch has been running in the ACT region since 1995 and covers the Murrumbidgee catchment upstream of Burrinjuck Dam near Yass, an area of more than 13,000 km^2.

Two primary functions of the Waterwatch program are firstly to facilitate community engagement in the monitoring and care of local waterways, and secondly to provide data (water quality, macro-invertebrate—water bug—and riparian condition) to contribute to an early warning system for aquatic ecosystem health issues. A key output of this program is the annual Catchment Health Indicator Program (CHIP), which provides a numerical score of catchment health using the data collected by Waterwatch volunteers.

In early 2015, Waterwatch released a pilot 2013–14 CHIP report. This report presented data on aquatic ecosystem health across 63 reaches in the Upper Murrumbidgee catchment, with 1184 water quality records and 78 water bug surveys conducted across 184 sites. Feedback was sought on the pilot report and used to improve the quality of the 2014–15 CHIP report.

The CHIP report was released during National Water Week (17–24 October 2015). The report is based on 1,556 water quality surveys, 206 water bug surveys and 178 riparian condition surveys. The total number of sites surveyed has increased from 184 in 2013–14 to 229 in 2014–15. A total of 90 reaches are covered in this report. Furthermore, the Yass catchment is included for the first time, with an additional five reaches defined. A CHIP score is presented for only one of the Yass reaches due to most reaches being in the initial stages of data collection. Yass catchment is now a focal area for growth of the Waterwatch program and brings the catchment area the CHIP covers up from 8600 km2 in 2013–14 to 11,400 km^2.



The full report can be downloaded from the WaterWatch website www.waterwatch.org.au.


The Waterbug Book
The Waterbug Book

9. PERFORMANCE MEASURES

9.1 LOCAL

Utility

Introduction

The ACT Government's Environment and Planning Directorate has several roles in water management within the ACT. It manages strategic water policy, including local implementation of national water reform, and national issues relating to water access, pricing, trading and develops the ACT Water Report for the Territory. The responsibilities for regulation of the ACT's water resources have recently been transferred to Access Canberra.

Reporting and compliance obligations for the ACT water sector are imposed by national legislation including the Commonwealth's *Water Act 2007*, the *Corporations Act 2001* and the *Privacy Act 1988,* and ACT legislation including the *Independent Competition and Regulatory Commission Act 1997*, the *Territory-Owned Corporations Act 1990*, the Work Safety Act 2008, the Utilities Act 2000, the *Water Resources Act 2007*, the *Environment Protection Act 1997*, the *Water and Sewerage Act 2000* and the *Public Health Act 1997*.

The Independent Competition and Regulatory Commission (ICRC) determines price directions for water utilities and regulates access agreements. The Utilities Act 2000 provides for the commission to issue licences and determine industry codes. A new price direction incorporating biennial reviews was issued in June 2013 for the next price path period up to 30 June 2019 (a six-year period), with a price path set for 2013–14 and 2014–15, and with major biennial reviews to take place in 2014–15 and 2016–17. Prices for water and sewerage services are to be increased in line with the consumer price index.

In September 2013, ACTEW Corporation Ltd submitted an application for a review by an industry panel of the price direction for regulated water and sewerage services (1 July 2013–30 June 2019) set by the ICRC. An industry panel under the Independent Competition and Regulatory Commission Act 1997 is currently examining the price direction that had been determined by the ICRC.

Among other functions, the Utilities Act 2000 provides for the Essential Services Consumer Council.

Water utilities in the ACT

ACTEW Corporation Limited, which was established as a corporation in 1995, is owned by the ACT Government and has two subsidiary companies, ACTEW Retail Limited and ACTEW Distribution Limited, which are ACTEW's partnership companies in ActewAGL. ACTEW owns and manages the water and sewerage business assets and is a 50% owner of ActewAGL, a joint venture with AGL Energy Limited and Singapore Power.

In late 2011, the ACTEW board approved the reintegration of the water and sewerage business into ACTEW. This change came into effect from 1 July 2012, when ACTEW resumed the management, operations, and maintenance of the ACT's water and sewerage assets and business. This was previously undertaken by ActewAGL on behalf of ACTEW. The services are provided under the business name ACTEW Water. The change was carried out so as to give ACTEW the opportunity to transform the business in a way that more closely aligns with the objectives of ACTEW Corporation. The ACTEW organisation grew from 38 personnel to almost 400.

ACTEW Water also released its Statement of Corporate Intent for 2013–14 to 2016–17.

On 31 October 2014, the Board of ACTEW Water announced a change in name for the water utility from ACTEW Water to Icon Water. The new branding of the utility and also the corporate name is to come into effect in early 2015.

The ACT Auditor-General is Icon's auditor. Internal audit services are provided by private firms. Icon reports regularly to the ACT Government. In April 2014, the ACT Auditor-General concluded a performance audit that examined the governance and administrative arrangements for the ICRC review of water and sewerage prices in the ACT.

Strategic planning for the sewage treatment plants culminated in the release of the Lower Molonglo Water Quality Control Centre Strategic Plan.

Operation of water utilities

ACT Health regulates and tests water quality under the *Public Health Act 1997*, in accordance with the Australian Drinking Water Guidelines 2004. Icon Water had 100% compliance with the Drinking Water Utility Licence and the Public Health (Drinking Water) Code of Practice (2007) in 2013–14. Icon Water also published its Annual Drinking Water Quality Report 2012–13 in accordance with the code in October 2013.

Icon also provides water services to Queanbeyan City Council under the updated Queanbeyan Water Supply Agreement 2008.

Construction of the Enlarged Cotter Dam was completed in August 2013. After commissioning the Murrumbidgee–Googong Pipeline (M2G) in August 2012, work has continued to incorporate the operations and maintenance processes of the pipeline into standard Icon Water operating practices. This included updating the Pipeline Management Plan for the M2G after significant amendments to the New South Wales Pipeline Regulations and the relevant Australian Standard. Upgrading works commenced on the Googong Water Treatment Plant for a combined carbon and fluoride dosing facility.

Performance reporting

Icon's commercial and business objectives, activities and priorities, as agreed by voting shareholders, are detailed in its annual Statement of Corporate Intent. The Icon Corporation Annual Report 2013–14 was provided to the ACT Government in September 2014. Quarterly reports of progress on the priorities outlined in the statement and financial and operational matters, as well as reports and briefings on key and emerging issues, were provided to the voting shareholders during the year.

Water Sensitive Urban Design

In August 2014 the ACT Government released the WSUD review report, which emphasises the importance of WSUD in our environment to manage our urban water cycle, encourages whole-of-government coordination to achieve better on-ground outcomes at reduced costs, and addresses implementation of report recommendations.

Priority Project 1: Code restructure and revision

EPD leads a revision of the water sensitive urban design provisions in the Territory Plan, supported by a practice guideline to provide for greater clarity and consistency in interpretation as well as to promote innovation and increase flexibility in meeting WSUD targets.

Priority Project 2: Alternative management and funding models

EPD, Territory and Municipal Services Directorate (TAMS), Chief Ministers, Treasury and Economic Development Directorate (CMTEDD) work together to investigate alternative management and funding models for sustainable maintenance of WSUD assets, informed by cost-benefit analysis.

Priority Project 3: Housing affordability

The ACT Government will encourage WSUD approaches that maximise cost efficiency at the appropriate level (e.g. on-site versus sub-catchment) to minimise impacts on housing affordability in the ACT, as well as the maintenance burden.

Priority Project 4: Green infrastructure strategy

EPD, subject to available funding, lead development of a green infrastructure strategy for the ACT as a means of realising the social, economic and environmental values of our green assets including the integration of WSUD assets.

Priority Project 5: Design standards

TAMS, subject to available resources, continue its review of design standards for urban WSUD and related infrastructure.

Priority Project 6: Modelling and monitoring

EPD leads the development of a water quality and flows modelling and monitoring program, focusing on understanding the performance of WSUD assets against modelled results and building internal capacity within the ACT Government in modelling and monitoring.

Priority Project 7: Erosion and sediment control

EPD, through the ACT Environment Protection Authority, review the Environment Protection Guidelines for Construction and Land Development in the ACT (2011) and continue to work with the construction industry to improve their performance in erosion and sediment control during the building construction phase. EPD also investigate building certifiers to ensure compliance with site management requirements, including erosion and sediment control.

Priority Project 8: WSUD asset management transfer

CMTEDD leads the development of a guideline in consultation with TAMS to inform the effective transfer of government owned WSUD infrastructure from construction to management.

Participation of the Actsmart Business Energy and Water program

The program is open to businesses in the ACT with electricity bills up to $20,000 per annum and/or up to 10 full-time equivalent staff. Businesses receive an energy and water assessment of their business premises conducted by an Actsmart assessor, resulting in a tailored energy and water action report. The report recommends upgrade opportunities as well as no-cost and behaviour change recommendations. Businesses are able to claim a rebate of 50% of costs of approved upgrades up to $5000, resulting in reduced energy and water consumption, and GHG emissions.

Table 22: Actsmart total program participation since July 2012

	2014–15 participation	Total program participation (since July 2012)
Number of businesses assessed	115	338
Number of businesses claiming a rebate	81	159

ACT State of the Environment Report

Every four years, the ACT Commissioner for Sustainability and the Environment prepares a State of the Environment Report for the ACT Minister for the Environment. The Minister for Environment, Simon Corbell, tabled the report in the Legislative Assembly on 18 February 2016. This ACT State of the Environment Report 2015 covers the period 1 July 2011 to 30 June 2015, and is the seventh report since the Commissioner for Sustainability and the Environment legislation was enacted in 1993. This evidence-based report captures and presents key information on the state of the ACT environment and makes recommendations to the ACT Government for action on environmental issues.

The previous State of the Environment Report, 2011, recommended a number of water-related activities for the ACT Government to address:

- establish cross-boundary management of the ACT's water resources, including
  - developing catchment policy and an integrated water supply catchment management strategy, as recommended in previous State of the Environment reports
  - strengthening integrated management action by facilitating improved exchange and use of information, such as spatial information, between government agencies, NRM groups and Catchment Management Authorities, and by promoting sustainable catchment management with landholders and the community

- complete an assessment of the ACT's at-risk groundwater resources
- update water management, monitoring and reporting programs to inform
  - » actions to mitigate impacts of urban development on water quality
  - » the efficacy of water-sensitive urban design measures
  - » improvements in sediment and erosion mitigation actions
  - » the management of ACT lakes.

The Commissioner's report on an investigation into the state of water courses and catchments for Lake Burley Griffin (published in April 2012) focused on the lake itself, but also included some broader recommendations on urban and rural catchment management and improved coordination of catchment management.

Recommendations on urban catchment management included the development of a strategic approach to water-sensitive urban design, including:

- ensuring water-sensitive urban design requirements are enforced
- monitoring the effectiveness of existing water-sensitive urban design infrastructure, including the efficacy of existing gross pollutant traps
- comparing ACT approaches with other jurisdictions.

Recommendations on rural catchment management included:

- on-ground actions to reduce the potential for soil erosion within the catchment area of Lake Burley Griffin by the ACT and NSW governments, with support from the National Capital Authority
- investigation of the role of Jerrabomberra Wetlands watercourses in improving water quality in the catchment.

Recommendations to improve the coordination of catchment management included the establishment of a Burley Griffin–Molonglo–Queanbeyan Catchment management agreement between the ACT, NSW and Australian governments to include strategic objectives for the integrated coordinated management of the lake and catchments.

Most of these recommendations are addressed through work being undertaken as part of the new ACT Water Strategy and the ACT Basin Priority Project. Significant progress has been made against these recommendations during the reporting period:

- **ACT Water Strategy, August 2014:**
  - » Includes outcomes, strategies and actions to guide water management across the ACT and region, including catchment management, storm water and flood management, water supply and services, water for the environment, recreational water use, and public health.

- **Cross-boundary management of water resources:**
  - » Catchment management arrangements have been established that better integrate water and land management, and improve the ACT spatial planning framework for NRM to inform management of land, water and biodiversity.
  - » The ACT and Region Catchment Management Coordination Group has been established, with a focus on improving cooperation, coordination and alignment of effort in regional catchment management issues; the priority action of the group is to develop a regional integrated catchment management strategy.

- **Water supply:**
  - » The enlarged Cotter Dam and the Murrumbidgee to Googong pipeline have ensured that current potable water supply challenges have been met.

- **Groundwater resources:**
  - An updated report (August 2013) on groundwater recharge rates in the sub-catchments—with the majority of abstraction bores and covering a full range of conditions from extreme drought to a La Niña high-rainfall cycle—validated previous calculations on sub-catchment recharge rates. Only a few low-volume bores have been installed during the past two years and these have not significantly increased the risk profile of the sub-catchments.

- **ACT Basin Priority Project:**
  - The first phase of an Australian Government–funded project to improve water quality leaving the ACT—a comprehensive ACT-wide water quality monitoring program with a focus on six priority catchments—has been implemented. The six priority catchments are Lower Molonglo (new development); Upper Molonglo (source water); Tuggeranong (lake); Yarralumla Creek (infill/developed); Riverview, West Belconnen (greenfield development); and Fyshwick (industrial/wetlands development).
  - The water quality monitoring program is updating and realigning existing monitoring arrangements to reflect changes in land use and technology. As well as addressing water quality monitoring across the ACT, more intensive monitoring is occurring in the six priority catchments, as well as a detailed audit of the performance of existing infrastructure.
  - An investigation, audit and analysis of ACT Government water quality infrastructure assets was conducted to assess the effectiveness of existing water quality infrastructure and recommend possible improvement opportunities.

- **Catchment management:**
  - In August 2014, the Government released the report of the review of water-sensitive urban design regulations in the ACT. Research was also undertaken on water-sensitive urban design implementation in other jurisdictions, and its influence on housing affordability. Recommendations are being implemented
  - Land managers have implemented on-ground projects to improve management, monitoring and reporting, including the installation of 12 groundwater and 6 surface water monitoring stations at Jerrabomberra Wetlands, allowing development of a model for groundwater and surface water movements across the wetlands. They are managing an additional 20,000 hectares after the construction of the enlarged Cotter Dam and the Googong Foreshores. The focus is to ensure water quality is not compromised by threatening processes such as environmental weed invasion, erosion and sedimentation, vertebrate pests and inappropriate visitor interaction.

2015 State of the Environment Report recommendation 7 - Water

Justification for the 2015 recommendation

Although most water resource indicators in the ACT are in a very good or good state, some are not and warrant some special attention: total nitrogen levels are in a very poor state; and turbidity, chlorophyll-a and ecological condition are in a poor state.

Assessing and managing the longer term consequences of this condition is of high importance. In some cases it may not be possible to quickly reverse the situation. Long-term strategic management and, possibly, land-use change—neither of which may be feasible—may be needed. Consequently, developing strategies and actions to improve these aspects of water quality should be a high priority.

The location of sampling points is also important to consider. For example, Australian River Assessment System Observed:Expected scores, turbidity and chlorophyll-a samples, which were all assessed as being in a poor state during the current reporting period, were predominantly taken from areas where land-use pressures are the most intense in the ACT (i.e. urban and agricultural areas). If more samples were taken in conservation areas, the percentage of sites classified as exceeding guideline levels would likely be much lower. In an overall assessment of water resource indicators, the proportion of sampling points in different environmental and land-use settings should therefore be considered.

Most water resource indicators had a good amount of data available. The data available for these indicators were collected at regular intervals (e.g. multiple times in every year of the assessment) and collected in many places across the ACT. For the state and trend of water resources in the ACT to be efficiently and effectively monitored into the future, it is essential the current monitoring network be maintained.

In contrast, data related to groundwater availability and quality were relatively limited. There seems to be a limited number and spread of bores, with much data collected outside the current reporting period. However, given the current limited use of groundwater in the ACT, this is not an issue. In the future, if groundwater use increases or pollution continues, then more extensive groundwater monitoring may be required. It is also important that monitoring of rainfall and groundwater levels occurs at each monitoring site to better understand the long-term relationship between rainfall and groundwater recharge.

Understanding the links between pressures and the state and trend of water quality indicators will become increasingly important as these pressures intensify; that is, through the increased land-use change and water resource development needed to support our growing population, and the changing rainfall patterns under climate change. Without understanding the driving mechanisms behind each indicator, it can be difficult to manage water quality into the future. The strategic collection of long-term data on indicators and pressures is critical. This information will help in the assessment of the state and trend of water resources. Importantly, it can also help model the relative importance of different drivers of water resource conditions and determine the most effective management action.

Recommendation 7

That the ACT Government assess the consequences of, and understand the driving mechanisms behind, the poor condition of water resources as shown by the indicators for total nitrogen, turbidity, chlorophyll-a and ecological biodiversity, and assess the need for collecting more information for indicators with little available data.

Government response

The ACT Government recognises the value of water quality data and supports Recommendation 7.

The ACT Wide Water Quality Monitoring Framework, a key output of the ACT's Basin Priority Project, is currently investigating what gaps exist, and how best to advance the understanding of water quality in the ACT. The project has established additional monitoring sites to develop a solid baseline for both monitoring water quality in the six Basin Priority Project sub-catchments, and for adaptive management of water systems and associated infrastructure both during and beyond the term of the project.

The ACT Government has developed water quality models to enable a representation of the existing condition, stormwater flows and pollutant loads throughout the ACT's urban catchments, and provide a tool for testing future scenarios of development, water sensitive urban design and water quality improvement. The data collected from these Basin Priority Project monitoring sites has been used to further update and better calibrate models to reflect the local condition and expected influences beyond the standard improved water sensitive urban design practice. This improvement in the modelling tools will allow an assessment of the effectiveness of any potential treatment options required to address water quality issues tailored to the urban catchments of the ACT.

An output of the comprehensive water quality monitoring framework is to provide recommendations for the existing monitoring network, including data capture and analysis, towards improving water quality throughout the territory.

The ACT Government notes the larger number of water quality monitoring sites situated within the territory's urban areas may generate a perception that the majority of the ACT suffers from poor water quality. The few monitoring reference sites situated within the conservation areas historically record results that are 'similar to reference' and/or 'more biologically diverse than reference' which, it is assumed, naturally maintains a high level of water quality with few pressures that may change or degrade the ecological condition. In contrast, the Territory's urban areas have a greater number of monitoring sites due to the many pressures that can impair and lead to declines in the freshwater ecosystem values.

Future SOE Reporting could consider incorporating available Waterwatch data that covers water quality, macroinvertebrate and riparian monitoring that is routinely collected throughout the conservation areas to complement AUSRIVAS monitoring. This approach would broaden the historical record of reference sites and highlight the disparity in ecosystem health between those areas with minimal pressures, and those areas facing a wide range of pressures.

The location of monitoring sites between conservation, agricultural and urban areas reflects the areas that require the most attention. It would be beneficial to closely link the results generated from each land use area and discuss the pressures of each, than focus on the overall ACT score of those within and exceeding the guidelines.

9.2 REGIONAL

Water strategy

During the reporting period a new draft water strategy was finalised and released (1 August 2014). The new strategy, the ACT Water Strategy 2014–44: Striking the Balance, is designed to build on the achievements of the 2004 Think Water, Act Water strategy. An extensive review of Think Water, Act Water confirmed significant progress towards achieving its targets for:

- providing a long term reliable source of water for the ACT and region
- increasing the efficiency of water usage by reducing per capital use of mains water
- promoting increased regional integration of water supply and management
- protecting water quality in ACT rivers, lakes and aquifers
- facilitating the incorporation of water sensitive urban design principles
- promoting community involvement in the management of ACT water resources.

The new Strategy, Striking the Balance, moves from a programs-based strategy, required to address immediate target-based issues, to a longer term outcomes-based strategy with regular review mechanisms to assess progress and where necessary re-address outcomes. It provides the framework for a renewed focus on total water system management and emphasises the importance of integrated catchment management.

A 2014–18 implementation plan for the strategy was released with the strategy. Progress of the implementation plan and traffic light indicators are provided on the following page, ACT Water Strategy Progress Report.

In summary:

- 7 actions are complete
- 9 actions are assessed as ‘green’ —ongoing and progressing as planned
- 9 actions assessed as ‘orange’—progressing and with minor issues to be resolved
- 1 action was deemed ‘red’—facing significant difficulties in implementation
- 3 actions are not yet due for commencement.

Of the 16 actions deemed to be either complete or progressing as planned, seven were identified as being ‘unfunded’ at the commencement of the strategy.

With respect to Action 2.4 “Undertake management planning with clear water management objectives”, the action experiencing difficulties, EPD has developed an operational plan for the Canberra Urban Lakes and Ponds Plan of Management and is investigating possible sources of resourcing to expedite the planning process. This action is deemed important to the implementation of the ACT Water Strategy as the Canberra Urban Lakes and Ponds Plan of Management describes the social, environmental and economic values of Canberra’s lakes and waterways and the management objectives for each waterbody.

ACT Water Strategy Progress Report

Reporting Key

STRATEGY 1: Achieve integrated catchment management across the ACT and region

Milestone	Lead	Progress	Comment
Action 1: Strengthen coordination and collaboration for catchment management across the ACT and region			
1.1 Establish new catchment management arrangements and mechanisms for stronger cross-border collaboration (ongoing).	EPD		**Completed.** ACT and Region Coordination Group established as a statutory body in August 2015.
Action 2: Enhance knowledge and spatial planning for water and catchment management			
2.1 Develop an integrated catchment management (ICM) plan for the ACT and surrounding upstream catchments to guide land and water management for protection of water quality and water supply.	EPD		**Ongoing.** Draft ACT and Region Catchment due to Cabinet 30 March 2016
2.2 Fill critical gaps in catchment knowledge and better integrate land, water and biodiversity data.	EPD		Catchment Heath Indicator Program report 2014–15 released and available on EPD website. Note: This is an ongoing program with annual CHIP reporting.
2.3 Develop the water component of an ACT spatial planning framework for natural resource management to inform management of land, water and biodiversity drawing on soil and vegetation mapping and Hydrogeological Landscape Framework, and the NARClim (NSW/ACT Regional Climate Modelling) project	EPD		**Ongoing** Hydrogeological Landscape Framework complete and final report available. NARClim (NSW/ACT Regional Climate Modelling) project complete. Australian Capital Territory Climate Change Snapshot final report is available on EPD Website.
2.4 Undertake management planning with clear water management objectives (water quality and recreational use):	EPD		Significant delays with completion of management plans, especially for Googong Foreshores (completed but not approved) and Canberra Urban Lakes and Ponds Operational plan has been developed and EPD Environment Protection Policy is current seeking additional resources to expedite planning.
Action 3 Integrate water cycle management and green infrastructure into the planning and design of urban environments			
3.1 Progress integration of water cycle management and green infrastructure into Canberra's urban design	EPD		**Ongoing.** WSUD Review Report implementation underway. Draft Climate Change Adaptation Strategy released.

Milestone	Lead	Progress	Comment
Action 4 Improve water monitoring and analysis across the ACT and region.			
4.1 Develop an integrated and coordinated water monitoring program			Monitoring framework completed. Next step will be centralised data housing and an educational website to improve access to water monitoring data for key stakeholders

STRATEGY 2: Protect and restore aquatic ecosystems in urban and non-urban areas

Milestone	Lead	Progress	Comment
Action 5: Improve water quality and ecosystem health in the ACT and region's rivers, lakes, aquifers, ponds and wetlands			
5.1 Undertake restoration activities	TAMS		Ongoing and subject to budget bids.
5.2 Undertake research and trials for improving water quality and ecosystems	EPD		**Completed** Final reports available.
Action 6: Ensure appropriate management (volume, timing, and quality) of environmental flows.			
Explore opportunities for improved management of environmental flows, including in-stream and riparian health.	EPD		Not due to commence until 2017–18.
Action 7: Strengthen compliance and enforcement for water resource management.			
7.1 Enhance regulatory functions in relation to risk assessment, enforcement, stakeholder engagement and monitoring (ongoing)			**Completed** Amendments to offence provisions notified 21/08/15.
7.2 Complete a review of the Environment Protection Act 1997 to strengthen enforcement provisions within the Act and to enable consideration of both actual and potential environmental harm	EPD		**Completed** Legislative amendments competed as required.

STRATEGY 3: Manage stormwater and flooding

Milestone	Lead	Progress	Comment
Action 8: Manage stormwater infrastructure sustainably			
8.1 Develop management and funding models for stormwater infrastructure that ensure whole of life performance	EPD		Cabinet paper due late 2016.
Action 9: Improve planning, monitoring and compliance for stormwater management			
9.1 Develop a strategic asset management plan for stormwater infrastructure (2015), including a mapping system to identify overland flow paths and WSUD devices within the network.	TAMS		Strategic Asset Management Plan is available.
9.2 Monitor, assess and actively manage stormwater impacts and review asset performance and management.	TAMS		**Ongoing.** TAMS have recently recruited to facilitate this process. Marsden Jacobs report, Alternate Management and Funding Models for Sustainable Operation and Maintenance of Sustainable Water Quality Assets, identified a number of improvements to existing arrangements such as developing a financial framework that records operation, maintenance and refurbishment costs for stormwater water quality assets and developing a performance management reporting framework.
Action 10: Improve planning, information and regulation for flood management.			
10.1 Undertake studies and release information on flood risk including Sullivan's Creek, Yarralumla Creek, Long Gully Creek, Weston Creek, Woolshed Creek, Tuggeranong Creek, Isabella Weir, Ginninderra Creek systems or others if required	EPD		Studies have been complete, awaiting peer review. Liaising with Emergency Services Authority and others to secure further funding. Agenda paper recommends a "whole of government "to the public release of information.
10.2 Review existing plans and develop an ACT Flood Strategy, including assessment of future flood risks and infrastructure opportunities and pressures	EPD		Draft flood management strategy to be circulated February 2016.

STRATEGY 4: Secure long term water supplies

Milestone	Lead	Progress	Comment
Action 11: Plan for long term water security			
11.1 Undertake future planning, using best data, including a review of 1yr in 20 restriction target	Icon Water		SEWG and DEWG agreed for the plan to progress to the next phase. Cross-agency project working group to be established to undertake a risk assessment. Draft project plan to be prepared by June 2016.
11.2 Develop a water resource plan under the MDB Plan	EPD		Delays experienced due to waiting for MDBA to provide further clarification. Cabinet submission to the Urban Renewal Cabinet Subcommittee in March 2016. Community consultation in April 2016.
Action 12: Strengthen water trading arrangements			
12.1 Enable inter-state water trading that enhances the ACT's long term water security and investigate an internal ACT water trading market	EPD		**Ongoing**. Initial approaches have been made to NSW and the MDBA, however NSW do not currently see it as a priority. Included as an action in the draft Catchment Management Strategy.
Action 13: Investigate the benefits and costs of more diverse water supply options			
13.1 Investigate the benefits (water quality and efficiency of water delivery) from local water supply systems	EPD		Not due for completion until June 2017. EPD to commence trial evaluations in 2016 to determine data sets required for final evaluation.

STRATEGY 5: Manage and promote water services efficiently and sustainably

Milestone	Lead	Progress	Comment
Action 14: Improve and monitor provision of water services			
14.1 Establish agreed levels of service for water utilities in the ACT and monitor performance, consistent with principles agreed under the National Water Initiative. Review performance of Icon WATER's licences	EPD		National review to be released in 2016.
Action 15: Encourage water users to conserve and use water wisely			
15.1 Explore the effectiveness of water pricing in promoting water use efficiency.	EPD		To be addressed in 2016.
15.2 Improve efficiency of non-residential water use.	EPD		Ongoing. To be addressed in 2016.

STRATEGY 6: Provide clean and safe water for the ACT

Milestone	Lead	Progress	Comment
Action 16: Improve management of rivers, lakes and public space to promote recreational use and reduce risks to public health.			
16.1 Review the ACT guidelines for Recreational Water Quality, taking into account the latest version of the NHMRC guidelines for managing risks in recreational waters.	HD		**Completed** Guidelines revised in October 2014.
16.2 Refine and develop new communication tools (Web, App etc) to provide public information and advice on water quality for recreational use to reduce risks to public health.	HD		**Completed** Upgraded information on ACT Government and National Capital Authority websites available (2015).

STRATEGY 7: Engage the community on understanding and contributing to a more sustainable city

Milestone	Lead	Progress	Comment
Action 17: Promote community involvement in management of ACT water resources.			
17.1 Support community volunteering in assisting the management of ACT water resources, including on-ground activities, e.g. through grants and the provision of equipment and training.	EPD		**Ongoing** Three community based part-time Waterwatch coordinators funded. Additional funding sought for on ground works. Budget bid for ACT Lakecarers Fund submitted as per commitments to the Parliamentary Agreement.
17.2 Public education, awareness raising and behavioural change campaigns on the role that individuals and businesses can play	EPD		**Ongoing.** Communications working group to be established. Stormwater education and behaviour change program pilot to be commenced shortly as part of the ACT and Region Catchment Management Strategy. Social Expectations of ACT and Region's Waterways survey conducted in 2015. Results will inform education campaigns.
Action 18: Ensure that indigenous and other cultural values are recognised in managing water planning and use			
18.1 Increasing our understanding of community and cultural values	EPD		**Ongoing** Extensive consultation undertaken as part of the Water Resource Plan development.

9.3 NATIONAL

Murray–Darling Basin Plan

The ACT's performance to fulfil responsibilities under the Basin Plan has been assessed as meeting its requirements by the Department of the Environment as part of the National Partnership agreement in 2012–13, 2013–14 and 2014–15 .

The ACT has submitted its second required Statement of Assurance to the MDB Authority.

The ACT has also provided 2GL of high security water to the MDB Authority under ACT commitments to the Living Murray Initiative.

The ACT Water Resource Plan (WRP) has been revised into a new format based on an index framework to more closely suit Basin Plan compliance requirements. The latest draft has been sent to key stakeholders including key ACT Government agencies and Icon Water and also the Murray–Darling Basin Authority for comment. The previous comprehensive draft will become supplementary material to the index format of the WRP.

The draft Water Resource Plan will undergo community consultation in 2016.

There are ongoing issues to be resolved with the MDB Authority with respect to the accounting of the ACT's permissible take. A response is pending from New South Wales on a small number of issues with respect to implications for the management of the Murrumbidgee River.

Following community consultation, the draft WRP will be submitted for approval to the MDB Authority and accreditation by the Commonwealth Minister for Agriculture and Water Resources.

As a possible future issue it may be necessary to tighten up the ACT's water access controls such as with respect to the issuing of new entitlements and controls on existing entitlements.

Work is continuing on a number of WRP issues:

- the need to establish inter-state water trading arrangements with NSW
- to strengthen ACT's water access control measures for entitlements
- develop a Source model to account for water quantity and management
- review sub-catchment sustainable yields
- review the ACT environmental flow guidelines

Water efficiency and labelling scheme

The Water Efficiency Labelling and Standards (WELS) scheme was established in 2005 under the Commonwealth *Water Efficiency Labelling and Standards Act 2005*. The Act's objectives are:

- to conserve water supplies by reducing water consumption
- to provide information for purchasers of water-use and water-saving products
- to promote the adoption of efficient and effective water-use and water-saving technologies.

The scheme aims to address these objectives by requiring registration and applying labels to water-using products for water efficiency, providing consumers with information so they can consider water efficiency in their purchasing decisions. The scheme also sets minimum water-efficiency standards (WES) where appropriate.

The scheme applies to plumbing products (showers, tap equipment, flow controllers); sanitary ware (toilet/lavatory equipment, urinal equipment) and whitegoods (clothes washing machines, dishwashers).

In 2015 a second independent review of the scheme found it had already achieved, and is likely to continue to achieve, much of the objectives. For water savings, the review found the scheme has contributed to observed reductions in water consumption, and the conservation of water supplies across Australia. For 2013 the water saving estimates suggests a saving of approximately 70,000 ML and as much as 204,000 megalitres could be saved by 2030. Savings of the Scheme as of 2015 could have an economic value of up to $1.5 billion.

The review found the scheme successfully provides information to consumers that is highly visible, well-utilised and trusted. Market research suggests consumers are actively using water-efficiency information to inform decisions about what products to purchase. Research undertaken in 2014 shows that 87% of consumers recognise the WELS water efficiency label. In addition, 83% of consumers have indicated they have confidence in the information provided.

For the adoption of water-saving products, the review found the scheme is the highest or second highest consideration for consumers in their purchasing decisions for products covered under the scheme. This is reflected in a general shift towards both greater availability and sales of more water-efficient products since the introduction of the scheme. Sales of WELS 205 star rating and below clothes washing machines have contracted substantially since 2007; at the same time, sales of WELS products with a WELS 3 star and below accounted for nearly 90% of all sales. However, by 2013 these dishwashing machines accounted for less than 20 per cent of all sales.

The ACT legislation was reformed in 2015 to reflect new administrative changes.