



## Lachlan River

# Long Term Intervention Monitoring Project

### **Progress Report**

1<sup>st</sup> October – 19<sup>th</sup> December 2018







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Cover Photo: Larval Murray cod captured in trip 3 at Euabalong (Photo Hugh Allan).

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#### Conditions in the Lachlan River system October – December 2018

Conditions remained warm across the catchment between October and December and rainfall was patchy. At Hillston, rainfall was above average in October and close to average in both November and December (Figure 1). The total rainfall for October until the 31<sup>st</sup> of December 2018 was more than both the long term median<sup>1</sup> rainfall (71.5 mm) and the long term average (95.3 mm). While the recorded rainfall at Hillston was close to average for the quarter, landholders reported considerable variability with particularly dry conditions around Booligal and the distributary creek systems.



*Figure 1. Rainfall at Hillston (075032) in the Lower Lachlan River Catchment for the end of 2018 compared with the long term average monthly rainfall and the long term median monthly rainfall. Data from the Bureau of Meteorology.* 

Average daily minimum and maximum temperature between October and December at Hillston were warmer than the long term averages (Figure 2).

<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.



*Figure 2. Average maximum and minimum temperatures for the end of 2018 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>No more data collection required</li> </ul>						
Fish (river)	2017-18 reporting completed	2018-19 fish sampling to commence						
Fish (larvae)	<ul> <li>2017-18 larval fish reporting completed</li> <li>2018-19 larval fish sampling completed in mid and lower reaches</li> </ul>	Processing samples						
Waterbird breeding (optional)	None	None						
Water quality and stream metabolism	<ul> <li>Logger data downloaded from sites in the mid and lower reaches and from additional loggers at The Ville and Kalyarr</li> <li>Water quality samples collected from mid and lower reaches and from additional sites at The Ville and Kalyarr</li> <li>2017-18 reporting completed</li> </ul>	<ul> <li>Maintenance of loggers and downloading of data.</li> </ul>						
Vegetation diversity	<ul> <li>Spring vegetation sampling completed</li> <li>2017-18 reporting completed</li> </ul>	None						
Frogs (optional)	None	None						
Evaluation activities								
Monitoring data entry	<ul> <li>Data uploading continuing as MDMS processes have been updated</li> </ul>	Data uploading finalised						
Communication and engagement								
Selected Area Working Group (EWAG and TAG meetings)	<ul> <li>Planning teleconferences held 24/10 and 20/12</li> </ul>	<ul> <li>Ongoing teleconferences relating to shepherding of flow pulse</li> </ul>						
Project team teleconference	<ul> <li>None – local meetings in Canberra associated with the report preparation</li> </ul>	None planned						
Other Stakeholder Engagement	<ul> <li>Meeting between larval fish monitoring team, landholders and fishing representatives near Hillston 31/10</li> </ul>	As opportunities arise						

**<u>Note</u>**: 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

Flow in the mid - Lachlan River between October and December ranged between 730 and 2300 ML/day (Figure 3). The hydrological objectives for this reach between October and November were to maintain the river above 800 ML/day and avoid rapid drops in water level. These objectives were designed to support the nesting period for native fish such as Murray cod and Freshwater catfish whose nests are vulnerable to exposure from rapidly changing water levels. Flows in the river were generally above the requested 800 ML/day except for a short period (4 days) at the start of November when the river dropped to 730 ML/day. The CEWO contributed around 3,500 ML to ensure the flow at Forbes (Cottons Weir) was maintained at 800 ML/day.

Around 1.6 to 1.8GL was held over in Brewster from the Wyangala spring pulse release. This was subsequently released on the 19-24 October to mimic a small rain event. This pulse resulted in a peak of 125mL/day on 18-19 November at Four Mile Weir.



*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>).

Further downstream, flow in the lower Lachlan was more variable displaying sharp drops in flow in response to irrigation supply and demands (Figure 4). Commonwealth environmental water was not used in this reach to maintain water levels.



*Figure 4. Flow in the Lachlan River recorded at the gauge upstream of Willandra weir (412038). Data from WaterNSW (http://waterinfo.nsw.gov.au/).* 

#### 3.2 Field observations

#### Larval fish monitoring

Fortnightly larval fish monitoring commenced on the 15<sup>th</sup> of October and the fifth and final trip was completed on the 14<sup>th</sup> of December. This year saw the introduction of a second reach to the larval fish sampling program, with a further three sites added between Forbes and Lake Cargelligo (referred to as the mid-Lachlan reach). Monitoring activities in the mid-Lachlan reach mirrors the monitoring being undertaken in the lower Lachlan with larval fish sampled using light traps (Figure 5) and drift nets. The samples collected during this season's monitoring are being sorted and all larval fish will be removed for later identification and measurement (to be undertake in January / February 2019).



Figure 5. Larval fish Light trap at Euabalong in the mid-Lachlan Reach (Photo: Hugh Allan)

Although formal identification and relative abundance estimates are not yet possible, field and laboratory observations indicate that small bodied native fish such as Australian smelt and flat-headed gudgeon (and potentially carp gudgeon) were the most numerous across all trips to date (Figure 6). Larval Murray cod were captured in trips two and three in the lower-Lachlan reach and trips two to four in the mid-Lachlan reach (see cover photo).

The larval fish team met with local land services representatives and the ex-president of the Hillston Fishing club to discuss pump screens which aim to reduce the impact of water offtake on larval fish.



*Figure 6. Larval Fish captured in light traps dominated by Australian smelt and flat-headed gudgeon at Hunthawang in the lower Lachlan reach on trip 4 (27<sup>th</sup> November 2018) (Photo Ben Broadhurst).* 

#### Vegetation sampling

Vegetation sampling was conducted between the 2<sup>nd</sup> and 12<sup>th</sup> November with all sites surveyed for groundcover species and cover. While the region is in drought, there were marked differences in the groundcover across the monitoring sites reflecting the localised rainfall experienced during spring. Hillston had received slightly above average rainfall during spring (see Figure 1), with a reasonable number of species and cover recorded at the sites. Further west at Moon Moon swamp, there was no groundcover at all, but the river red gums were still displaying good canopy cover and were just starting to flower (Figure 7). It is possible that groundwater reserves may be supporting the trees.



*Figure 7. River red gums starting to flower at Moon Moon Swamp (left) and the river red gums surrounding Moon Moon Swamp (right). (Photo: Fiona Dyer)* 

Further west around Booligal, the Merrowie and Merrimajeel systems were not as dry as expected given the climatic conditions. Groundcover at these sites was drying off and there was evidence of recent flow in the creek systems to provide stock and domestic water supply (Figure 8).



Figure 8. Booligal National Park monitoring site showing in-channel groundcover vegetation (Photo: Fiona Dyer).

Very little groundcover was present at Lake Bullogal, The Ville and Lake Ita, with the number of species and cover similar to those observed at the commencement of monitoring in 2014. Conditions were very dry at these sites. Lake Tarwong still displayed the effects of the long period of inundation with native groundcover comprising mainly blue rods (*Stemodia florulenta*), with some spreading goodenias (*Goodenia heteromera*) observed under the river redgums (Figure 9). Almost no groundcover was present under the black box.



*Figure 9. Lake Tarwong vegetation monitoring site within the river red gum community (left) and groundcover species blue rods and spreading goodenia observed at the sites (right). (Photo: Fiona Dyer)* 

There was water in Nooran Lake, but Clear Lake and Lake Marrool were dry. Amphibious species (plants that need to be inundated for part of their life cycle) were still recorded in some of the open water sections of the wetlands, suggesting a prolonged response to the flooding of 2016-17. Field observations were that the river red gums at Nooran Lake and Lake Marrool were not looking as good (canopy cover appeared to have reduced) as in recent visits.

#### 3.3 Communication and Engagement activities

Throughout October to December, the lower Lachlan LTIM University of Canberra Team were in the field for larval fish and vegetation monitoring from Willanthery (near Hillston) to Oxley (near Hay).

The engagement highlight during this period was the larval fish monitoring demonstration and insightful discussion between LTIM researchers and NSW DPI Fisheries Engaged Angler representative, Graeme May, local Lachlan River landholder, Andre Cashmere, and several staff from Western and Central Tablelands Local Land Services (LLS) (Figure 10). Mr May has been advocating for screens on irrigation pumps to prevent larval fish entrapment while LLS is developing a pilot project with a trial site ear-marked for the Hillston area. This engagement event and the data that the LTIM Project has generated on 'larval drift hotspots' for varying species (e.g. threatened species of freshwater catfish) will inform and improve Mr May and Local Land Services efforts to demonstrate the benefits of such technology to local irrigators and recreational fishing community.



Figure 10 Engaged Angler Graeme May in foreground inspecting a larval sample with Ben Broadhurst and Casey Proctor (Central Tablelands LLS) in the background; and right is Tweet associated with event. (Photo: Mal Carnegie, Lake Cowal Foundation).

The LTIM Project continued to support the Booberoi Creek cultural–environmental flow has also continued to provide further opportunities for Ngiyaampaa Elders to reconnect with their country as they are the traditional owners of Booberoi Creek country. Several Ngiyampaa community representatives assisted Community & Engagement Theme Leader Jo Lenehan download data and change the batteries on the supplementary stream metabolism station on Booberoi Creek in early December 2018 (Figure 11). Dr Adam Kerezsy (Dr Fish Consulting) and Jo Lenehan also engaged several Booberoi Creek landholders and their family and friends ('Doone', 'Hyandra' and 'Booberoi Station') on the LTIM Project and watering events by having them assist with the fyke net directional monitoring. Dr Kerezsy commented that this form of engagement (combining data collection with landholder interaction) is simple but highly effective as it provides a visual demonstration, and opportunity for landholders to ask lots of questions about what they have observed – and put that local observational knowledge into a broader monitoring context. Photographic images captured by Mal Carnegie

from Lake Cowal Conservation Centre during these landholder engagement events and monitoring have proven invaluable for several CEWO Tweets (Figure 10 and Figure 12). Dr Fiona Dyer also promoted the LTIM Vegetation Monitoring via 5 Tweets in November 2018 (Figure 14).



Figure 11. Ngiyampaa custodians of Booberoi Creek assisting Jo Lenehan with stream metabolism station on Booberoi Creek. (Photo: Mal Carnegie, Lake Cowal Foundation).





Follow

Healthy Australian Smelt ready to spawn in Booberoi Creek, #Lachlan River, NSW. Spring flows provide food for these guys & help grow water plants which are key sites for laying eggs. Lots of little fish = food for big fish, like #MurrayCod. dpi.nsw.gov.au/\_\_data/assets/...

Figure 12. Unspecked hardyhead (image on left) was recorded for the first time in Booberoi Creek during moniroing of CEWO flow in October, and Australian smelt in roe (image on right) Tweet. (Photo: Adam Kerezsy, Dr Fish Consulting)

A small proportion of the Commonwealth Environmental Water Office (CEWO) licenced water was diverted into Lake Brewster in 2017 to support aquatic plant growth and pelican breeding. The LTIM Project took the opportunity in late October to video and drone Keith Bell from K & C Fisheries Global Pty Ltd removing tonnes of large carp from the Brewster main cell and outlet channel (Figure 13 – <u>Note</u> this is a commercial fisheries

operation and not funded by environmental water holders). There is further opportunity to develop a case study into collaborative management of carp in conjunction with environmental watering in known 'carp biomass and breeding hotspots', such as Lake Brewster and Lake Cargelligo.



Figure 13 Commercial carp removal from Lake Brewster with Keith Bell Fisheries and Feralfisherman (Photo: Mal Carnegie, Lake Cowal Foundation).



*Figure 14 Dr Fiona Dyer's LTIM Vegetation Tweets during November 2018 promoting the Lachlan LTIM Project.* 

# 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 15. 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 16. Lower Lachlan LTIM monitoring sites, hydrological zones and NSW gauging stations



Figure 17. Mid Lachlan monitoring sites 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	$\checkmark$	✓	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