



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Identifying drought refuges in the Wakool system and assessing status of fish populations and water quality before, during and after the provision of environmental, stock and domestic flows.

This document is part of a larger publication. The remaining parts and full version of the publication can be found at:

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6. APPENDICES

Appendix 1. NSW Department of water and energy and Murray-darling basin commission Media releases.



Media Release – Department of Water and Energy Murray Murrumbidgee Regional Office

Deniliquin: 20 November 2007

WATER TO FLOW INTO WAKOOL RIVER AND MERRAN CREEK

The Department of Water and Energy today announced that water would be released into the Wakool River and Merran Creek systems.

"A limited release of 8,000 megalitres will be made into the Wakool River and Merran Creek systems immediately," said the Department's Deputy Director General, Mr David Harriss.

"The purpose of this release is to provide water for essential stock and domestic purposes and to benefit the environment. It cannot be used for irrigation.

"The flows will give landholders along the Wakool River and Merran Creek systems access to fresh water for stock and domestic use for the first time in months. It will also help improve water quality, and provide water into pools that provide drought refuge for native fish and other aquatic species.

"I must stress that the amount of water available is limited and that not all creeks in these systems will receive flows.

"Initially water will be released into the Yallakool Creek from the Yallakool Escape and Yallakool Creek offtake regulator at a rate of 80 and 20 megalitres per day (ML/d) respectively. Water will also be released into the Wakool River from the Mulwala Canal at a rate of 20 ML/d, while Merran Creek will be supplied at a rate of 20 ML/d," Mr Harriss said.

"While currently only 8,000 megalitres is available for release, the NSW Government is negotiating with the Murray Darling Basin Commission to make some additional water available from environmental water accounts that will supplement the flow. "

Mr Harriss said that water availability in the Murray Valley remained very low and that the Department would continue to work with councils, industry groups and environmental groups to make the best use of available water over the coming months.

"In the continuing drought we need to balance the water needs of the community with that of the environment," Mr Harriss said.

"Our priority is to now set aside enough water for critical human needs in 2008/09."

The latest information on water availability in the Murray Valley is available in the Department's critical water planning communiqué. Go to www.naturalresources.nsw.gov.au.

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MEDIA RELEASE

Date: December, 2007

Water release aims to prevent Edward-Wakool native fish deaths

The Murray-Darling Basin Commission (MDBC) today announced it would release 6GL of environmental water to supplement a NSW Government increase in flows in the Edward-Wakool River system to save large numbers of native fish.

MDBC Chief Executive, Dr Wendy Craik AM said the water, being made available through the MDBC's Living Murray program, would combine with an increase in local water allocations for stock and domestic use announced by the NSW Government last month to create a 'win-win' situation.

The water will begin to be released gradually from Hume Reservoir over several weeks. It will water a system of creeks and aquatic habitats bounded by the Murray, Edward and Wakool rivers in a triangular area between Echuca, Deniliquin and just downriver of Swan Hill.

"This is an excellent example of local stock and domestic users and the environment both benefiting from complementary water releases," she said. "Either allocation on its own would not have been as effective.

"The NSW water alone has freshened the fish's drought refuges for the interim. But together with the Living Murray allocation vital relief will be extended into next year, greatly reducing the risk of the waterholes drying up, salinising and leaving the fish high and dry," Dr Craik said.

"We and our partner governments see the decision to supply environmental water to this area as a priority to avoid a catastrophic environmental event. MDBC studies have shown that 93 per cent of fish in the area are natives with large populations of Murray Cod, Silver Perch and other threatened and vulnerable native fish."

Dr Craik said the 6GL was part of 12.8 GL carried over from last water year for environmental use through The Living Murray. Supplying this water will not impact on assessment of water available for other users.

"The threat to fish and other aquatic animals in the area has come about because of the severe shortage of water brought about by prolonged drought conditions," Dr Craik said.

"To minimise losses and guarantee critical urban water supplies some wetlands and anabranch systems were disconnected from the Murray River earlier this year. This put enormous pressure on fish and other aquatic animals using waterholes in the area, which was lessened by the recent NSW stock and domestic water and this environmental water will provide further relief to the fish populations.

"Protecting these native fish will not only help them survive the drought, but will help promote population numbers to recover after the drought."

For media inquiries contact: Sam Leone, phone 0407 006 332

Appendix 2. Water quality recordings.

Date	Location	Temp (oC)	DO (mg/L)	EC (uS/cm)	pH	Turbidity (NTU)	Time	Notes	Officer
28/12/2007	W3	32	4.76	1010	7.1	7	1400	no flow	Vey
28/12/2007	N1	33.1	5.9	141	7.5	21	1500	fresh	Vey
28/12/2007	W2	32	3.9	170	7.2	70	1600	fresh/flow	Vey
29/12/2007	W3	31.9	4.84	1090	7.29	7	1100	red algae, no flow, pools	Vey
29/12/2007	N1	32.9	6.02	157	7.62	22	1200	fresh, low flow	Vey
29/12/2007	W2	33	3.8	163	7.1	65	1300	lower DO compared to 20/12/07 (DWE records), some flow	Vey
29/12/2007	W1	33	6.41	120	7.3	80	1400		Vey
30/12/2007	W3	32	4.7	1010	7.2	7	900		Vey
30/12/2007	W2	26.4	5.2	185	6.9	45	1000	Reports of flow u/s Norong SF	Vey
30/12/2007	W1	28	7.8	147	7.43	75	1100		Vey
31/12/2007	W5	28	6.44	780	7.17	78	1200		Vey
31/12/2007	W1	31.7	7.2	136	7.26	71	1400		Vey
31/12/2007	W2	30.2	6.72	179	7.29	55	1500		Vey
1/01/2008	W1	28.5	4.2	158	7.2	5	900	low DO<5	Vey
1/01/2008	N1	28.2	5.91	145	7.73	41	1200	Noted falling water level from 29/12/7	Vey
1/01/2008	W3	29.4	5.54	1150	7.24	21	1400	no flow	Vey
1/01/2008	W4	30.6	8.8	9500	3.35	35	1400	Fish kill, 12 dead carp. Red algae/ASS?. , more readings/inspection taken at u/s and d/s pools.	Vey
2/01/2008	W4	30.5	8.01	1370	3.34	35	900	Noted 8 dead carp, falling water level, further inspections 3km u/s and d/s. Meeting SWC re: Erigin plan	Vey
3/01/2008	W4	30.2	6.5	9010	3.31	31	800	No further fish kills, water falling, inspected pools u/s and d/s	Vey
4/01/2008	W4	30.5	6.6	9080	3.23	21	900		Vey
5/01/2008	W1	34.9	6.7	190	6.73	72	900		Vey

Date	Location	Temp (oC)	DO (mg/L)	EC (uS/cm)	pH	Turbidity (NTU)	Time	Notes	Officer
5/01/2008	W2	28.8	7.75	173	6.75	54	1000	Noted flow commenced.	Vey
5/01/2008	N1	29.7	7.89	166	7.25	80	1100		Vey
5/01/2008	W4	30.5	6.4	9110	3.41	35	1200		Vey
5/01/2008	W2	28.8	7.75	173	6.75	54	1300		Vey
5/01/2008	N1	29.7	7.89	166	7.25	80	1400		Vey
5/01/2008	W4	30.5	6.4	9110	3.41	35	1500	d/s pools OK, inspections. No flow.	Vey
5/01/2008	W6	28.5	3.8	110	6.3	61	1600	Low DO, flows from Merran had passed crossing.	Vey
5/01/2008	W7	38.1	6.86	195	8.05	35	1600	No flow.	Vey
5/01/2008	W8	32.3	8.55	177	7.92	42	1600	No flow.	Vey
6/01/2008	W6	34.6	0.71	134	6.36	55	800	Lots of organic matter, leaves, etc. Multiple readings taken, inspections u/s and d/s.	Vey
6/01/2008	W9	28	6.4	196	6.9	150	900	Merran u/s of Erigen offtake.	Vey
8/01/2007	W1	31.7	6.4	117	7.75	35	1500		Fredrickson
8/01/2007	W2	28.5	6.92	181	7.68	35	1600		Fredrickson
8/01/2007	W4	30.3	5.5	9500	3.39	17	1600		Fredrickson
8/01/2007	W6	29	1.3	130	6.13	26	1800	Black water, flow.	Fredrickson
8/01/2007	W7	29.7	2.53	193	6.25	82	1800	Black water, flow from erigin in pool.	Fredrickson
8/01/2007	W8	27.7	2.85	176	6.47	22	1800	Black water, flow from erigin in pool.	Fredrickson
9/01/2008	W2	24.1	5.39	299	6.53		800	Flowing slowly, ph and DO dropping.	Fredrickson
9/01/2008	N1	25	5.31	159	6.94		900		Fredrickson
9/01/2008	N2	23.4	8.01	900	6.67	73	1000		Fredrickson
9/01/2008	W9	26.2	6.95	15300	7.62		1100	No flow, carp.	Fredrickson
9/01/2008	W4	28.5	6.8	1240	7.01		1400	No flow.	Fredrickson
9/01/2008	W7	27.7	2.2	259	6.48		1500	E flow arrived previous 12 hours, rapid flow, pools connected, Erigen creek stopped flowing.	Fredrickson
9/01/2008	W8	28	2.42	290	6.37		1500		Fredrickson
10/01/2008	W7	25.6	2.28	241	6.54	33	800		Fredrickson

Date	Location	Temp (oC)	DO (mg/L)	EC (uS/cm)	pH	Turbidity (NTU)	Time	Notes	Officer
10/01/2008	W4	26.5	7.02	800	6.62	2	900		Fredrickson
10/01/2008	W3	26.1	6.94	1121	6.67	6	900		Fredrickson
11/01/2008	W2	27.7	4.5	265	6.78	29	800		Fredrickson
11/01/2008	W7	27.8	2.89	241	6.53	19	900	Turbid grey water.	Fredrickson
11/01/2008	W3	27.5	7.55	1280	6.7	4	1100	Smelt/hardyheads observed swimming.	Fredrickson
11/01/2008	W4	27.6	10	11800	3	45	1100	Red algae, no flow, pools.	Fredrickson
12/01/2008	W1	28		146	6.7	57	900		Vey
12/01/2008	W2	26.7		187	6.13	64	1000		Vey
12/01/2008	W10	28.3		1220	7.3	12	1200	Multiple readings taken throughout Merran Downs, obs.	Vey
12/01/2008	N4	29.3		6560	7.3	23	1500	Multiple readings taken throughout Pine Point, high EC, no flow.	Vey
13/01/2008	W7	25.5		208	7.04	15	800	No Erigin flow. High akool flow, tannin colour.	Vey
13/01/2008	W2	24.8		136	7.13	45	1000		Vey
15/0/08	W4	32.9	8.5		3.06		1830	No flow.	Fredrickson
16/01/2008	W7	25.4	4.7	143	7.21	69	830	Water level dropping, water colour black/grey.	Fredrickson
16/01/2008	W12	23.7	6.12	162	7.46	110	110	No flow, flow u/s of site.	Fredrickson
16/01/2008	W11	26.1	5.02	231	7.05	240	1130	Front of flow.	Fredrickson
17/01/2008	W2	22.7	4.14	137	7.08	123	730		Fredrickson
17/01/2008	N1	23.3	2.74	336	7.2	46	800		Fredrickson
18/01/2008	W1	23.9	6.2	800	7.26	85	900		Vey
20/01/2008	W4	22.6	6.2	13200	3.12	15	900	Heavy rain.	Vey
20/01/2008	N1	22.5	4.29	1650	6.91	120	1000	Heavy rain.	Vey
20/01/2008	W2	22.2	4.87	1220	7.16	208	1100	Heavy rain.	Vey
20/01/2008	W1	22.4	5.8	690	7.26	110	1200		Vey
22/01/2008	W1	29.3	8.57	690	7.57	94	1700	Dark brown water, no fish kill.	Weingott
22/01/2008	W13	28	6.74	12300	6.64	32	1900	Stagnant pool.	Weingott
22/01/2008	W14	27.6	7.06	8830	6.86	69	1930		Weingott

Date	Location	Temp (oC)	DO (mg/L)	EC (uS/cm)	pH	Turbidity (NTU)	Time	Notes	Officer
22/01/2008	W3	27.6	3.69	9200	6.67	36	1945		Weingott
22/01/2008	W4	27.9	5.46	739	6.75	44	2000		Weingott
22/01/2008	W2	27	7.04	105	7.41	133	2030		Weingott
23/01/2008	W7	25.8	5.91	161	7.18	79	1000	Water light brown.	Weingott
23/01/2008	W4	25.2	3.45	696	6.69	39	1100	Flow.	Weingott
23/01/2008	W3	26.1	3.7	787	6.6	26	1200	Steady flow.	Weingott
23/01/2008	N1	26.5	6.52	81	7.38	110	1330		Weingott
23/01/2008	W2	27.1	6.87	102	7.37	142	1400		Weingott
24/01/2008	W7	23.6	2.6	120	6.68	68	830		Weingott
24/01/2008	W3	25.6	2.69	740	6.65	39	930		Weingott
24/01/2008	W4	25.4	2.73	613	6.77	40	1000	Dark Grey/brown. Dead carp on bank.	Weingott
24/01/2008	N1	24.8	4.84	80	7.11	114	1130		Weingott
24/01/2008	W13	26	4.73	1170	6.66	21	1400		Weingott
24/01/2008	W1	25.6	6.08	74	7.3	84	1200		Weingott
26/01/2008	W7	27.7	6.21	160	7.37	91	800		Vey
26/01/2008	W4	27.5	2.6	470	6.8	75	900		Vey
26/01/2008	W13	29.5	3.58	782	6.83	21	1000		Vey
26/01/2008	W14	26.3	5.97	3.39	7.6	19	1200	No flow.	Vey
27/01/2008	W9	28.2	7.37	11600	8.26	56	900		Vey
27/01/2008	W15	27.9	8.6	22000	8.15	62	1100		Vey
27/01/2008	W16	28.8	6.1	18600	6.8	39	1230	Large deep refuge hole.	Vey
5/02/2008	W1	29.8	7.42	74	7.49	76	1600		Weingott
5/02/2008	N1	29.9	4.96	69	7.19	81	1700		Weingott
5/02/2008	W3	28.7	3.77	194	7.32	73	1730		Weingott
5/02/2008	W9	29.5	10.43	23000	8.86	110	1830	Flow, light brown.	Weingott
6/02/2008	W9	24.9	3.54	22900	8.52	49	830		Weingott

Date	Location	Temp (oC)	DO (mg/L)	EC (uS/cm)	pH	Turbidity (NTU)	Time	Notes	Officer
6/02/2008	N3	23.9	0.83	980	6.75	469	930	No flow. Stagnant pools, high turbidity, low DO.	Weingott
6/02/2008	W13	26	2.02	220	7	59	1030		Weingott
14/02/2008	W1	21.6	3.5	86	7.1	121	1200		Fredrickson
14/02/2008	W3	23.7	2.87	122	7.18	93	1300		Fredrickson
14/02/2008	W15	25.5	3.3	910	7.47	54	1530		Fredrickson
14/02/2008	W9	25.7	4.12	9600	8.28	56	1600	Flow has reached bridge.	Fredrickson
15/02/2008	W17	23.1	3.57	17200	8.36	34	830		Fredrickson
15/02/2008	W18	22.8	3.19	8070	7.75	62	930		Fredrickson
15/02/2008	W14	24	2.42	1500	7.31	39	1100		Fredrickson
26/02/2008	W1	22.8	3.27	730	7.9	140	1200		Vey
26/02/2008	W2	21.5	2.65	75	7.4	138	1300		Vey
26/02/2008	N1	21.9	2.34	60	7.32	108	1400		Vey
26/02/2008	W7	23.2	3.13	87	7.26	132	1500		Vey
26/02/2008	W4	24.6	3.25	110	7.3	216	1600		Vey
26/02/2008	N3	23.7	2.14	216	7.13	88	1700		Vey
26/02/2008	W9	24.2	3.4	2410	7.87	240	1800		Vey

Appendix 3. Electronic communications.**Update No. 1 (30/12/07)**

Hi All

In accordance with the surveillance monitoring afforded for the Wakool River flows, NSW DPI have commenced daily observations and water quality observations as of the 28th of December. The work is being undertaken with a view to preserving native fish populations and their refuges and all information gathered and reported is with respect to this.

On the 29/12/07 a DO (mg/l) was recorded at 3.8 mg/l, (anything <5 is of concern) at the Moulamein/Barham Road Bridge. Flow appears to have reached this site and an inspection approx 2000 metres u/s and d/s confirmed this reading within 1 mg/l to a depth of 300mm. The water is discoloured and turbid.

A further inspection was conducted today at the Moulamien/Barham road bridge site (30/12/07) and no significant observations have been made. The DO at the site was 7.8 mg/l.

The flow event appears at this stage to have reached an area in the upstream regions of the Noorong State Forest. Further inspections over the coming days will pin-point this location.

The Wakool River has been subject to some recreational activity over the weekend and a few fisherman encountered reported no evidence of poor water quality or fish kills within the area subject to the flow event.

The region is experiencing high temperatures (40°C+) today (30/12/07) and persisting through to the 2/1/07.

I am in field and will be able to provide email updates every three days, however if you do wish to contact me, please don't hesitate to call me on 0419 185 506.

Cheers
Adam

Update No. 2 (2/1/08)

Hi All

In accordance with the surveillance monitoring afforded for the Wakool River flows, NSW DPI have continued daily surveillance and water quality observations. The work is being undertaken with a view to preserving native fish populations and their refuges and all information gathered and reported is with respect to this.

In the 24 hour period commencing the 31/12/07 and 1/1/08 a fish kill event did occur in the Wakool River upstream of the Gee Gee Bridge. Previously (29/12/07) red algae had been observed in these upstream areas.

8 dead Carp were observed (Attached pic GGUS01). The extremely poor water quality of the pool (DO = 8.8mg/l, EC = 9500us/cm, pH = 3.35) (Attached pic GGUS02) was significantly different to the adjacent pools which maintained larger bodies of sound quality water (DO = 4.7mg/l, EC 1100us/cm, pH = 6.9). As per update 1, the flow has not reached this area as yet.

An aquadam will be installed on the 3/1/08 and works undertaken to facilitate flow from the Merran Creek into the Wakool system u/s of the area of the fish kill. The commencement of flow into this “middle” area of the Wakool system (to compliment the upstream discharge) will be the key focus of surveillance over the coming days.

I am in field and will be able to provide email updates every three days, however if you do wish to contact me, please don't hesitate to call me on 0419 185 506.

Update No. 3 (7/1/08)

Hi All

In accordance with the surveillance monitoring afforded for the Wakool River flows, NSW DPI have continued daily surveillance and water quality observations. The work is being undertaken with a view to preserving native fish populations and their refuges and all information gathered and reported is with respect to this.

As per previous Update 2, the aquadam was installed on the Merran Creek (see attached pic) and flow diverted into the Wakool River via a previously dry Erigin Creek channel. The commencement of flow into this “middle” area of the Wakool system (to compliment the upstream discharge) has been the key focus of surveillance since Update 2.

On Saturday the 5/1/08 the flow had made progress down Erigin Creek. Water quality in Erigin Creek was monitored and the dissolved oxygen (DO) was as low as 3 mg/l (as previously mentioned, <5 mg/l can be fatal for fish).

On Sunday the 6/1/08 the flow had continued to within 800 metres of the Wakool River confluence. Critically low DO levels, less than 1 mg/l were detected throughout the Erigin Creek flow (pH 6.36, DO 0.58 mg/l, EC 1340 us/cm, temp 34.6oC). Large amounts of debris were present (see attached pic). Water quality within the Merran upstream of the offtake to Erigin Creek is sound (pH 6.9, DO 5.7 mg/l, EC 1960 us/cm, temp 28.0°C).

As of today (8:00am), the 7/1/08 the flow had reached an area about 400 metres from the Wakool River, however the aqua dam on the Merran did fail overnight (6/1/08). It is unlikely that the flow of this poor quality water will continue into the Wakool River until the aqua dam is replaced by State Water staff this week.

The water quality of the two significant pools at the confluence of the Erigin Ck and Wakool R is sound and they are likely to hold some native fish. The dilution of the Erigin Creek flow in these pools will be monitored over the coming days and any impacts will be reported and appropriate actions (fish relocation or flow cessation) will be recommended if necessary.

Further to Update 2, there has been no further fish kills in the Gee Gee Bridge area, however the water quality of pools that are directly adjacent to each other is extremely variable.

I am taking a break from the Wakool monitoring and will be in the office from the 8th to the 10th January if you need to contact me. DPI staff will continue the daily monitoring and I will keep you all updated.

Cheers
Adam

Appendix 4. Climatic data (Temperature, rainfall) Swan Hill, 1/1/08 to 29/2/08).

Date	Day	Temps		Rain mm
		Min °C	Max °C	
1/01/2008	Tu	22.9	41.6	0
2/01/2008	We	20.7	38.9	0
3/01/2008	Th	16.1		0
4/01/2008	Fr			
5/01/2008	Sa		37.3	
6/01/2008	Su	22.7	37.4	0
7/01/2008	Mo	13	33	0
8/01/2008	Tu	14.1	34.6	0
9/01/2008	We	14.1	37.6	0
10/01/2008	Th	16.5	42	0
11/01/2008	Fr	29.2	42.1	
12/01/2008	Sa	16.8	34.2	0
13/01/2008	Su	15.2	29.1	0
14/01/2008	Mo	12.3	31.6	0
15/01/2008	Tu	12.8		0
16/01/2008	We		31.4	
17/01/2008	Th	12.2	34.2	0
18/01/2008	Fr	17.5	21.4	2.6
19/01/2008	Sa	17.3	20.2	13.2
20/01/2008	Su	17.1	24.7	6
21/01/2008	Mo	12	27.5	0.2
22/01/2008	Tu	14.6	30.7	0
23/01/2008	We	16.1	33.5	0
24/01/2008	Th	20	28.2	0
25/01/2008	Fr	15.9	33.7	1.6
26/01/2008	Sa	19.4	36.7	0.2
27/01/2008	Su	20.5	35.2	0
28/01/2008	Mo	16.1	33.3	0
29/01/2008	Tu	17	36.9	0
30/01/2008	We	19	36.4	0
31/01/2008	Th	21.1	30.2	0
1/02/2008	Fr	11.4	31.1	0
2/02/2008	Sa	14.1	34.4	0
3/02/2008	Su	16.9	34	0
4/02/2008	Mo	18.7	34.8	0
5/02/2008	Tu	19.4	34	0
6/02/2008	We	19.1	28.5	0
7/02/2008	Th	12.7	26.2	0
8/02/2008	Fr	10.7	24.6	0
9/02/2008	Sa	9.6	25.7	0
10/02/2008	Su	11.3	28.2	0
11/02/2008	Mo	14	31.7	0
12/02/2008	Tu	15.7	33.5	0

Date	Day	Temps		Rain mm
		Min °C	Max °C	
13/02/2008	We	12.2	26.8	0
14/02/2008	Th	13	29.3	0
15/02/2008	Fr	13	33.3	0
16/02/2008	Sa	15.6	35.1	0
17/02/2008	Su	17.8	33.1	0
18/02/2008	Mo	19.3	33.3	0
19/02/2008	Tu	17.1	35.5	0
20/02/2008	We	23.9	30.2	0
21/02/2008	Th	14.1	31.3	0
22/02/2008	Fr	17	27.8	0
23/02/2008	Sa	11.1	26.3	0
24/02/2008	Su	12.6	26.1	0
25/02/2008	Mo	9.6	28.2	0
26/02/2008	Tu	13.3	30	0
27/02/2008	We	12.6	27.8	0
28/02/2008	Th	11.1	24.3	0
29/02/2008	Fr	8.7	23.6	0

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