INTRODUCTION

Purpose

This report is intended to provide the ACT Community with information on the water quality in ACT lakes, rivers and streams for the year 1 April 1999 to 31 March 2000. In order to establish a more statistically significant analysis of water quality trends, the analysis includes data for the period 1992 to 2000.

The report is divided into three main sections. The first introduces the report and provides background information for interpreting the water quality data. The second section discusses water quality condition. The indicators used are introduced and results discussed for the lakes and rivers in light of the Territory Plan and Water Quality Standards. The final section briefly discusses special water quality studies that have occurred in the ACT region during the reporting period.

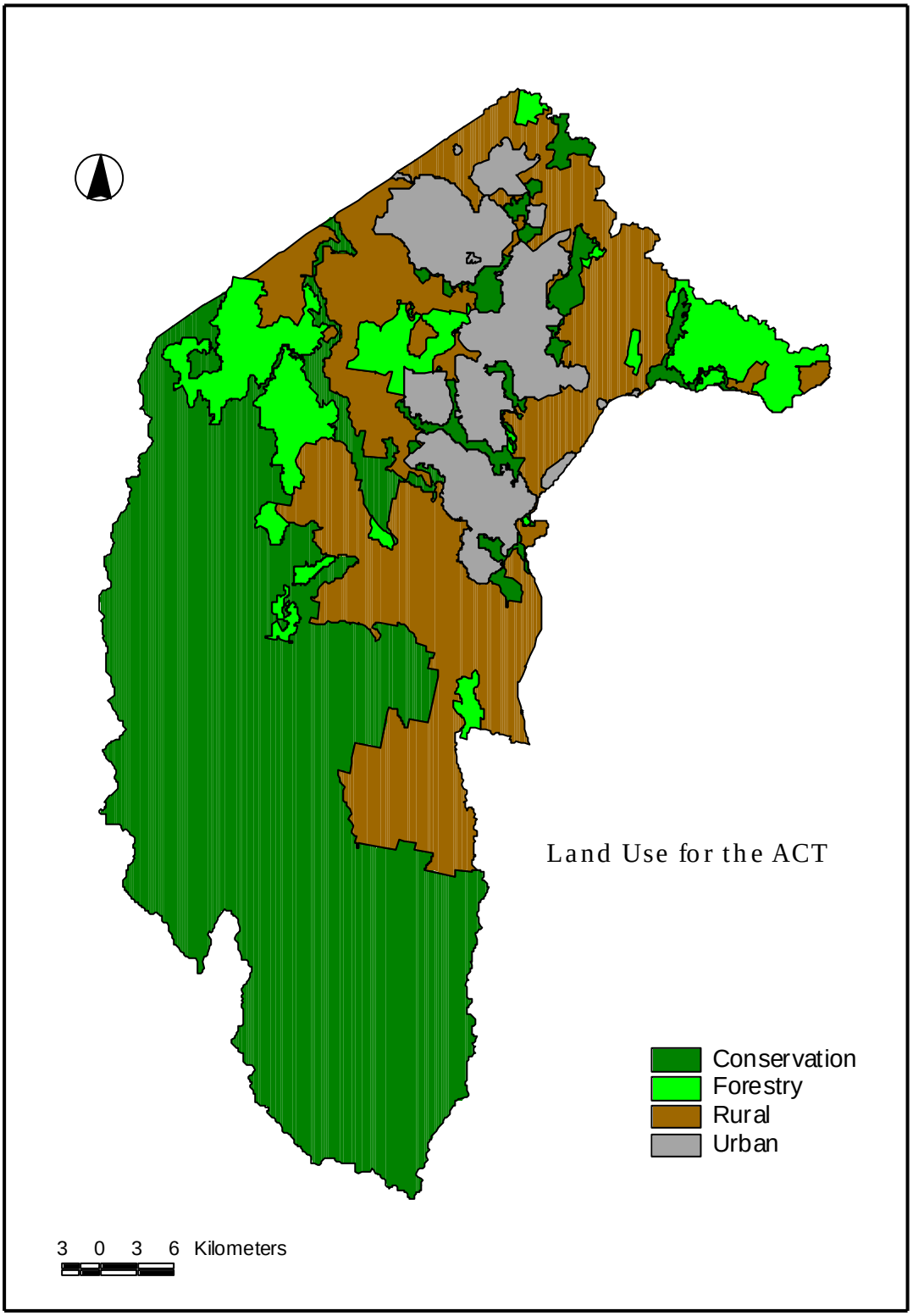
Scope

The report focuses on the waterways of the ACT with the exception of the Cotter catchment and Lake Burley Griffin. The water quality of the Cotter catchment is not of significant concern because of the generally undisturbed nature of the catchment. Lake Burley Griffin is a Commonwealth responsibility and is the subject of an annual report produced by the National Capital Authority.

Landuse

There are four major land uses in the ACT (see Figure 1). Conservation land use tends to have a minimal impact on water quality. Plantation forestry and agricultural use can have significant impacts on water quality where these activities result in soil erosion or the release of agricultural chemicals and animal waste to water bodies. Urban use has the greatest potential for impact on water quality per unit area. Materials entering urban waterways, which are likely to impact on water quality, include fertilisers and other chemicals, organic matter, soil, oil, and sewage effluent.

Figure 1: Land Use Map



Climate

Rainfall in the ACT is strongly affected by the landform. In the mountainous region to the west of the Murrumbidgee River, annual average rainfall ranges from 800-1000 mm. The flatter tablelands on which Canberra is built are in a rain shadow area and the annual rainfall reaches only 600-700 mm.

The ACT Government measures rainfall at a number of sites in the ACT. Rainfall for a site in Belconnen near the Barton Highway is presented in Figure 2, and shows both the monthly average rainfall for the 1999-2000 reporting period as well as the long term monthly average.

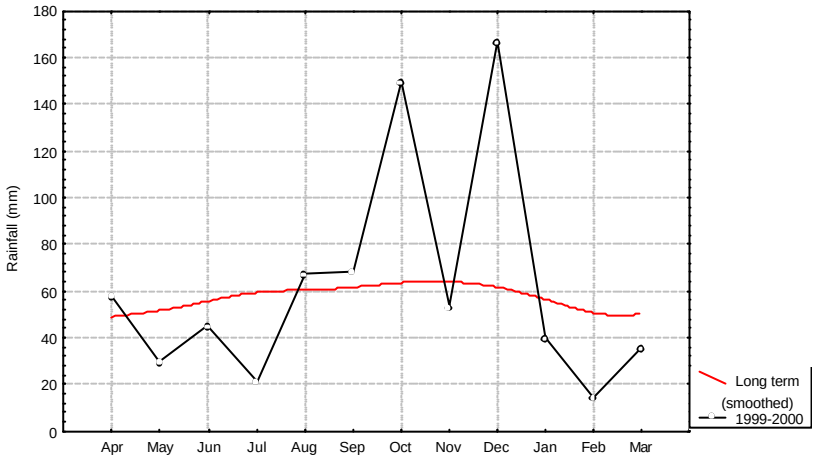


Figure 2: Rainfall in Belconnen near Barton Highway

The long term average annual rainfall in Belconnen is 670 mm. The annual rainfall for this reporting period was slightly above the average at 740 mm but less than the 847 mm recorded during the last reporting period of 1 April 1998 to 31 March 1999.

Lower than average winter rainfall and higher spring and early summer rainfall was experienced during this reporting period.

Streamflow

Streamflow during the period appeared generally to be below the long term average. Flow in the Murrumbidgee River near Angle Crossing (Figure 3), shows that the mean monthly flow did not exceed the long term average at any point for this site. It also shows the extended dry period that occurred during most of the year except the spring season.

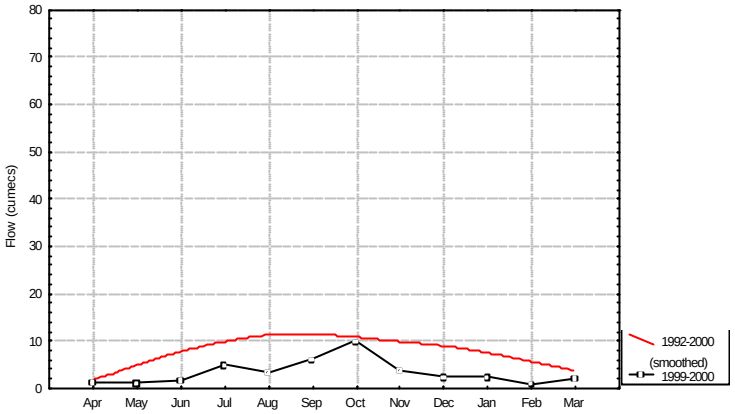


Figure 3: Flow in the Murrumbidgee River near Angle Crossing

Urban areas react more quickly to rainfall with a greater proportion of rainfall being converted to run off due to the large impervious surface areas. Flow in Ginninderra Creek illustrates the elevated levels of run off from the urban area (Figure 4). It more closely matches the rainfall than the flow at Angle Crossing that drains a less developed catchment and responds more slowly to rainfall events.

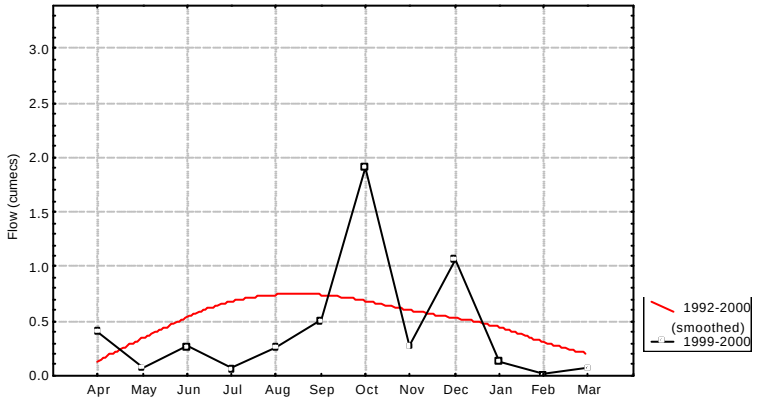


Figure 4: Flow in Ginninderra Creek near Charnwood Road

Flow during the 1999 spring and early summer period in particular was above the average for the past eight years (Figure 2).

Rivers of the ACT and Region

A number of the rivers and streams that flow through the ACT originate in NSW. The catchment boundaries of other major rivers in the ACT form part of the ACT/NSW border.

The Murrumbidgee River originates well to the south of the ACT. Its headwaters are impounded by Tantangara Reservoir and the river is further regulated downstream of the ACT at Burrinjuck Reservoir.

The Molonglo River and Queanbeyan River rise to the south- east of the ACT with both draining to Lake Burley Griffin.

The Cotter catchment forms the western boundary of the ACT and the Naas and Gudgenby form the southern and southeastern boundaries.

ACT Government Responsibilities in Relation to Water Quality

The Territory Plan and Water Quality Standards

The Territory Plan sets the designated uses for the waterways in the ACT. The Plan identifies three categories of water use and catchment policies. These are drainage and open space, water supply, and conservation. For each category a range of other uses are allowed which are generally compatible with, but secondary to, the primary value. Water quality standards are identified in the *Environment Protection Regulations 1997*. These regulations contain a set of tables that list the necessary water quality to support each of the water uses referred to in the Territory Plan. Table 1 provides examples of some of the water quality standards for certain water uses.

	Water Use				
Indicator	Water based recreation—swimming (REC/1)	Water based recreation—boating (REC/2)	Water supply—stock (STOCK)	Water supply—irrigation (IRRIG)	Aquatic habitat—wetland (AQUA/1 to AQUA/6)
Total Phosphorus (mg/L)	0.1	0.1			0.1
Turbidity (NTU)	not objectionable	not objectionable			10–30
Suspended Solids (mg/L)				So as not to block irrigation systems	12.5–25
Chlorophyll ‘a’ (µg/L)	10	10	10		2–10
Algal Cells Counts (cells/mL)	5,000	5,000	up to 10,000 depending on species		5,000
Bacteria (faecal coliforms/100 mL)	150	1,000	1,000	1,000	
Dissolved Oxygen (mg/L)					>4
Acidity (pH)	6.5–8.5	6.5–8.5	6.5–9.2	4.5–9.0	6–9
Total Dissolved Solids (mg/L)			3000	500	

Table 1: Water Quality Standards (Ref: *Environment Protection Regulations 1997*)

Protection of Water Quality

The ACT Government has broad responsibilities in relation to water quality. This includes meeting ACT and national standards. The ACT Water Quality Standards are at Schedule 4 of the *Environment Protection Regulations 1997.* Water uses or activities which are not included in the Water Quality Standards are managed under the appropriate part of the *National Water Quality Management Strategy.*

The Department of Urban Services in the ACT Government has a water monitoring program for the ACT that includes the collection of water quality and streamflow information. Such information is used to determine whether waters in the ACT are of adequate quality, and if the management strategies used to achieve or maintain such water quality are adequate. The information is not intended to identify specific pollution incidents but provide information about changes to water quality over time.

The Government seeks, through an integrated approach, to manage waterways so that standards are not exceeded or remain within their prescribed range. Achieving this is a measure of the success of policy and planning decisions that aim to prevent environmental problems from occurring. Infrastructure such as gross pollutant traps and water quality control ponds are designed and managed to reduce urban impacts on water quality. The system of ponds and lakes in the ACT were designed to minimise the impact in the Murrumbidgee River from activities in the ACT.

Monitoring Program

The data for this report is sourced from the ACT Government water quality monitoring program and data from authorised dischargers (including Lower Molonglo Water Quality Control Centre and Queanbeyan Sewage Treatment Plant). The ACT Government program is based on regular sampling of lakes and rivers.

Sampling Sites

Sites are located so as to be representative of stream and lake conditions in the ACT. It is not possible to monitor all sites and all parameters of interest, consequently those considered most representative of environmental conditions are selected with the intention of generalising to other similar areas. The site locations can be seen on the water quality indicator maps such as Figure 5.

Lakes

The major urban lakes (with the exception of Lake Burley Griffin) are sampled eight months of the year (see Table 2 for sampling regime). The sampling program for lakes is routine and not flow related.

Month	*Sample type*
August	Routine plus sediment particles plus BOD
October	Routine
November	Routine
December	Routine
January	Routine plus sediment particles plus BOD
February	Routine
March	Routine
May	Routine

Table 2: Lake Sampling Occasions

The ACT Government also monitors Burrinjuck Reservoir. The ACT's impact on the Murrumbidgee River is not readily identifiable downstream of Burrinjuck Reservoir as a result of the Reservoir's size and the residence time of water entering it.

A separate program to monitor algae in Canberra's lakes is undertaken by Environment ACT. In the reporting period between 1 April 1999 and 31 March 2000 the observed levels of algae were low and no public alerts were issued as a result of high algae levels.

Rivers

The major rivers and some urban streams are also monitored based on flow. Not all urban streams are included as many have little flow for most of the year and results may not be indicative of general stream condition.

Samples are collected within four flow percentile groupings as indicated below (see Table 3). The 5^{th} percentile flow is the flow exceeded only 5% of the time, ie very high flow, conversely the 90^{th} percentile flow indicates very low flow.

Flow Percentile Group	Number of Samples
5–29	2
30–49	2
50–69	2
70–89	2

Table 3: Flow Percentiles for River Sampling

Flow percentile based monitoring enables a more cost effective characterisation of water quality than time based monitoring, where streamflow is the major determinant of quality.

Streamflow is measured at a number of sites throughout the ACT. This information is valuable for interpreting water quality data. Most of the pollutants that wash off streets and fields do so during rainfall events. In conjunction with water quality monitoring, streamflow allows for the calculation of pollutant loads in our lakes and rivers.

Only six river samples were taken during this reporting period. There is a requirement to sample within flow percentile groups (Table 3) with an additional requirement to ensure there is a reasonable time period between each sample. The aim of this strategy is to provide a representative assessment of river health over time and flows and not base the assessment on one rainfall event that rises and falls through the flow percentile groups.

The samples that were taken occurred over a range of flow periods with the lowest flow at the about the 90^{th} percentile and highest flow at approximately the 20^{th} percentile. The consequence of the higher flows is that the water quality indicators that are flow dependent may record higher than long term average median values.