



## Lachlan River

## Long Term Intervention Monitoring Project

### **Progress Report**

 $1^{st}$  of April –  $30^{th}$  June 2019







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Cover Photo: Vegetation monitoring of Moon Moon Swamp taken following rainfall in June 2019 (Photo: Kyle McGrath).

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#### 1 Conditions in the Lachlan River system April to June 2019

Conditions remained warm, but wetter across the catchment in the second quarter of 2019. Rainfall was above average in April and May 2019 (Figure 1), and for June up to 24<sup>th</sup> it was below average. The total rainfall accumulated for the period up to 19<sup>th</sup> of June is 94 mm, the same amount as the long-term average of 94.4 mm. With 70.5 mm as long term median<sup>1</sup> rainfall, the 2019 rainfall for this period is above this. The 123.1 mm annual total until May, is already three times higher than last years value (39 mm), but similar to 2017, 2015 and 2014 (2016: 201.7 mm). In all 3 months the majority of the rainfall fell more or less in one big event; 39 mm on the 22<sup>nd</sup> April, 20.6 on the 3<sup>rd</sup> of May and 11.2 on the 13<sup>th</sup> of June.



Figure 1. Rainfall at Hillston (075032) in the Lower Lachlan River Catchment for the second quarter of 2019 compared with the long term average monthly rainfall and the long term median monthly rainfall. Data from the Bureau of Meteorology.

<sup>&</sup>lt;sup>1</sup> Median rainfall is the mid-point of all observed rainfall records when they are sorted in order of magnitude. The median is the preferred measure of 'typical' rainfall from a meteorological point of view. This is because of the high variability of rainfall; one extreme rainfall event will have less effect on the median than it will have on the arithmetic mean.

Overall for this period monthly average daily maximum and minimum temperatures at Hillston were above average. Particularly April was warm, with an average temperature of 27 degrees which is 2.6 degrees warmer than the long term average (Figure 2). These daytime temperatures in April were accompanied by correspondingly higher minimums, with an average minimum temperature of 10.6 degrees (1.7 above average). June minimum temperatures are below average.



*Figure 2. Average maximum and minimum temperatures for the second quarter of 2019 at Hillston (075032) in the Lachlan River Catchment compared with the long term average daily temperatures. Data from the Bureau of Meteorology.* 

## **2** Summary on progress against core monitoring and evaluation activities

ACTIVITIES	PROGRESS TO DATE	UPCOMING ACTIVITIES							
Monitoring activities									
Ecosystem type	<ul> <li>Data collection complete and suggested Australian National Aquatic Ecosystems (ANAE) types for all sites included in the Monitoring and Data Management System (MDMS).</li> </ul>	<ul> <li>Assign ANAE types for mid Lachlan sampling sites</li> </ul>							
Fish (river)	• 2018-9 fish sampling in the lower and mid Lachlan completed	Data analysis and reporting							
Fish (larvae)	• 2018-9 larval fish fish sampling completed	Data analysis and reporting							
eDNA	All sampling completed	• Data processing, analysis and reporting							
Waterbird breeding (optional)	None	• None							
Water quality and stream metabolism	None	Data analysis and reporting							
Vegetation diversity	2019 Autumn vegetation surveys     completed	Data analysis and reporting							
Frogs (optional)	None	• None							
Evaluation activities									
Monitoring data entry	Data entry continuing	• 2018-19 Data upload to commence							
Communication and engage	gement								
Selected Area Working Group (EWAG and TAG meetings)	• None	EWAG meeting planned for August							
Project team teleconference	None	• None							
Other Stakeholder Engagement	Murrin Bridge Workshop	As opportunities arise							

**Note:** for the Long-Term Intervention Monitoring (LTIM) Project, Lachlan River system selected area:

• **Appendix A** provides a summary of monitoring to be undertaken under the project from 2014-2019.

#### **3** Observations

#### 3.1 Hydrology

Flows in the mid-Lachlan River (Cottons Weir and the lower Lachlan River (Willandra weir) during April and June (19<sup>th</sup>)) ranged from 437 to 1616 ML/day (Figure 3) and 65 to 1210 ML/day (Figure 4), respectively. Flows were generally low throughout April and June as orders for irrigation have subsided as the weather cooled, with the exception of two flow pulses. A Commonwealth watering action targeting the Lower Lachlan to the Great Cumbung Swamp commenced with increasing flows out of Brewster in late May 2019. Flows at Booligal achieved a peak of 550 ML/day on 17-18 June, with this maximum reducing over the next 10 days back to normal operational flows of around 30 ML/day (Figure 5). This watering action required nearly 5,500 ML to complete with water from Wyangala Dam supplementing releases from Lake Cargelligo and Lake Brewster weir. This watering action follows on from an earlier non-CEW flow pulse which passed Booligal approximately 45 days prior to the CEW flow pulse.



Figure 3. Flow in the Lachlan River recorded at the gauge at Cottons weir near Forbes (412004). Data from WaterNSW (<u>http://waterinfo.nsw.gov.au/</u>). The shaded regions show the timing of the use of Commonwealth and NSW environmental water: blue shows the spring pulse (Commonwealth environmental water), orange shows the use of water during the period (shown by the orange line) in which management of water levels aimed to support fish breeding (Commonwealth environmental water) and the green shows the protection of tributary flows to provide a small flow pulse (NSW Environmental water allowance).



Figure 4. Flow in the Lachlan River recorded at the gauge upstream of Willandra weir (412038). Data from WaterNSW (<u>http://waterinfo.nsw.gov.au/</u>). The shaded region shows the release of water for the June Commonwealth pulse targeted the Lower Lachlan to the Great Cumbung Swamp. Note: this pulse also included stock and domestic replenishment flow.



Figure 5. Flow in the Lachlan River recorded at Booligal (412005) for the past year (top) and the past three months (bottom). Data from WaterNSW (<u>http://waterinfo.nsw.gov.au/</u>). Yellow shading indicates the CEW June pulse which targeted the Lower Lachlan to the Great Cumbung Swamp.

#### 3.2 Field observations

#### Hydrology

Sentinel imagery and hydrographs (generated from WaterNSW data) indicated that the earlier non-CEW pulse (3 May 2019 Booligal peak) reached the lower Lachlan Cumbung Swamp area mid-late May 2019 and persisted until the start of the recession in mid-June (Figure 6 – Figure 7). The wetting up of the area from this earlier event is likely to allow greater penetration of the CEW pulse (17-18 June 2019 Booligal peak) as it arrives in the Great Cumbung Swamp in July 2019.

The CEW watering action targeting the Lower Lachlan will deliver water to the Great Cumbung Swamp, which is listed on the Directory of Important Wetlands because it contains one of the largest remnant examples of Common Reed swamps. The Great Cumbung Swamp also provides refuge to many native plants and animals, particularly waterbirds, during dry times.

The watering action aims to:

- protect the core reed beds and other non-woody vegetation communities as the catchment continues into a dry period
- provide connectivity and variability to flows along the lower Lachlan during autumn-winter
- encourage native fish movement in the lower Lachlan River and improve the condition of native fish before winter
- limit the opportunity for carp breeding, particularly in the river channel (carp are spring-summer spawners)



Figure 6 Sentinel image from 7 June 2019 Cumbung area near 'Clear Lake, Maude' (for Sentinel search area). Peak of earlier non-CEW pulse continues to arrive in region.



Figure 7 Sentinel image from 17 June 2019 Cumbung area near 'Clear Lake, Maude' (for Sentinel search area). Earlier non-CEW pulse appears to have started to slowly recede in region.

#### Larval fish

Larval fish have been sent off for otolith processing. Results will be used to interpret growth patterns across years and provide preliminary indications of relationships between growth and stream productivity. The analysis will focus on the larvae of two native fish species, Murray cod and Australian smelt collected each year from 2014 – 2019 (with the exception of 2016 where no larvae of these species were captured).

#### Fish community sampling

Fish community sampling in the mid-Lachlan is now complete. Initial observation from the field indicate that young-of-year Murray cod were present at most sites, which is consistent with the breeding event detected in the larval sampling. Silver perch were detected at two of the 10 sites monitored (Figure 8).



*Figure 8 Two silver perch captured from the mid Lachlan River at Mulguthrie during community sampling in 2019 (Photo: Hugh Allan)* 

#### Vegetation monitoring

The majority of sites for the autumn vegetation monitoring had been surveyed between 8 and 13<sup>th</sup> of April. The 3 remaining sites were surveyed between the 16<sup>th</sup> and 19<sup>th</sup> of June. The sites monitored in April (those which occur below Booligal on the Lachlan River) were all dry, with lower than usual numbers of species present at most sites and groundcover was generally very low (Figure 9). Between vegetation monitoring in April and June, approximately 90 mm of rainfall occurred (at Hillston Airport), requiring two monitoring trips to be rescheduled. The three sites (Moon Moon, Whealbah, and Hazelwood) which were surveyed in June had an obvious response to the wetter conditions. A diverse range of both terrestrial and aquatic respondent annual species were present, and some species were in very high abundance (Figure 10). The vegetation monitoring team were assisted in the field for two days by CEWO members Adam Coterill and Dennis Ryan (Figure 11).





Figure 9 Vegetation sampling conducted in April 2019 at Nooran Lake in the Lower Lachlan Catchment (top) and Booligal in the lower Lachlan Catchment (bottom).



Figure 10 Vegetation sampling conducted in June at Moon Moon Swamp, North of Booligal in the lower Lachlan Catchment (top) and Whealbah Lagoon, in the lower Lachlan Catchment (bottom).



Figure 11 Vegetation survey at "The Ville" and "Lake Tarwong" in April 2019.

#### eDNA (environmental DNA)

In 2019, the LTIM team, in collaboration with colleagues from the University of Canberra, have been trialling an eDNA monitoring program as a complementary approach to the LTIM and STIM (Short Term Intervention Monitoring) fish monitoring in the Lachlan River reaches that receive environmental water. In the first quarter of 2019, water samples were taken from 18 sites in the mid and lower Lachlan River to analyse for eDNA. These samples have been taken from the same LTIM sites as the adult fish monitoring. DNA extraction is now complete, with the next stage in the process being metabarcoding (Metabarcoding is a rapid method of biodiversity assessment that combines two technologies: DNA based identification and highthroughput DNA sequencing).

#### **Communication and Engagement activities** 3.3

A two-day Waterwatch workshop was held in Murrin Bridge to introduce the community to the new WaterWatch and Waterbug team. Lake Cargelligo Local Landcare Coordinator Nicole O'Neill will assist the Community Development team for the area as well as Landholders to put their training into action over the next year. The workshop was very popular with all who attended. Data from the program will be available to contribute to the Commonwealth Environmental Water LTIM Lachlan River project.

## Don't let the waterbugs bite

#### WaterWatch workshop reveals some odd specimens in local water samples

INTRODUCING Murrin Bridge and Cargelligo's Waterwatch Lake new and Waterbug Team, where quality is just as important as quantity! important as quantity! Cecil Ellis, aquatic ecologist from Nature Navigation and the Waterbug Shop, led another two-day workshop last month at Murrin Bridge with the C o m m u n l t y Development Program (CDP) Team and interested tocals. Keen interested locals. Keen participants included Debra and Harry Clarke, Rachel Kennedy, Sinclle Thorpe, Shirylae Kirby, Charmaine Johnson. Charmaine Johnson, Brian Griffiths, Peter Harris, Ed Vagg, Mary Flaskas and Belinda McFadyen. Lake's Local Landcare

Lake's Local Landcare Coordinator, Nicole O'Neill, will assist the CDP Team and landbolders put their training into action over the next year, regularly collecting and entering water quality data into the NSW WaterWatch database The Team monitor turbidity, turbidity monitor salinity, pH, temperature and dissolved oxygen. and take photos and observations. The Team and have specialised equipment to obtain equipment to obtain representative water samples and obtain waterbug samples from a range of habitats Cecil from Nature

Navigation remarked it was one of the best run workshops he has had the pleasure to be involved in, with the canoe run at Fantasy Island to end the second fantastic experience! The Team

was also lucky enough to have Down the Track cater a great morning tea and picnie lunch both days, led by Roy: and plans to by Roy. "On the day we found several waterbug curiosities from our samples at Lake Cowal, Lake Cargelligo and the Lachlan River at Fantasy Island near Murrin Island near Murrin Bridge" said Cecil, The Lachlan River

pincers. We also found a mayfly larvae in the Lachlan River, mayflies are indicators of good waterway health. With only one mayfly, it is probably not worth getting too excited, notil we return in Spring to complete another Other waterbugs

found across the sites,

camouflaged in the tray for 20 minutes: before to Rachel's and Charmaine's surprise, it 'came alive' and wandered out of the sample tray and across the classroom floor!" And while winter isn't the ideal time for

the ideal time for waterbug sampling, the Team will use the time to train in preparation for the Waterbug Blitz in



water (Ranatra)

or

Lake News, Wednesday, June 12, 2019

sample revealed several types of freshwater crustaceans, including yabbies, freshwater shrimp and freshwater prawns or Macrobrachium Macrobrachium look like a larger freshwater shrimp, but with a very long pair of front

dragonfly a slender scorpion (Ranatra). Nicole O'Neill, who was being trained by Cecil to lead the group commented, "Ranatra had everyone capitivated as it had been sitting devices the

where identified using the free Waterbug App available for Google and Apple

Dr Jo Lenchan, from the Office of Environment and Heritage (OEH) has been working with the Murrin

Bridge community on a wetland restoration project over the past two years and coordinates this workshop series component of the CDP work plan. The data will contribute to OEH and the Commonwealth's Long Term Intervention Monitoring (LTIM) Project routine water quality monitoring and gramy monong and stream productivity research in the mid and lower Lachlan, which has been conducted by the University of Canberra for the past 5 years. The LTIM Project also includes fish nonitoring, with highlights to date the capture of cel-tailed catfish larvae from one site upstream of Lake Cargelligo near Kiacatoo in late November 2018. During the same During the same sampling period, Murray cod were the most abundant species abundant species captured at all sites with good numbers of larval flat-headed gudgeon and Australian smelt, with only a handful of the alien species, gambusia and no larval carp detected!

To find out more about the LTIM Project or the Waterwateh/bug Citizen Science project contact Jo Lenehan on 043 793 8365 or email Nicole 8365 or email Nicole O'Neill lakec@lachlandcare.org. au. Or visit sites below https://www.waterbugbli tz.org.au/ and www.environment.gov.a u/water/cewo/catchment/ lachlan/monitoring. Pictured: slender а

water scorpion and fresh water shrimp from local water samples.

Figure 12 Lake News newspaper article from the 12th of June 2019.

# Appendix A: The Long-Term Intervention Monitoring Project for the Lachlan River system and its context in terms of ecological monitoring and evaluation within the Murray-Darling Basin.

The Long Term Intervention Monitoring (LTIM) Project for the Lachlan river system selected area is funded by the Commonwealth Environmental Water Office. The project is being delivered by a consortium of service providers lead by University of Canberra and includes NSW Office of Environment and Heritage, NSW Department of Primary Industries (Fisheries), NSW Department of Primary Industries (Office of Water), University of New South Wales and Charles Sturt University.

The LTIM project is based on a clear and robust program logic, as detailed in the <u>Long-Term Intervention</u> <u>Monitoring Project Logic and Rationale Document</u>. That document sets out the scientific and technical foundations of long-term intervention monitoring and is being applied to areas where LTIM projects are being undertaken. It also provides links between Basin Plan objectives and targets to the monitoring of outcomes from Commonwealth environmental watering actions. For more information, see <u>Monitoring and</u> <u>evaluation for the use of Commonwealth environmental water</u>.

Many different agencies play a role in the reporting on environmental outcomes, consistent with the Basin Plan (see figure 1 below). The Murray Darling Basin Authority is responsible for reporting on achievements against the environmental objectives of the Basin Plan at a basin-scale, which are broadly focussed on flows and water quality, fish, vegetation and birds across the whole of the Basin. State Governments are responsible for reporting on achievements against the environmental objectives of the Basin Plan at an assetscale i.e. rivers, wetlands, floodplains. The Commonwealth Environmental Water Holder is responsible for reporting on the contribution of Commonwealth environmental water to the environmental objectives of the Basin Plan (at multiple-scales).



Figure 11. A summary of roles various agencies play a in the reporting on environmental outcomes, consistent with the Basin Plan.



Hydrological zones and monitoring sites of the lower Lachlan for the Long-Term Intervention Monitoring Project.

Figure 12. Lower Lachlan LTIM monitoring sites, hydrological zones and NSW gauging stations

#### Monitoring to be undertaken in the Lachlan system for the Long Term Intervention Monitoring Project from 2014-2019

The five year monitoring schedule has been based around the expected watering options and is focussed on the monitoring of Basin Indicators. Monitoring effort is consistent across the five years with the exception of monitoring Waterbird Breeding and Frogs which are options that can be implemented on request from the CEWO, and some additional fish monitoring sites in the mid Lachlan which is implemented in Year 5.

	ZONE	DATA CONTRIBUTE OF RESPONSES TO ENVIRONMENTAL V SELECTED AREA	S TO THE EVALUATION COMMONWEALTH WATERING WHOLE OF BASIN SCALE	MONITORING FREQUENCY	SITES	EXPECTED SCHEDULE
Ecosystem type	All	$\checkmark$	✓	Once only	All sites for other indicators	Establishment of ANAE type at the start of the LTIM Project. Expected August- December 2014
Riverine fish	1 Mid Lachlan Year 5	$\checkmark$	√	ANNUAL	Basin Evaluation: 10 fixed sites within Zone 1	Annual sampling between March and May
Larval fish	1 Mid Lachlan Year 5	$\checkmark$	√	ANNUAL	3 fixed riverine sites in Zone 1	Annual sampling 5 times during breeding season (September to February)
Stream metabolism	1 Mid Lachlan Year 5	$\checkmark$	V	CONTINUOUS REGULAR	Four fixed sites matched to riverine fish sampling sites in Zone 1	Continuous monitoring of dissolved oxygen and temperature. 6 weekly sampling of nutrients and water quality attributes.
Hydrology (River)	1 Mid Lachlan Year 5	$\checkmark$	✓	CONTINUOUS	Gauging sites	
Vegetation diversity and condition	All	✓		ANNUAL & EVENT BASED	12 fixed sites	Before and after watering (expected to be April/May and 3 months after first fill)
Waterbird breeding (Option)	1	V		EVENT-BASED (on request from the CEWO)	One fixed site – Booligal wetland	Fortnightly surveys of bird breeding triggered by breeding events in Booligal wetland.
Frogs (Option)	All	$\checkmark$		EVENT-BASED (on request from the CEWO)	15 sites comprising 2 to 8 wetland sites and 2 to 7 riverine sites depending on watering targets	3 sampling events between August and February (one sample in each of winter, spring and summer).
Hydrology (wetland – Option)		$\checkmark$		EVENT-BASED (in conjunction with Waterbird Breeding or Frog monitoring)	Cameras at 6 roving wetland sites	Cameras installed prior to targeted watering each year and downloaded after the watering event has passed