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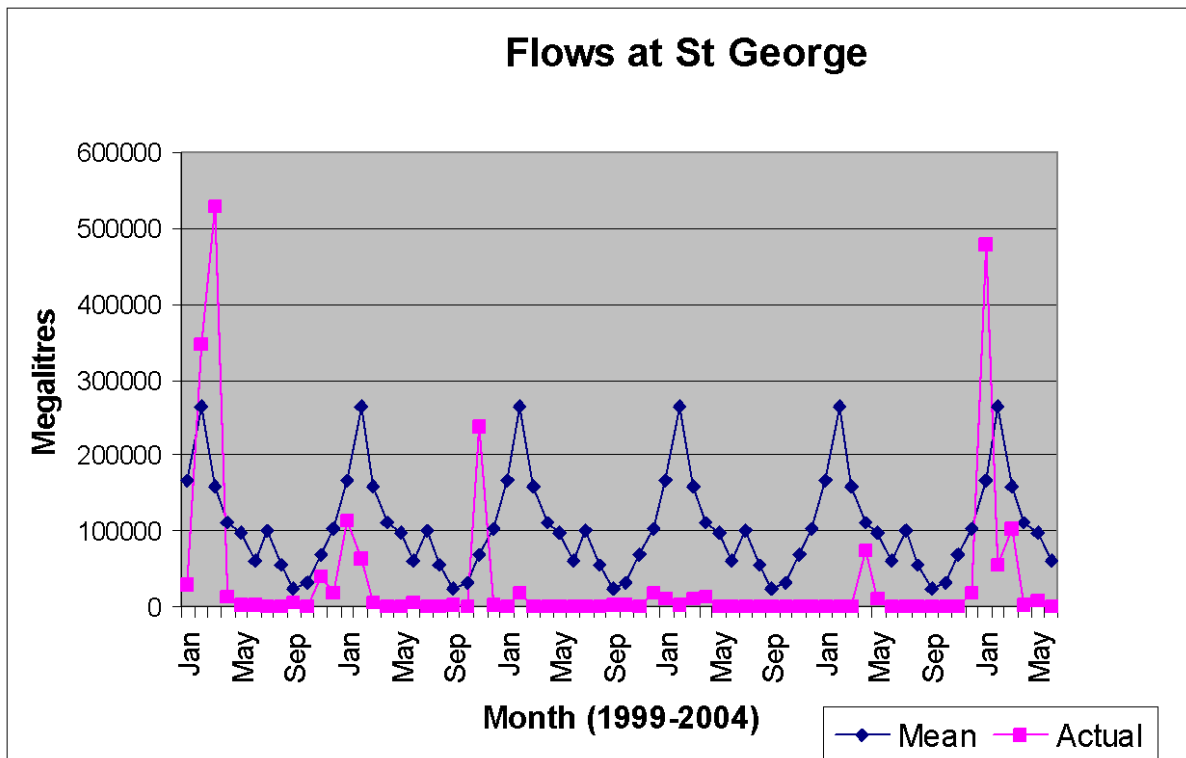
1. Introduction

This report represents the sixth in a series recording the results of monitoring events sponsored by stakeholder organizations in the Lower Balonne.

At the time of sampling in May 2004, the area was recovering from a prolonged drought which broke, to an extent, in January / February. Flows since January 1999 are shown below (**Figure 1.1**). The previous sampling event in November 2003 was undertaken at what turned out to be the height of the drought.

The peak flow in January of 65,607ML/d was the first since November 2000 to initiate floodplain flow or significant flow in any major flood runners, such as Chinaman Ck. Peak flows were short lived, with flows over 60,000ML/d lasting just 2 days while these flows average nearly 5 days per year. Flows well below average have occurred in each month since January. The flood would be classified as at the very lower end of the *moderate* flood range. The Culgoa River flowed for 180 days from mid-December; the Narran for 107 days; the Balandool for 99 and Briarie Ck for 44. These flow figures are not yet confirmed.

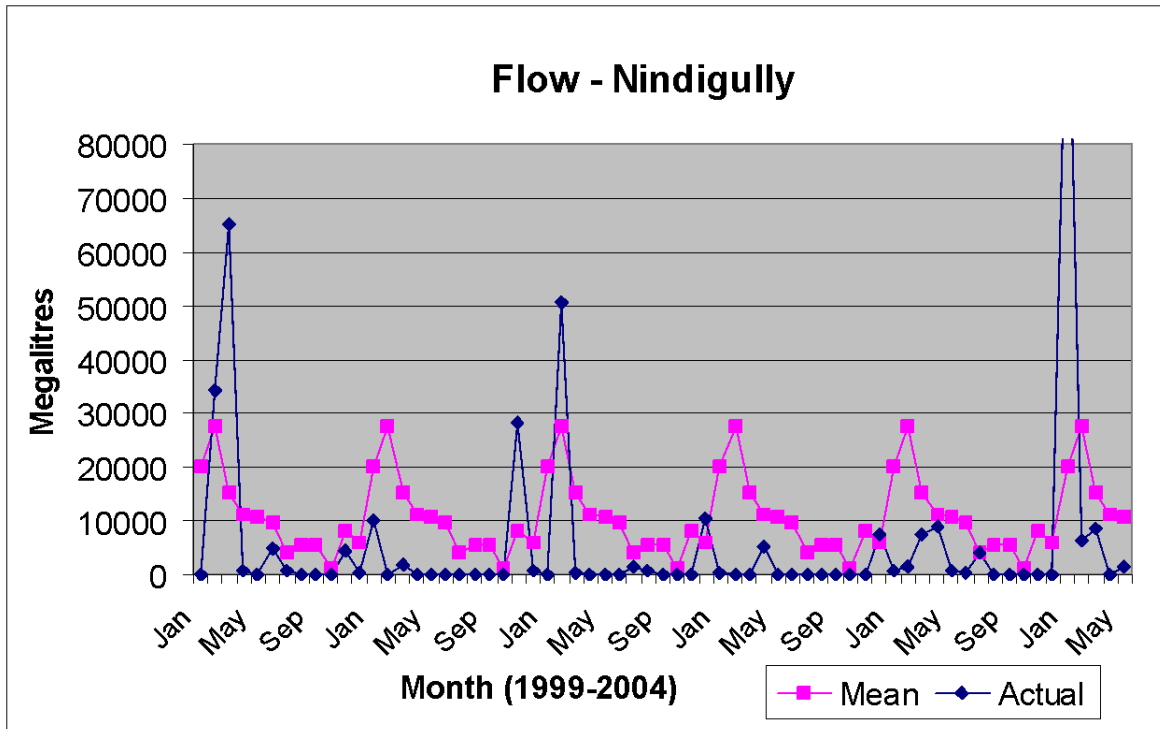
■ **Figure 1.1 Balonne River – monthly flow at St George since January 1999.**



Note: Data sourced from DNRM

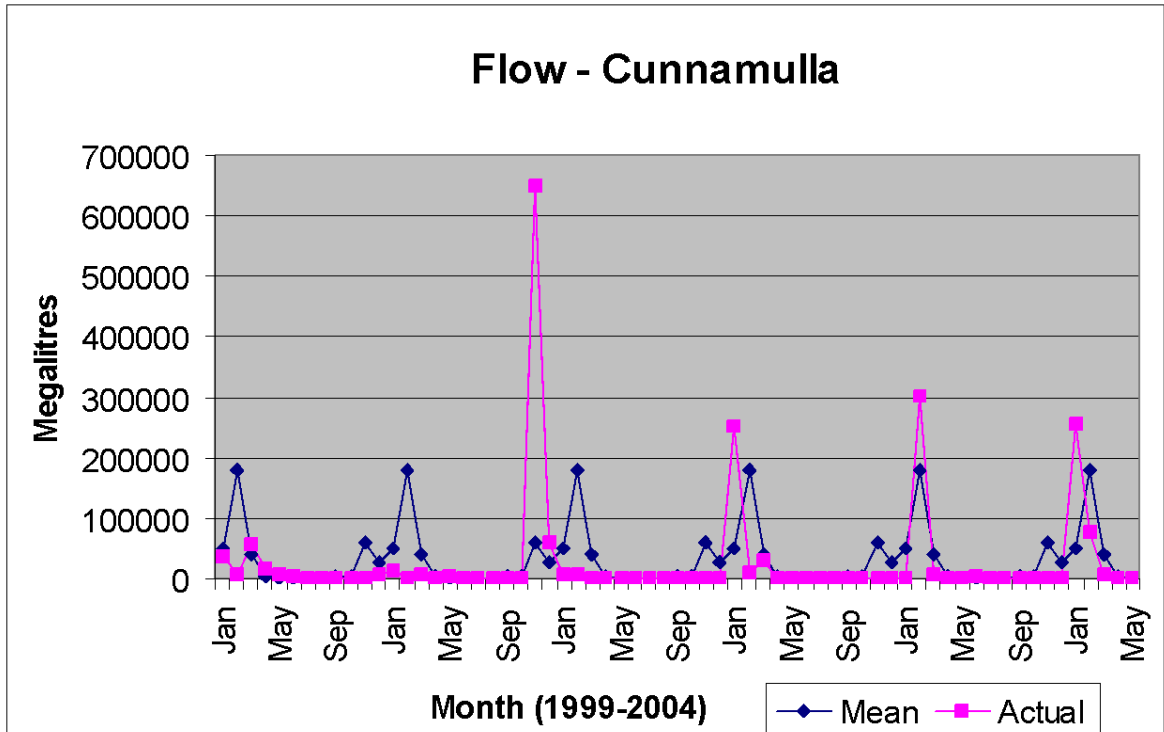
Flows in the Moonie River and Warrego River are shown in Figures 1.2. and 1.3 respectively. The drought affected these rivers differently and the Balonne was undoubtedly worst affected. The Warrego at Cunnamulla again received good summer flows in 2003/4 while the Moonie at Nindigully In January received nearly twice the flow it had in any month since sampling commenced.

■ Figure 1.2 Monthly flow in the Moonie River at Nindigully since January 1999



Note: Data sourced from DNRM. Flow in January 2004 was 120,134ML.

■ Figure 1.3 Monthly flow in the Warrego River at Cunnamulla since January 1999



A small inflow to Beardmore Dam occurred during May. While the dam harvested some of this flow, some was released at compensation flow levels in natural sequence. This flow raised water levels by between 10cm and 30cm at most river sites, meaning the macroinvertebrate surber edge samples were usually collected from very recently inundated substrate. As sampling took place over a month long period, the effect of the flow varied from site to site. Some sites were not affected.

2. Methods

Nineteen riverine and eleven floodplain sites were sampled between 4 May and 29 May 2004. Sampling methods mirrored earlier events (Benson and Paton 2002) with respect to:

- Fish sampled by multiple gill and fyke nets, bait traps, seine and dip nets.
- Water quality sampled by a multi-parameter data logging water quality meter (a Yeokal 610). This was set within 25cm of the surface for overnight recording.
- Macroinvertebrates sampled by replicated surbers in the edge habitat.
- Specialised habitats sampled for macroinvertebrates by qualitative dip netting.

No investigation of riparian zones was undertaken as these have been described previously for most sites. For sites added since June 2000, riparian zones and stream physical habitat will need to be described according to State of the Rivers protocols in the near future. No analytical chemistry was undertaken as this data is only collected occasionally, the most recent occasion being November 2001.

Macroinvertebrates were identified and counted by Ecowise Pty Ltd. Staff overseeing the work included Dr Garry Bennison and Mr Bernie Cockayne, the latter formerly of DNRM and a person with significant experience of the local fauna. Ecowise used a Marchant box subsampling technique and for samples with high numbers of micro-crustacea, a Sedgwick rafter sorting tray was employed.

3. Results

Results are initially presented by site. A regional appraisal is presented in the Discussion.

3.1 *Balonne River at St George*

This site is adjacent the gauging station below Jack Taylor weir. The banks have a fairly gradual slope and a good cover of grass and trees. The substrate is mainly deep silt with large outcroppings of conglomerate rock. The river is approximately 60m wide and contained a significant number of large snags, particularly near the gauge. Water level was similar to previous sampling events and about 30cm below the grass line. Flow increased and the water level rose late in the afternoon of sampling as the dam release commenced.

3.1.1 Water quality

Overnight logging of water quality parameters commenced basically as the dam release came through. Little variation was evident. The recorded ranges for each parameter were:

Temperature: 18.2 – 19.9°C
 Dissolved oxygen: 78 – 86 % sat; 7.3 – 7.8mg/l
 pH: 7.7 – 7.8
 Conductivity: 126 – 130 µS/cm
 Turbidity: 219 – 222 NTU.

3.1.2 Macrophytes

Ludwigia peploides and green *Azolla* were noted in a small area near the rocks.

3.1.3 Fish

All nets were set and used at this site. **Table 3-1.1** shows the catch by netting technique. The result of six native species and two introduced for a total catch of 283 individuals is comparable to the previous sampling event. The seine net had only previously been used once at this site but even if we disregard the catch from that net, the site total in comparison with previous events is five native species and two introduced in a total catch of 45 individuals. Hyrtl's tandan, Rainbowfish and Goldfish were captured in November 2003 but Spangled Perch, *Tandanus* and *Gambusia* were not. *Tandanus* is a new record for this site. The majority of the Bony bream captured were small, in the 20-50mm range.

■ **Table 3-1.1 Results of fishing at St George in May 2004, by fishing method**

Species	Common name	Gill nets	Seine nets	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly			2	2		4
<i>Nematolosa erebi</i>	Bony Bream	1	195	36			232
<i>Leioptherapon unicolor</i>	Spangled Perch			1			1
<i>Retropinna semoni</i>	Smelt		13				13
<i>Tandanus tandanus</i>	Eel-tailed catfish	1					1
<i>Hypseleotris klunzineri</i>	Western carp gudgeon		25	1			26
<i>Cyprinus carpio</i>	Carp	1					1
<i>Gambusia holbrooki</i>	Mosquitofish		5				5
Total Numbers		3	238	40	2		283

3.1.4 Macroinvertebrates

Two habitats were sampled at St George. Surber samples were collected from rock (1) and mud/silt substrates. A dip net sample was collected from *Ludwigia*. A total of 19 discrete (non-overlapping) taxa were identified, 12 from the surbers and 17 from the dip net (**Table 3-1.2**). Bait traps also collected 40 *Macrobrachium* and two *Cherax*. The edge fauna was dominated by ceratopogonids and chironomids while copepods dominated the dip net. Taxa captured by the dip net but not in surbers included Atyidae, Baetidae, Zygoptera and Trichoptera.

■ Table 3-1.2 Numbers of aquatic macroinvertebrates recorded from St George

	Edge surber		Macrophyte dip
	Mean	Stddev	
Acarina			5
Copepoda	2.8	3.6	940
Cladocera	1.0	0.7	45
Atyidae			50
Palaemonidae	0.8	0.8	10
s-f Chironominae	17.6	3.8	165
s-f Tanypodinae	3.4	1.9	25
s-f Orthoclaadiinae			20
Ceratopogonidae	29.2	23.4	20
Baetidae			50
Caenidae	1.8	2.0	5
Corixidae	0.2	0.4	
Gerridae			10
Mesoveliidae	0.2	0.4	
Cirolanidae	0.2	0.4	
Zygoptera			25
Oligochaeta	1.0	1.2	5
Ecnomidae			5
Leptoceridae	0.2	0.4	15
Trichoptera			5
Taxa	7.2	0.4	17
Abundance	58.4	28.7	1400
Total taxa			19

3.2 Balonne River at Mooramanna

This site was on a straight stretch of river just upstream from the Brookdale pump station. The channel was approximately 50m wide and of trapezoidal shape with parallel benches. Site structure and water depth was almost identical to November 2003. *Juncus* sp was present in low density near the low water line but there were no macrophytes. Tufts of filamentous green alga were common, particularly on sticks in shallow water. The area was obviously frequented by recreational fishers and campers.

The site was generally very shallow, though small areas reached about 2m. There was no flow at the time of sampling.

3.2.1 Water quality

Results from spot water quality profiling are shown in Table 3.2.1. Slight stratification was evident in the upper water column.

■ Table 32.1 Water quality depth profiling at Mooramanna in May 2004.

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
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1315	Surface	20.5	101	146	160	8.2
	1.0	16.6	77	146	166	7.7
	2.0	16.5	68	146	270	7.7

3.2.2 Macrophytes

Juncus sp. was present on the edge and green alga was common.

3.2.3 Fish

Table 3-2.2 shows the fish catch by netting technique.

■ Table 32.2 Fish catch by fishing technique at Mooramanna in May 2004.

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Maccullochella peelii</i>	Murray Cod	1					1
<i>Macquaria ambigua</i>	Yellowbelly	1	3				4
<i>Nematolosa erebi</i>	Bony Bream		34	26			60
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		11				11
<i>Hypseleotris</i> sp IV	Sp 4		1				1
<i>Retropinna semoni</i>	Smelt		5				5
<i>Gambusia holbrooki</i>	Mosquitofish		132				132
Total Numbers		2	186	26	0		214

Six native fish species (five if *Hypseleotris* is pooled) and one introduced were captured, predominantly in the seine net. The number of fish captured on this occasion is similar to previous catches. The Murray Cod (fork length 552mm) was captured in 5" mesh near shore and a large snag. The Bony bream were generally between 50 and 85mm length. One long neck turtle was captured in a fyke net.

3.2.4 Macroinvertebrates

Surber samples were collected from sand/gravel and silt substrates on different sides of the river. One dip net was collected from amongst the fibrous roots of *Melaleucas*. The samples were collected prior to the rise in water levels. Twenty-four discrete taxa were recorded at the site with chironomids, micro-crustaceans, ceratopogonids and caenids the most common (Table 3-2.3). Bait traps collected 101 *Macrobrachium* and three *Cherax*. The seine haul captured numerous *Macrobrachium*.

■ Table 32.3 Numbers of aquatic macroinvertebrates recorded from Mooramanna

	Edge surber		Tree root dip
	Mean	Stddev	
Acarina			10
Corbiculidae	0.8	1.8	
Bivalvia	2.8	3.3	
Hydrophilidae	1.0	1.2	
Ostracoda	5.6	6.7	60
Copepoda	96.8	63.2	940
Cladocera	8.0	13.6	420
Atyidae			20
Palaemonidae	1.0	1.7	10
s-f Chironominae	119.2	76.5	235
s-f Tanypodinae	43.6	33.0	30
s-f Orthocladiinae	4.4	3.6	15
Ceratopogonidae	118.4	102.4	270
Baetidae	1.2	1.6	30
Caenidae	83.2	56.4	420
Planorbidae			5
Corixidae	8.2	4.9	
Gerridae			50
Notonectidae	0.2	0.4	5
Nematoda	1.8	2.0	5
Zygoptera			5
Oligochaeta	15.2	16.9	20
Ecnomidae	0.4	0.5	5
Hydroptilidae	0.4	0.9	
Leptoceridae	1.8	1.8	170
Trichoptera			20
Taxa	13.2	1.1	21
Abundance	514.0	219.5	2745
Total taxa			24

3.3 Balonne River at Whyenbah

This site is within the pool formed by the bifurcation weirs and is just upstream of the bridge, within a popular camping and fishing area. The right bank has a relatively gentle slope while the left is very steep for about 4 metres above the water line. The substrate is black soil or fine sand. The flat camping area is reasonably cleared with only a thin line of young melaleuca at the water's edge. The left bank is better treed. No Melaleuca roots trailed in the water but vegetation overhang was significant on the left bank. Recent germination of native riparian trees was evident.

The pool was approximately 60m across and the sampling gear was spaced over about 150m. The water level was similar to November 2003 but rose slightly in the afternoon and had fallen again by next morning. No algal scum was present on the first day but fully covered the pool on the second.

3.3.1 Water quality

Both overnight logging and depth stratified sampling of water quality parameters was undertaken at this site. Little variation was evident in the logged data. The recorded ranges for each parameter were:

Temperature: 16.4 – 19.6°C

Dissolved oxygen: 64 – 74 % sat; 6.1 – 6.8mg/l

pH: 7.7

Conductivity: 148 – 153 µS/cm

Turbidity: 150 – 155 NTU.

Results from spot water quality profiling at 0900hrs are shown in Table 3-3.1. A slight thermocline was evident in surface waters.

■ **Table 33.1 Water quality depth profiling at Whyenbah in May 2004.**

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
0900	Surface	20.4	74	156	156	7.7
	1.0	17.4	68	154	155	7.6
	1.5	17.4	67	155	194	7.6

3.3.2 Macrophytes

Juncus occurred above the water line in patches. Small tufts of submerged alga were noted in shallow water.

3.3.3 Fish

All fishing nets were deployed at this site and the results are presented in **Table 3-3.2**.

■ **Table 33.2 Results of fishing the Balonne River at Whyenbah in May 2004, by fishing method**

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net (0)	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	2		1			3
<i>Nematolosa erebi</i>	Bony Bream	2	4	3			9
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		8	1	1		10
<i>Hypseleotris sp.4</i>	Carp gudgeon				1		1
<i>Melanotaenia fluviatilis</i>	Rainbowfish		3				3
<i>Retropinna semoni</i>	Smelt		1				1
<i>Gambusia holbrooki</i>	Mosquitofish		11	1	1		13
<i>Cyprinus Carpio</i>	Carp	1					1
Total Numbers		5	27	6	3		41

The catch of 6 native species and two introduced is in line with previous catches and the species complement is the same as found in November 2003. Many more Smelt, Mosquitofish and Carp Gudgeon were captured in November.

3.3.4 Macroinvertebrates

Surber samples were collected from a fine sandy/silt substrate and some samples included leaf litter. A dip net sample was collected from tree roots. Twenty-six discrete taxa were identified with micro-crustacea, chironomids and ceratopogonids being most common (**Table 3-3.3**). Odonates, ephemeropterans and trichopterans were well represented in the dip net sample. Eighty-eight prawns and one yabby were captured in bait traps and prawns were common in the seine haul.

■ **Table 33.3 Numbers of aquatic macroinvertebrates recorded from the Balonne River at Whyenbah**

	Edge surber		Tree root dip
	Mean	Stddev	
Corbiculidae	2.4	3.3	
Dytiscidae	0.2	0.4	4
Elmidae			4
Hydraenidae			8
Ostracoda	0.4	0.9	4
Copepoda	80.4	36.6	480
Cladocera	34.0	43.5	5184
Atyidae	1.2	1.8	
Palaemonidae	0.6	0.9	20
s-f Chironominae	119.4	115.7	116
s-f Tanypodinae	21.4	15.0	124
s-f Orthocladiinae	2.4	4.3	4
Ceratopogonidae	72.8	47.9	32
Tipulidae	0.4	0.9	
Baetidae	3.8	2.3	108
Caenidae	7.6	9.0	24
Corixidae	12.0	11.3	4
Gerridae	0.6	1.3	
Mesoveliidae	0.4	0.9	
Cirolanidae	0.2	0.4	
Nematoda	3.4	7.1	
Protoneuridae			4
Zygoptera			8
Oligochaeta	7.4	9.9	12
Ecnomidae			8
Hydroptilidae			4
Leptoceridae	4.0	4.7	108
Taxa	11.6	2.1	20
Abundance	375.0	144.2	6260
Total taxa			26

3.4 Culgoa River at Whyenbah

This site is about 1.5 km downstream from the gauging station and weir and just upstream of an old bridge. The bridge suffered wash-out of footings in the January flood and significant debris built up against the stanchions. The dam release flow was

occurring when sampled and appeared to have raised the water level by about 20cm though it had receded back to the original level. A green algal fringe was very evident. A number of sand bars existed within the channel and tree roots (red gum) were common. Depth reached 2m in places. There was no evidence of grazing or feral animals. Grass cover on the banks was good except in very steep areas. There was no *Azolla* on the upstream pool as there had been in November.

3.4.1 Water quality

Spot water quality readings were collected from near a large tree at the entrance point to the site. The water was well mixed and oxygenated.

■ **Table 34.1 Water quality depth profiling; Culgoa River at Whyenbah in May 2004.**

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
0900	Surface	16	97	129	228	7.8
	1.0	16	96	129	292	7.8

3.4.2 Macrophytes

No macrophytes were present.

3.4.3 Fish

All nets were set at this site, unlike the November 2003 event when the water was too shallow. Five native fish and one introduced were recorded, the same result as in November and the complement only varied in that Smelt was not captured and Spangled Perch was. The number of Smelt captured in November was 1408. Bony bream numbered 280 in November (**Table 3-4.2**).

■ **Table 34.2 Results of fishing the Culgoa River at Whyenbah in May 2004, by fishing method**

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly			7			7
<i>Nematolosa erebi</i>	Bony Bream		4	61			65
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		8				8
<i>Leiopotherapon unicolor</i>	Spangled Perch			1			1
<i>Melanotaenia fluviatilis</i>	Rainbowfish		1				1
<i>Gambusia holbrooki</i>	Mosquitofish		71				71
Total Numbers		0	84	69	0		153

3.4.4 Macroinvertebrates

Surber samples were collected from fine compact silt within the algal fringe. Twenty-one discrete taxa were recorded at the site with micro-crustacea, chironomids and ceratopogonids being most common (**Table 3-4.3**). Odonates, ephemeropterans, trichopterans and beetles were well represented in the dip net sample. Bait traps captured 81 prawns and three yabbies.

■ **Table 34.3 Numbers of aquatic macroinvertebrates recorded from Culgoa River at Whyenbah**

	Edge surber	
	Mean	Stddev
Dytiscidae	0.2	0.4
Elmidae		
Hydraenidae		
Ostracoda		
Copepoda	26.6	11.6
Cladocera		
Palaemonidae	0.6	0.9
s-f Chironominae	20.4	12.9
s-f Tanypodinae	13.0	6.8
s-f Orthocladiinae		
Ceratopogonidae	28.2	13.5
Tipulidae	1.0	1.7
Baetidae	0.6	0.9
Caenidae	3.2	2.9
Corixidae	1.4	2.2
Mesoveliidae	0.4	0.9
Protoneuridae		
Zygoptera		
Oligochaeta	0.2	0.4
Ecnomidae		
Hydroptilidae		
Leptoceridae	0.2	0.4
Taxa	7.4	1.9
Abundance	96.0	40.2
Total taxa		21

3.5 Culgoa River at Cubbie

This site has been regularly sampled by either SKM or NRM since June 2000. It is described in earlier reports. The western bank has only a very thin riparian zone and the outer side of the meander is eroding. The banks are steep with little or no vegetation. The inner side of the meander has a much better riparian zone but little or no understorey because of accumulated leaf, bark and branch litter. Snags are plentiful in the water but little other specialised habitats exist. The debris dam at the main bend in the site had been washed away. The substrate tends to be very compact clay. The river varied between 5 and 15 metres across and up to 1.5m deep. The site had been heavily fished since the flood, with 3 cod traps evident, numerous line holding sticks and abundant footprints.

3.5.1 Water quality

Overnight logging of water quality parameters was undertaken and little variation was evident. The recorded ranges for each parameter were:

Temperature: 15.5 - 19.3°C

Dissolved oxygen: 61 – 96 % sat; 6.1 – 8.9mg/l

pH: 7.6 – 7.9

Conductivity: 139 – 145 μ S/cm

Turbidity: 200 – 209 NTU.

3.5.2 Macrophytes

No macrophytes or fringing aquatic plants were observed.

3.5.3 Fish

Seven native species and Carp were caught at the site in a catch of 48 individuals. Previous sampling at this site has resulted in (native sp / total catch): June 2000 (6/49), April 2001 (4/67), November 2001 (2/58), May 2002 (4/20) and November 2003 (3/165), the latter dominated by Smelt. Gill nets captured nothing in November and only two individuals in May 2002 so the capture of 17 good-sized Yellowbelly is encouraging, as is the capture of Silver perch. Given that recreational anglers were heavily fishing the site at the time, this is a good result. It is possible that the Yellowbelly were accumulating here because they could not migrate upstream past the weir, which is about 1km upstream, though there were similar numbers much further downstream at Woolerbilla and very few large Yellowbelly at any location upstream as far as St George or immediately downstream of the Whyenbah weirs. A long-neck turtle was also captured in a fyke net.

■ **Table 35.1 Results of fishing the Culgoa River at Cubbie in May 2004, by fishing method**

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	17		1			18
<i>Bidyanus bidyanus</i>	Silver perch	1					1
<i>Nematolosa erebi</i>	Bony bream	3	1	14			18
<i>Retropinna semoni</i>	Smelt		4				4
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		2				2
<i>Melanotaenia fluviatilis</i>	Rainbowfish		3				3
<i>Neosilurus hyrtlii</i>	Hyrtl's tandan			1			1
<i>Cyprinus carpio</i>	Carp	1					1
Total Numbers		22	10	16	0	0	48

3.5.4 Macroinvertebrates

Surber samples were collected from compact silt on the edge and included bath-tub ring when present. No dip net samples were collected. Twenty-two discrete taxa were identified from the edge habitat. The most common elements were micro-crustacea, chironomids, ceratoponids and caenids. Bait traps collected 67 *Macrobrachium*.

■ **Table 35.2. Numbers of aquatic macroinvertebrates recorded from Culgoa River at Cubbie**

	Edge surber		Tree root
	Mean	Stdev	dip
Corbiculidae	0.8	1.8	

Ostracoda	0.8	1.8	
Copepoda	58.2	38.5	1780
Cladocera	147.8	180.2	1460
Palaemonidae	3.2	2.6	25
s-f Chironominae	114.8	105.1	595
s-f Tanypodinae	6.2	6.8	235
s-f Orthoclaadiinae			65
Ceratopogonidae	85.0	131.6	40
Culicidae	0.4	0.5	
Tabanidae	0.6	0.5	
Baetidae			160
Caenidae	12.8	18.2	1735
Corixidae	0.2	0.4	
Gerridae	1.0	1.7	
Hydridae			10
Cirolanidae			5
Nematoda	7.2	10.4	
Oligochaeta	7.8	7.7	15
Ecnomidae			60
Leptoceridae			10
Trichoptera			80
Temnocephalidae	0.8	1.8	
Taxa	10.0	2.2	15
Abundance	446.8	208.3	6275
Total taxa			22

3.6 Culgoa River at Woolerbilla

This site is on a straight stretch of river and has a uniform trapezoidal bed and banks. Little vegetation exists on the sloping banks though the occasional tea tree or coolibah sits adjacent the water. On the eastern side, the riparian zone on the top levee is relatively thick and includes red gum, coolibah, cooba, and some Belah. A fence runs about 12m from the top levee and separates grazed country which has been partly cleared and contains significant roly-poly. The riparian zone on the western side is not as thick or diverse. The river was between 15 and 20m wide and sometimes to greater than 1.5m depth when sampled. Flow was very minor, the edge was recently inundated and the water level was receding. Some snags and roots were in the water but there were no macrophytes or algae.

3.6.1 Water quality

Overnight logging of water quality parameters was undertaken between 8pm and 1130am, therefore missing the heat of the day. Little variation was evident. The recorded ranges for each parameter were:

Temperature: 13.6 – 16.5°C

Dissolved oxygen: 84 – 104 % sat; 8.3 – 10.3mg/l

pH: 7.9 – 8.0

Conductivity: 148 – 154 µS/cm

Turbidity: 181 – 187 NTU.

3.6.2 Macrophytes

No macrophytes or fringing aquatic plants were noted.

3.6.3 Fish

All gill nets were set despite the generally shallow water and the inability to get a boat into the site. Two species of native fish plus one introduced were captured. A low species count is characteristic of Woolerbilla but on the positive side, the proportion of the catch represented by introduced species, usually dominated by Carp and Goldfish, has traditionally been high but on this occasion only two Mosquitofish were captured (**Table 3-6.1**). The Yellowbelly tended to be good-sized healthy fish.

■ **Table 36.1 Results of fishing the Culgoa River at Woolerbilla in May 2004, by fishing method**

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	19		2			21
<i>Nematolosa erebi</i>	Bony Bream	2	1	4			7
<i>Gambusia holbrooki</i>	Mosquitofish		2				2
Total Numbers		21	3	6	0		30

One long-neck turtle was captured in a fyke net.

3.6.4 Macroinvertebrates

No specialised habitats were available for sampling but an increase in water depth would inundate several areas of fibrous tree roots. No ring of filamentous green algae was present so surber samples were collected only from recently inundated compact clay/silt. The recent inundation was particularly obvious here because significant cracks were still evident in the edge clay, despite it being under water. Eleven discrete taxa were identified with micro-crustacea, corixids and chironomids most common (**Table 3-6.2**). Nineteen prawns and two yabbies were captured in bait traps and prawns were abundant in fyke and seine nets.

■ **Table 36.2 Numbers of aquatic macroinvertebrates recorded from the Culgoa River at Woolerbilla**

	Edge surber	
	Mean	Stddev
Ostracoda	0.6	0.9
Copepoda	85.2	14.9
Cladocera	0.2	0.4
s-f Chironominae	6.6	4.0
s-f Tanypodinae	7.4	4.1
Ceratopogonidae	5.2	2.7
Simuliidae	0.6	1.3
Baetidae	0.4	0.5
Caenidae	6.2	1.6
Corixidae	11.6	11.7
Oligochaeta	1.8	1.3
Taxa	8.2	1.3
Abundance	125.8	17.5
Total taxa		11

3.7 Culgoa River at Balandool

Recent flows had inundated the main bench at this site and remnant water remained in one pool on the bench. Inundation of the main channel was continuous and flow was significant. Width of the flowing channel was between 20 and 30m and depth was up to about 1.5m in the sample area but deeper in the pool downstream. Red gum and tea tree dominated in the bed while coolibah and wattle were more common on top of the levee. A reasonable cover of grass was evident on all but the steepest banks. The dam release flow had recently inundated a range of habitats including tree roots, snags and low branches. Small islands had significant growth of sedges. Herbs and hard cracked clay were inundated to depths of about 10cm.

3.7.1 Water quality

Spot water quality readings were collected from the centre of the main channel. Dissolved oxygen readings were dubious so are not shown. The water column was well mixed other than for a thin layer of very turbid water near the bottom.

■ **Table 37.1 Water quality depth profiling at Balandool in May 2004.**

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
1530	Surface	15.6		149	186	7.7
	1.0	15.6		149	468	7.8

3.7.2 Macrophytes

No macrophytes or algal fringe were visible.

3.7.3 Fish

Two gill nets were not set at this site because a boat cannot be used here and much of the channel was too deep for wading. Three native species and two introduced were recorded, none from gill nets. The large Yellowbelly recorded from upstream sites were not seen here though the property managers noted some had been caught in April. Previous samples had captured four, six and three native species respectively. The taxa recorded previously and missing on this occasion were Rainbowfish, Smelt and Gudgeons.

■ **Table 37.2 Results of fishing the Culgoa River at Balandool in May 2004, by fishing method**

Species	Common name	Gill nets (2)	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly			11			11
<i>Nematolosa erebi</i>	Bony Bream		11	1			12
<i>Leioptherapon unicolor</i>	Spangled Perch		1	1			2
<i>Cyprinus carpio</i>	Carp			2			2
<i>Gambusia holbrooki</i>	Mosquitofish		34				34
Total Numbers		0	46	15	0		61

3.7.4 Macroinvertebrates

Surber samples were collected from compact mud substrate which had been recently inundated. One sample was collected from the pool on the bench. A dip net sample was collected from tea tree root but it may have been recently inundated. Sixteen discrete taxa were recorded with taxonomic density and overall abundance relatively low. The fauna was dominated by micro-crustacea, chironomids, corixids and ceratopogonids. Six prawns and 13 yabbies were captured in bait traps.

■ **Table 37.3 Numbers of aquatic macroinvertebrates recorded from the Culgoa River at Balandool.**

	Edge surber		Tree
	Mean	Stddev	root dip
Dytiscidae	0.4	0.5	2
Hydrophilidae	0.4	0.5	
Ostracoda	1.6	2.1	
Copepoda	6.6	5.7	138
Cladocera	1.2	1.3	
s-f Chironominae	3.4	3.9	22
s-f Tanypodinae	0.4	0.5	10
Ceratopogonidae	8.4	5.4	4
Tipulidae	0.6	1.3	
Baetidae	0.2	0.4	18
Caenidae	0.4	0.5	8
Physidae			2
Corixidae	4.0	5.6	2
Mesoveliidae			6

Libellulidae	0.4	0.9	
Oligochaeta	0.6	0.9	2
Taxa	7.2	1.9	11
Abundance	28.6	15.9	214
Total taxa			16

3.8 Balonne Minor River at Meigunyah

The mouth of Middle Creek marks the downstream end of a significant pool. At this point the Balonne Minor constricts and flows through a well-treed section with more sand and gravel than the pool upstream. The constricted section was a shallow riffle/glide when sampled in May 2002 but was dry in November 2003. In May 2004 the riffle was flowing strongly as a result of the dam release flow. It was generally about 20cm deep but against the trees it reached 1.5m. The flow had raised the water level in the pool by about 1m and it receded about 20cm overnight. Overnight wind added significant terrestrial debris to the pool surface. The pool includes plenty of snags but trailing roots are restricted to the riffle. No algal fringe was present but a light surface scum was evident in the upstream end.

3.8.1 Water quality

Spot water quality readings were taken near the tarzan swing. **Table 3-8.1** shows the spot readings. Maximum depth at this location was 1.6m.

■ **Table 3-8.1 Spot water quality readings – Balonne Minor at Meigunyah**

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
0900	Surface					
	1.0	16.4	90	128	229	7.7
	1.5	16.4	91	128	450	7.8

3.8.2 Macrophytes

No macrophytes or algae were present.

3.8.3 Fish

All nets were used at this site but one fyke net set at the head of the riffle collapsed overnight in the current. It did record a reasonable catch so may not have been significantly affected. Six native species and two introduced were identified from a total of 56 fish. Historical sampling at the site shows (native sp / total catch): June 2000 (5/333, including 114 *Gambusia*), April 2001 (3/133 - NRM), May 2002 (5/256, including 228 Western Carp Gudgeon) and November 2003 (5/62). One large river turtle was captured in a fyke net.

■ **Table 38.2 Results of fishing the Balonne Minor River at Meigunyah in May 2004, by fishing method**

Species	Common name	Gill nets	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	4		1			5
<i>Nematolosa erebi</i>	Bony Bream			24			24
<i>Leioptherapon unicolor</i>	Spangled Perch		4	2			6
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		4				4
<i>Tandanus tandanus</i>	Eel-tailed catfish			1			1
<i>Melanotaenia fluviatilis</i>	Rainbowfish			1			1
<i>Cyprinus carpio</i>	Carp		4	6			10
<i>Gambusia holbrooki</i>	Mosquitofish		5				5
Total Numbers		4	17	35	0		56

3.8.4 Macroinvertebrates

Surber samples were collected from compact silt (4) at the downstream end of the pool and from gravel (1) in the riffle. A dip net sample was collected from tea tree root mat (uncovered subterranean roots rather than aerial trailing) in the riffle. Recent changes in water level meant that samples were collected from very recently inundated substrate. Sixteen discrete taxa were recorded (**Table 3-8.3**). The most common elements were micro-crustacea, caenids and ceratopogonids. Bait traps collected 67 prawns and 3 yabbies. Prawns were highly abundant in the seine and fyke nets.

■ **Table 38.3 Numbers of aquatic macroinvertebrates recorded from the Balonne Minor at Meigunyah**

	Edge surber		Tree root dip
	Mean	Stddev	
Hydraenidae	0.2	0.4	
Ostracoda	0.4	0.5	
Copepoda	20.2	5.9	186
Palaemonidae	0.8	1.1	42
s-f Chironominae	6.6	5.8	6
s-f Tanypodinae	3.8	6.8	4
Ceratopogonidae	10.6	5.7	
Tipulidae	1.6	2.1	
Baetidae	5.0	8.5	2
Caenidae	18.6	36.8	6
Corixidae	0.8	0.8	
Mesoveliidae			4
Cirolanidae			2
Epiproctophora			2
Oligochaeta	0.4	0.5	
Leptoceridae	5.6	10.3	18
Taxa	8.2	2.7	10

Abundance	74.6	67.1	272
Total taxa			16

3.9 Balonne Minor at Trafalgar

This site is at the upper end of the weir pool. The site contains a good number of snags and partly submerged red gums and melaleucas but no macrophytes were observed and the extent of fibrous roots within the water is very limited. The substrate is black clay. The water was deeper than previous, reaching 3m. Significant areas of lignum, particularly at the upstream end where the river splits, were partly submerged. Filamentous green alga was common on the stems of trees and on snags and also in shallow water on the eastern bank. The riparian zone here is about 20m wide then grades into open woodland. The understorey near the water is bare of grass but has occasional lignum. This grades into roly-poly and more grass. There was no evidence of recent use of the area by cattle. A light scum covered 25% of the pool.

3.9.1 Water quality

Overnight logging of water quality parameters was undertaken at this site. Little variation was evident. The recorded ranges for each parameter were:

Temperature: 14.1 – 16.0°C

Dissolved oxygen: 73 – 86 % sat; 7.5 – 8.5mg/l

pH: 7.6 – 7.7

Conductivity: 149 – 153 µS/cm

Turbidity: 179 – 194 NTU.

Spot readings are shown in Table 3-9.1. No significant stratification was evident.

■ Table 3-9.1 Spot water quality readings – Balonne Minor at Trafalgar

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
1700	Surface	14.7	89	154	190	7.5
	1.0	14.1	79	150	199	7.5
	2.0	14.1	78	150	230	7.6

3.9.2 Macrophytes

No macrophytes were observed, nor was a filamentous algal fringe.

3.9.3 Fish

All nets were used at this site. Three native species and two introduced were captured and this is more reflective of the history of sampling at this site than was the catch from November 2003 in which six native species were recorded. Given the range of available habitats, this result is somewhat surprising.

■ Table 39.2 Results of fishing the Balonne Minor at Trafalgar in May 2004.

Species	Common name	Gill	Seine	Fyke nets	Bait traps	Dip	Total Numbers

<i>Macquaria ambigua</i>	Yellowbelly		1	4			5
<i>Nematolosa erebi</i>	Bony Bream		44	1			45
<i>Leiopotherapon unicolor</i>	Spangled Perch			2			2
<i>Gambusia holbrooki</i>	Mosquitofish		73				73
<i>Cyprinus Carpio</i>	Common Carp	1	1	1			3
Total Numbers		1	119	8	0		128

3.9.4 Macroinvertebrates

Five surbers were collected from black clay silt areas. Dip net samples were collected from tea tree root and submerged lignum. Twenty-one taxa were recorded with common taxa including copepods, ceratopogonids and caenids (**Table 3-9.3**). Ten prawns and 14 yabbies were captured in bait traps and a few were captured in the fyke nets.

■ **Table 39.3 Numbers of aquatic macroinvertebrates recorded from the Balonne Minor at Trafalgar.**

	Edge surber		Tree	Lignum
	Mean	Stddev	root dip	dip
Acarina	0.4	0.9		
Hydraenidae			20	5
Ostracoda	0.4	0.9		4
Copepoda	45.2	22.3	3040	732
Cladocera	1.4	1.7		32
Atyidae			10	1
Palaemonidae	0.4	0.9		
Parastacidae			10	
s-f Chironominae	0.8	1.1		34
s-f Tanypodinae	1.2	1.8	10	6
Ceratopogonidae	10.6	8.0		9
Culicidae				2
Tabanidae	0.8	1.1		2
Baetidae				3
Caenidae	3.2	2.7	30	2
Leptophlebiidae				1
Corixidae	1.2	1.1		1
Nematoda	0.4	0.9		
Zygoptera				2
Oligochaeta	1.4	2.6		1
Leptoceridae				3
Trichoptera	0.6	0.9		
Taxa	6.8	1.1	6	17
Abundance	68.0	26.9	3120	840
Total taxa				21

3.10 Donegri Ck (Narran River) at Dirranbandi

The site conditions were as per earlier descriptions but the dam release flow had raised water levels and some flow was evident. There was no bath-tub ring.

3.10.1 Water quality

Spot water quality readings were recorded near the centre of the pool (Table 3-10.1). The water was very well mixed despite the depth.

■ Table 3-10.1 Spot water quality readings – Donegri Creek

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
1520	Surface	16.3	97	128	231	7.4
	1.0	16.2	94	128	233	7.5
	2.0	16.2	93	128	228	7.5
	3.0	16.2	92	129	235	7.5
	3.5	16.1	92	129	242	7.5

Overnight datalogging was undertaken and little variation was evident in the results.

The recorded ranges for each parameter were:

Temperature: 15.3 – 16.1°C

Dissolved oxygen: 87 – 90 % sat; 9.4mg/l

pH: 7.6 – 7.7

Conductivity: 126 – 131 µS/cm

Turbidity: 213 – 231 NTU.

3.10.2 Macrophytes

Patchy sedges occurred above the water line and a small area of *Ludwigia* was present.

3.10.3 Fish

All nets were set at this site. Five native species and three introduced were captured. No more than four native species have been recorded from previous single sampling events. This is the first time *Tandanus* has been recorded at this site. In November 2003 only the seine net could be used and it captured large numbers of Smelt, a species not recorded in May 2004. The Yellowbelly and Bony bream covered a range of sizes.

■ Table 310.2 Results of fishing at Donegri Creek in May 2004, by fishing method

Species	Common name	Gill nets	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	6	2	11			19
<i>Nematolosa erebi</i>	Bony Bream	2	4	22			28
<i>Leiopotherapon unicolor</i>	Spangled Perch			2			2
<i>Tandanus tandanus</i>	Eel-tailed catfish			2			2
<i>Neosilurus hyrtlilii</i>	Hyrtl's tandan			3			3
<i>Cyprinus Carpio</i>	Common Carp			11			11
<i>Carrasius auratus</i>	Goldfish		1	1			2
<i>Gambusia holbrooki</i>	Mosquitofish		4				4
Total Numbers		8	11	52	0		71

3.10.4 Macroinvertebrates

Surbers were collected from edge mud substrate and from an area which included Melaleuca root mat. A dip net sample was collected from *Ludwidgia*. Twenty-three discrete taxa were recorded with the most abundant being micro-crustacea, chironomids and ceratopogonids (Table 3-10.3). Bait traps captured 49 prawns and two yabbies.

■ Table 310.3 Numbers of aquatic macroinvertebrates recorded from Donegri Creek (Narran River)

	Edge Surber Mean	Stdev	Tree root dip
Dytiscidae			20
Hydraenidae			80
Hydrophilidae			10
Ostracoda	0.8	0.8	
Copepoda	20.2	13.6	320
Cladocera	6.4	11.6	30
Atyidae			10
Palaemonidae	0.2	0.4	20
s-f Chironominae	1.2	0.8	30
s-f Tanypodinae	0.2	0.4	70
s-f Orthoclaadiinae			10
Ceratopogonidae	1.4	2.1	40
Culicidae			60
Tabanidae	0.4	0.5	50
Tipulidae	0.2	0.4	
Baetidae	0.2	0.4	10
Caenidae	1.0	0.7	
Corixidae	0.8	0.8	10
Gerridae	0.2	0.4	30
Mesoveliidae			50
Nematoda	1.6	3.6	
Oligochaeta	0.8	0.8	
Leptoceridae	0.4	0.5	30
Taxa	7.6	1.1	18
Abundance	36.0	23.9	880
Total taxa			23

3.11 Narran River at Clyde

The substrate at this site is black clay over fine sand. The eroding outer edge of the meander had very little riparian vegetation and this then merged with cleared grazing land. This edge showed signs of cattle usage and had a sparse understorey. The inner edge was more thickly wooded for a considerable distance and the species comprised red gum, wattle and coolibah with a good grass cover. There were quite a few snags

and coolibah roots in the water but no fibrous tree roots, no macrophytes and no filamentous algal ring or surface scum. There was no flow at the time of sampling.

3.11.1 Water quality

Spot measurements are shown in **Table 3-11.1**. The bottom was reached at 1.5m. The water column was well mixed and the turbidity relatively high.

■ **Table 3-11.1 Spot water quality readings – Narran River at Clyde**

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
0930	Surface	15.1	77	147	267	7.6
	1.0	13.9	73	147	410	7.6
	1.5	13.9	72	147	468	7.6

3.11.2 Macrophytes

No macrophytes were recorded. The bath-tub ring was only weakly developed.

3.11.3 Fish

All nets were set at this site and the catch comprised three native species and three introduced (**Table 3-11.2**). Sampling in November 2003 was restricted to a seine haul only and this was dominated by Smelt and also recorded Carp Gudgeon (*H. klunzingeri* and *H. sp4*).

■ **Table 311.2 Results of fishing the Narran River at Clyde in May 2004, by fishing method**

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	2	4	1			7
<i>Nematolosa erebi</i>	Bony Bream		39	10			49
<i>Neosilurus hyrtlii</i>	Hyrtl's tandan			2			2
<i>Cyprinus carpio</i>	Carp	1	3				4
<i>Carrasius auratus</i>	Goldfish			1			1
<i>Gambusia holbrooki</i>	Mosquitofish		2				2
Total Numbers		3	48	14	0		65

3.11.4 Macroinvertebrates

No specialised habitats were available to sample at this site. The surbers were all collected from fine silt over sand. Sixteen discrete taxa were recorded with micro-crustacea, chironomids, caenids and corixids most common (**Table 3-11.3**). Bait traps captured 32 prawns and 12 yabbies.

■ **Table 311.3 Numbers of aquatic macroinvertebrates recorded from the Narran River at Clyde**

Edge Surber
Mean Stdev

Dytiscidae	0.2	0.4
Ostracoda	7.6	4.4
Copepoda	197.6	205.7
Cladocera	4.2	1.5
Palaemonidae	0.4	0.9
s-f Chironominae	143.4	194.1
s-f Tanypodinae	7.8	5.6
Ceratopogonidae	6.2	4.5
Baetidae	0.2	0.4
Caenidae	13.4	9.0
Ancylidae	0.2	0.4
Corixidae	9.2	7.0
Hydridae	0.2	0.4
Epiproctophora	1.0	1.4
Oligochaeta	6.0	5.0
Leptoceridae	0.8	1.1
Trichoptera	0.2	0.4
Taxa	10.8	1.3
Abundance	398.6	384.7
Total Taxa		16

3.12 Narran River at Booligar

When last sampled in November 2003 the water level was very low but it was now flowing through the riffle at the lower end and the river was continuous. Cattle camp and water at this site and dung was plentiful. There is no ground cover on the western side but the eastern, which is accessed by sheep and goats, has better cover and a thicker riparian zone. Snags and submerged roots are common at the upstream end but not in most of the main pool or the riffle. Significant amounts of red sand can be found in the riffle and lower end of the pool. No macrophytes or filamentous algal fringe were noted.

3.12.1 Water quality

Spot water quality readings showed well oxygenated unstratified water, which was certainly not the case in November 2003 (**Table 3-12.1**).

■ **Table 3-12.1 Spot water quality readings – Narran River at Booligar**

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
1445	Surface	15.3	108	165	258	7.5
	1.0	14.5	103	165	257	7.6
	1.5	14.0	100	163	270	7.6

3.12.2 Macrophytes

No macrophytes or filamentous algae were observed.

3.12.3 Fish

All nets were set at this site. Four native species and two introduced were captured (Table 3-12.2). From four sampling events, five native species and three introduced have been recorded at this site (below plus Smelt and Mosquitofish). This catch was by far the best for Yellowbelly, with good sizes as well as good numbers.

■ Table 312.2 Results of fishing the Narran River at Booligar in May 2004.

Species	Common name	Gill nets	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	10		10			20
<i>Nematolosa erebi</i>	Bony Bream	5	10	13			28
<i>Leiopotherapon unicolor</i>	Spangled Perch			5			5
<i>Tandanus tandanus</i>	Eel-tailed Catfish			1			1
<i>Cyprinus carpio</i>	Carp	4	1	1			6
<i>Carrasius auratus</i>	Goldfish	1		1			2
Total Numbers		20	11	31	0		62

3.12.4 Macroinvertebrates

All surbers were collected from the lower end of the pool or within the riffle and from black clay or red sand substrate. No dip nets were collected due to lack of habitat. Eleven discrete taxa were recorded. The fauna was dominated by copepods and appears significantly affected by the dam release flow (Table 3-12.3). Bait traps collected 35 prawns.

■ Table 312.3 Numbers of aquatic macroinvertebrates recorded from Narran River at Booligar

	Edge surber	
	Mean	Stddev
Dytiscidae	0.2	0.4
Ostracoda	0.2	0.4
Copepoda	54.6	17.6
Cladocera	0.8	1.1
Palaemonidae	0.2	0.4
Ceratopogonidae	2.6	1.1
Tipulidae	0.2	0.4
Corixidae	2.6	5.3
Mesoveliidae	0.2	0.4
Oligochaeta	0.6	1.3
Leptoceridae	0.2	0.4
Taxa	4.2	0.4
Abundance	62.4	18.5
Total taxa		11

3.13 Balandool River at Cubbie

This site has tended to be dry by spring so is only sampled in autumn. The site is near a bridge used to get sheep across the river. It has a very narrow riparian zone of mainly tea tree and wattle, very limited grass cover but significant roly-poly. Fallen and cut timber (old) is common in the riparian zone and small snags are common in the water. Cattle dung and pugging along the edge were common. The water level had risen with the dam release flow to be above the base and lower branches of the tea trees and it was now falling. Edge substrate was recently inundated. The channel was about 15m wide and up to 1.5m deep.

3.12.1 Water quality

Spot water quality readings showed mild stratification but the water column was well oxygenated (Table 3-12.1).

■ Table 3-12.1 Spot water quality readings – Balandool River at Cubbie

Sample Time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
0900	Surface	16.3	99	136	210	7.4
	1.0	13.5	89	140	468	7.9

3.12.2 Macrophytes

No macrophytes or filamentous algae were observed.

3.12.3 Fish

All nets were set at this site. Four native species and two introduced were captured (Table 3-12.2). Yellowbelly captured in the fyke net were between 50 and 80mm long and the Bony bream between 46 and 95mm, suggesting breeding in recent months.

■ Table 312.2 Results of fishing the Balandool River at Cubbie in May 2004.

Species	Common name	Gill nets	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	2		14			16
<i>Nematolosa erebi</i>	Bony Bream		10	17			27
<i>Leiopotherapon unicolor</i>	Spangled Perch			7			7
<i>Neosilurus hyrtlilii</i>	Hyrtl's tandan			1			1
<i>Cyprinus carpio</i>	Carp			2			2
<i>Carrasius auratus</i>	Goldfish			1			1
Total Numbers		2	10	42	0		54

3.12.4 Macroinvertebrates

All surbers were collected from a substrate of silt/mud. Eight discrete taxa were recorded. Copepods were the most common element (Table3-12.3). The fauna was very likely affected by the dam release flow. Bait traps collected 12 prawns and 26 yabbies. Fyke nets captured 83 *Cherax*.

■ **Table 312.3 Numbers of aquatic macroinvertebrates recorded from Balandool River at Cubbie**

	Edge surber	
	Mean	Stddev
Copepoda	14.0	11.6
s-f Chironominae	2.2	0.8
s-f Tanypodinae	1.0	0.7
Ceratopogonidae	0.8	0.8
Tipulidae	0.4	0.9
Corixidae	1.0	1.2
Epiproctophora	0.2	0.4
Leptoceridae	1.6	1.7
Taxa	5.0	0.7
Abundance	21.2	13.5
Total taxa		8

3.14 Balandool River at Euraba

This site has also been dry when sampling has been conducted each spring. The dam release flow had lifted the water level and while it had recently receded at least 30cm, flow was still significant. The outside of the meander bend is very sparsely treed and shows moderate gully erosion. These gullies have recently deposited significant localised sediment piles in the river. There is very little understorey other than lignum, which is sparse. The inside of the meander is much better treed, including relatively young (2-5m) coolibah and tea tree. There were no macrophytes and no bath tub ring of filamentous algae. There were few snags in the water but some coolibah roots and tea tree branches.

3.12.1 Water quality

Datalogging was undertaken between 1630 and 0730. Little variation was evident.

The recorded ranges for each parameter were:

Temperature: 15.0 – 15.9°C

Dissolved oxygen: 91 – 98.1 % sat; 9.3 – 10.3mg/l

pH: 7.7 – 7.8

Conductivity: 131 – 136 μ S/cm

Turbidity: 212 – 229 NTU.

3.12.2 Macrophytes

No macrophytes or filamentous algae were observed.

3.12.3 Fish

All nets were set at this site and they captured three native species and one introduced (**Table 3-12.1**). Low numbers of Smelt and Rainbowfish were captured here in April 2001 and Goldfish and Carp have also been recorded previously.

■ **Table 312.1 Results of fishing the Balandool River at Euraba in May 2004.**

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly			3			3
<i>Nematolosa erebi</i>	Bony Bream			2			2
<i>Leiopotherapon unicolour</i>	Spangled Perch			4			4
<i>Gambusia holbrooki</i>	Mosquitofish		11				11
Total Numbers		0	11	9	0		20

3.12.4 Macroinvertebrates

All surbers were collected from a substrate of silt/mud with little organic matter. No dip nets were collected due to lack of habitat. Thirteen discrete taxa were recorded. The fauna was strongly dominated by copepods, corixids and chironomids (Table 3-12.2). Bait traps collected 10 prawns and 20 yabbies. Eighty-three *Cherax* were captured in fyke nets.

■ **Table 312.2 Numbers of aquatic macroinvertebrates recorded from Balandool River at Euraba**

	Edge surber	
	Mean	Stddev
Acarina	0.2	0.4
Dytiscidae	0.4	0.5
Hydraenidae	0.6	1.3
Staphylinidae	0.2	0.4
Copepoda	29.6	4.9
s-f Chironominae	9.6	3.6
s-f Tanypodinae	0.2	0.4
Ceratopogonidae	4.2	4.0
Culicidae	0.2	0.4
Corixidae	16.8	16.2
Notonectidae	0.2	0.4
Nematoda	0.6	0.9
Leptoceridae	0.6	0.9
Taxa	6.4	1.3
Abundance	63.4	11.4
Total taxa		13

3.15 Bokhara River at Kirrima

This site is another intermittent waterway. The site sampled in November was upstream of the weir but the normal site downstream could be sampled on this occasion as the dam release flow was occurring. Water level fell about 30cm overnight. Edge habitat was therefore recently inundated. The substrate is black clay and the riparian zone is represented by only a thin band and it has been partly cleared. Snags are common in the water but there are no macrophytes and there was no algal ring. The river was 15m wide and up to 1.5m deep.

3.15.1 Water quality

Spot water quality measurements were taken at this site (Table 3-15.1). There was little difference between top and bottom.

■ Table 3-15.1 Spot water quality readings – Bokhara River at Kirrima

Sample time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
1115	Surface	15.0	91	148	201	7.6
	1.0	14.9	89	148	210	7.8

3.15.2 Macrophytes

No macrophytes were observed.

3.15.3 Fish

All nets were used at this site and captured four native species and one introduced (Table 3-15.2). On each of the previous two sampling occasions, Smelt, Rainbowfish, Western Carp Gudgeon and Mosquitofish have also been captured and in November 2003 that was all that was captured, albeit in very large numbers.

■ Table 3-15.2 Results of fishing the Bokhara River at Kirrima in May 2004.

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly			6			6
<i>Nematolosa erebi</i>	Bony Bream		4	10			14
<i>Leiopotherapon unicolor</i>	Spangled Perch			2			2
<i>Neosilurus hyrtlil</i>	Hyrtl's tandan			2			2
<i>Carrasius auratus</i>	Goldfish			1			1
Total Numbers		0	4	21	0		25

3.15.4 Macroinvertebrates

Surber samples were collected from silt substrate with at times significant organic matter. No habitat was available for dip net sampling. Ten discrete taxa were captured with the most common being copepods and chironomids (Table 3-15.3). Bait traps captured 17 prawns and 11 yabbies. Fyke nets captured 128 yabbies and prawns were abundant.

■ Table 3-15.3 Numbers of aquatic macroinvertebrates recorded from the Bokhara River at Kirrima

	Edge surber	
	Mean	Stddev
Dytiscidae	0.4	0.9
Copepoda	30.2	14.0
Cladocera	1.2	1.6
s-f Chironominae	3.2	1.9
s-f Tanypodinae	1.8	0.4

Ceratopogonidae	1.4	1.7
Dixidae	0.2	0.4
Tipulidae	0.2	0.4
Baetidae	0.6	0.9
Oligochaeta	0.2	0.4
Taxa	5.4	1.3
Abundance	39.4	17.2
Total taxa		10

3.16 Bokhara River at Koala

The site is basically a long and apparently permanent pool which usually reaches 2m deep in places. On this occasion it was actually deeper and an area of usually dry mud flat was inundated. Few snags were noted in the water. Small areas of *Lignum*, *Ludwigia* and *Schoenoplectus* were inundated.

3.16.1 Water quality

Both spot and overnight water quality data were recorded at this site. Spot data showed little variation with depth (**Table 3-16.1**) and logged data showed little variation over time.

■ **Table 3-16.1 Spot water quality readings – Bokhara River at Koala**

Sample time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
1630	Surface	14.8	90	140	385	7.6
	1.0	13.2	80	142	400	7.6

The ranges recorded overnight for each parameter were:

Temperature: 13.1 – 15.4°C

Dissolved oxygen: 77 – 83 % sat; 7.9 – 8.4mg/l

pH: 7.7 – 7.9

Conductivity: 135 – 140 µS/cm

Turbidity: 363 – 381 NTU.

3.16.2 Macrophytes

Small areas of *Ludwigia* were present.

3.16.3 Fish

All nets were used at this site and captured three native species plus three introduced (**Table 3-16.2**). In November 2003, Smelt was captured in low numbers but Spangled Perch, Carp and Goldfish were not, while in May 2002, single specimens of Spangled Perch, Carp and Goldfish were recorded while Bony Bream and Yellowbelly dominated in a total catch of 34 individuals.

■ **Table 3-16.2 Results of fishing the Bokhara River at Koala in May 2004.**

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	8		2			10
<i>Nematolosa erebi</i>	Bony Bream	1	5	4			10
<i>Leiopotherapon unicolor</i>	Spangled Perch			1			1
<i>Cyprinus carpio</i>	Carp	3		1			4
<i>Carrasius auratus</i>	Goldfish		1	1			2
<i>Gambusia holbrooki</i>	Mosquitofish				1		1
Total Numbers		12	6	9	1		28

3.16.4 Macroinvertebrates

Surber samples were collected from soft mud. A dip net sample was collected from a mixture of lignum, *Ludwigia* and sedge. Twenty-six discrete taxa were recorded, 12 from the surbers and 17 and 20 from the dip nets respectively. The more common taxa in surbers were micro-crustacea, chironomids, ceratopogonids and corixids (**Table 3-16.3**) while the dip nets recorded more beetles, mayflies, caddisflies and odonates. Bait traps captured 9 prawns and one yabby.

■ Table 3-16.3 Numbers of aquatic macroinvertebrates recorded from Bokhara River at Koala in May 2004

	Edge surber		Macrophyte	Tree
	Mean	Stddev	dip net	root dip
Dytiscidae				4
Hydraenidae			53	36
Staphylinidae				12
Ostracoda	56.0	35.8	53	
Copepoda	1560.8	860.7	1547	288
Cladocera	16.8	10.0	293	64
Atyidae			20	16
Palaemonidae			7	12
s-f Chironominae	107.2	114.0	80	96
s-f Tanypodinae	60.8	21.1	20	192
s-f Orthocladiinae			60	16
Ceratopogonidae	24.0	12.3	113	8
Tabanidae			7	
Tipulidae				8
Baetidae	4.0	5.7	153	120
Caenidae	4.0	4.0		604
Corixidae	24.0	22.8	7	
Gerridae				12
Mesoveliidae			7	
Nematoda	15.2	12.1		
Libellulidae				4
Protoneuridae				12
Zygoptera			127	
Oligochaeta	15.2	10.7		8
Ecnomidae				196
Hydropsychidae				4
Leptoceridae	4.8	4.4	73	
Trichoptera			7	
Taxa	10.8	0.8	17	20
Abundance	1892.8	883.3	2627	1712
Total taxa				26

3.16 Briarie Ck

Briarie Ck is rarely sampled because it does not hold water for long once flow ceases. Compensation-level flows do not reach it. This pool was isolated, about 15m wide and up to 1m deep. The banks have a gradual slope and the riparian zone comprises eucalypt woodland with very sparse low trees and a very sparse grassy ground cover. The grassy ground cover was denser on the right bank. The dominant canopy tree was coolibah with river red gum and river tea tree less abundant. River cooba was the dominant low tree species. No weeds were observed. The area adjacent to the site

was heavily grazed by cattle. The adjacent vegetation was coolibah tall open woodland and native grassland. There were minor snags and debris piles in the water and coolibah roots above the water line.

3.16.1 Water quality

Spot water quality readings indicated mild thermal stratification of the water column, high conductivity, turbidity and pH. These changes are characteristic of isolated pools as they dry out, though the high turbidity may relate to cattle access.

■ **Table 3-16.1 Spot water quality readings – Briarie Ck**

Sample time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
1340	Surface	16.0	93	303	468	8.6
	1.0	12.7	77	308	468	8.4

3.16.2 Macrophytes

No macrophytes or fringe of filamentous green alga was present.

3.16.3 Fish

All but two gill nets could be successfully deployed at this site. Three native species and two introduced were captured (**Table 3-16.2**). Bony bream in the fyke net averaged just over 100mm in length while Yellowbelly ranged between 39 and 180mm. The same suite of species plus Goldfish was captured on the only other sampling occasion (June 2000) and Bony bream was more dominant at that time.

■ **Table 3-16.2 Results of fishing the Briarie Ck in May 2004.**

Species	Common name	Gill nets (2)	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	2	4	1			7
<i>Nematolosa erebi</i>	Bony Bream	1	8	112	2		123
<i>Leiopotherapon unicolor</i>	Spangled Perch		4	9			13
<i>Cyprinus carpio</i>	Carp		1	17			18
<i>Gambusia holbrooki</i>	Mosquitofish		49				49
Total Numbers		3	66	139	2		210

3.16.4 Macroinvertebrates

Surber samples were collected from soft mud. Seventeen discrete taxa were recorded, with the more common taxa being micro-crustacea, corixids, chironomids and nematodes (**Table 3-16.3**). Bait traps captured 23 prawns and 8 yabbies. Yabbies and prawns were also abundant in fyke and seine nets.

■ Table 3-16.3 Numbers of aquatic macroinvertebrates recorded from Briarie Ck

	Edge surber	
	Mean	Stddev
Acarina	3.4	4.8
Dytiscidae	0.6	1.3
Ostracoda	79.6	53.7
Copepoda	412.2	252.5
Cladocera	158.0	141.9
s-f Chironominae	20.4	10.8
s-f Tanypodinae	74.2	45.2
Ceratopogonidae	17.2	6.9
Tabanidae	2.0	4.5
Baetidae	6.2	7.9
Corixidae	103.2	118.3
Nepidae	0.2	0.4
Nematoda	83.4	44.7
Epiproctophora	1.0	2.2
Oligochaeta	17.2	27.1
Leptoceridae	3.0	2.5
Temnocephalidae	0.6	1.3
Taxa	11.8	0.8
Abundance	981.8	479.6
Total taxa		17

3.17 Warrego River at Shannonvale

The site consists of a long pool with a sand / gravel substrate. The full width of the base flow channel was wet, meaning the pool varied between 15 and 40m in width. Various snags, roots and a well vegetated island provided a range of habitats. Campers heavily use the western bank so little understorey is present in this area, which is basically a flood terrace about 40m wide. The eastern bank and the unoccupied parts of the western bank, show a good riparian zone of red gum, coolibah, tea tree and wattles. This covers the sloping bank. Little grass is present in the understorey, which is dominated by Noogoora Burr. There was no flow at the time of sampling.

3.17.1 Water quality

Overnight logging of water quality parameters was also undertaken at this site. Little variation was evident. The recorded ranges for each parameter were:

Temperature: 14.5 – 16.6°C

Dissolved oxygen: 64 – 78 % sat; 6.5 – 7.7mg/l

pH: 7.7

Conductivity: 164 – 169 µS/cm

Turbidity: 86 – 93 NTU.

Spot water quality readings were taken in mid channel (Table 3-17.1). The water column was well mixed.

■ **Table 3-17.1 Spot water quality readings – Warrego River at Shannonvale**

Sample time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
0955	Surface	14.5	66	165	91	7.7
	1.0	14.4	67	169	92	7.8
	2.0	14.4	68	169	95	7.8

The water is less turbid than Lower Balonne sites but also less well oxygenated.

3.17.2 Macrophytes

No macrophytes or bath tub ring were recorded.

3.17.3 Fish

All nets were deployed at this site. Seven species of native fish plus Carp were captured (**Table 3-17.2**). In November 2003, eight species were recorded including three species of gudgeon (totalling 171 individuals). Twenty-seven Rainbowfish were also recorded. Smelt has also been recorded in significant numbers on at least one occasion. While Hyrtl's tandan is commonly caught at this site, it has never been as abundant as on this occasion. This result continues the trend of good catches at this site since May 2002 though catches prior to that were poorer.

■ **Table 3-17.2 Results of fishing the Warrego River at Shannonvale in May 2004.**

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	20					20
<i>Nematolosa erebi</i>	Bony Bream	2	15	17			34
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		17		1		18
<i>Leiopotherapon unicolor</i>	Spangled Perch			4			4
<i>Retropinna semoni</i>	Smelt		1				1
<i>Neosilurus hyrtlilii</i>	Hyrtl's tandan			173			173
<i>Melanotaenia fluviatilis</i>	Rainbowfish		2				2
<i>Cyprinus Carpio</i>	Common Carp	1					1
Total Numbers		23	35	194	1		253

3.17.4 Macroinvertebrates

Surber samples were collected from a mix of sand / clay substrate; some including tea tree root. A dip net sample was collected from tea tree root. Twenty-six taxa were recorded by the two sampling methods (**Table 3-17.3**), 22 from the surbers and 19 from the dip net. Common faunal elements were chironomids, caenids, micro-crustacea and ceratopogonids. Four *Macrobrachium* were captured in bait traps.

■ Table 3-17.3 Numbers of aquatic macroinvertebrates recorded from Shannonvale

	Edge surber		Tree
	Mean	Stddev	root dip
Acarina	0.4	0.9	10
Corbiculidae	1.6	3.6	
Hydrophilidae			10
Ostracoda	0.2	0.4	
Copepoda	121.8	78.5	2560
Cladocera	11.2	18.6	120
Atyidae	1.6	3.6	30
Palaemonidae	0.8	1.8	30
s-f Chironominae	170.0	103.9	1050
s-f Tanypodinae	18.8	12.9	40
s-f Orthocladiinae	3.4	5.1	60
Ceratopogonidae	59.0	58.1	200
Tabanidae	1.6	2.2	
Tipulidae	0.4	0.9	
Baetidae	2.4	3.6	70
Caenidae	160.0	114.2	1350
Planorbidae	0.8	1.8	
Corixidae	1.8	2.5	
Gerridae			10
Mesoveliidae	0.2	0.4	
Veliidae	0.8	1.8	30
Libellulidae	0.8	1.8	
Zygoptera			10
Oligochaeta	3.2	5.2	10
Ecnomidae			120
Leptoceridae	10.2	10.4	20
Trichoptera			10
Temnocephalidae			10
Taxa	10.8	1.3	19
Abundance	571.0	258.1	5740
Total taxa			26

3.18 Warrego River at Tinnenburra

On previous sampling occasions this site has varied from two very small pools to a single pool at least 400m long and 20m wide. On this occasion the site consisted of a series of small pools generally less than 30cm deep. The substrate was a red clay silt overlaying sand. A few isolated snags occurred in places but generally the riparian related habitat was exposed away from the water. The riparian zone was very sparse, represented more by floodplain vegetation reaching the waters edge. The outside of meanders was badly eroding and gully erosion was common nearby. Roly-poly, Warrego Summer Grass and some lignum made up the ground cover. No macrophytes, significant algal fringe or other habitats were present.

3.18.1 Water quality

Results of spot water quality samples are shown in **Table 3-18.1**. The turbidity was much higher than at Shannonvale.

■ **Table 3-18.1 Spot water quality readings – Warrego River at Tinnenburra**

Sample time	Depth (m)	Temp. (°C)	Dissolved Oxygen (%sat)	Conductivity (µS/cm)	Turbidity (NTU)	pH
1530	Surface	14.5	100	168	195	7.8
	0.5	13.0	88	168	260	7.8

3.18.2 Macrophytes

No macrophytes were observed and only a slight algal fringe was present.

3.18.3 Fish

Only seining was undertaken as the site was too small and shallow for set nets. Six native fish species and two introduced were captured (**Table 3-18.2**). This is a good result considering the low sampling effort. In November 2001 only seine netting was undertaken, but on that occasion just three species were recorded; Yellowbelly, Bony Bream and Goldfish. Eight native species were captured in the seine net alone in November 2003. Those not captured on this occasion were Silver perch, Carp gudgeon and Smelt. Much higher numbers of Bony bream and Rainbowfish were recorded in the seine net in November 2003 and significant numbers of Hyrtl's tandan in the fyke.

■ **Table 3-18.2 Results of fishing the Warrego River at Tinnenburra in May 2004.**

Species	Common name	Gill nets (0)	Seine net (1)	Fyke nets (0)	Bait traps (0)	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly		14				14
<i>Nematolosa erebi</i>	Bony Bream		23				23
<i>Leiopotherapon unicolor</i>	Spangled Perch		1				1
<i>Neosilurus hyrtl</i>	Hyrtl's tandan		1				1
<i>Melanotaenia fluviatilis</i>	Rainbowfish		20				20
<i>Cyprinus carpio</i>	Common Carp		1				1
<i>Gambusia holbrooki</i>	Mosquitofish		2				2
Total Numbers		NA	62	NA	NA		62

3.18.4 Macroinvertebrates

No specialised habitats were present at Tinnenburra so sampling was restricted to surbers collected from silty sand with occasional leaf litter and twigs. Fifteen discrete taxa were recorded with ceratopogonids, chironomids, micro-crustacea and caenids most common (**Table 3-18.3**). *Macrobrachium* and *Cherax* were also captured in the seine haul.

■ **Table 3-18.3 Numbers of aquatic macroinvertebrates recorded from Tinnenburra**

	Edge surber	
	Mean	Stddev
Acarina	1.2	2.7
Ostracoda	0.4	0.9
Copepoda	32.6	31.0
Cladocera	0.4	0.9
Palaemonidae	0.4	0.9
s-f Chironominae	30.4	23.0
s-f Tanypodinae	5.8	3.3
s-f Orthoclaadiinae	0.4	0.9
Ceratopogonidae	153.8	80.8
Baetidae	0.8	1.8
Caenidae	17.6	17.2
Corixidae	1.8	2.0
Mesoveliidae	1.4	1.7
Oligochaeta	1.6	2.2
Leptoceridae	3.4	5.0
Taxa	8.4	1.3
Abundance	252.0	118.0
Total taxa		15

3.19 Moonie River at Nindigully

The site looked much like it did in May 2002, that is, with a flowing clay-based riffle at the downstream end. In November 2003 the water level was slightly lower and the riffle was not active. A tree had fallen at the head of the riffle in November and had now shifted slightly into the riffle. Another tree had fallen on the western side at the boat entry point. The grassy understorey extended a considerable distance down the bank. No *Ludwigia* was present and the fringe of filamentous algae was poorly developed, though snags were often densely covered at the water line. The pool was over 250m long, up to 40m wide and over 1.5m deep in places.

3.19.1 Water quality

Spot water quality meter data was collected from this site. The water column was well mixed (Table 3-19.1) and very turbid.

■ Table 3-19.1 Spot water quality readings - Moonie River at Nindigully in May 2004

Sampling Time	Depth (m)	Temp. (°C)	DO (mg/L)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
0930	Surface	13.7	8.8	88	128	461	7.3
	1.0	13.5	7.2	72	129	468	7.4

3.19.2 Macrophytes

No macrophytes were observed. Occasional *Juncus* and Sword sedge were noted above the waterline.

3.19.3 Fish

All nets were set at this site. Three native fish species and two introduced were recorded (**Table 3-19.2**). As has been observed previously, the fish were generally larger than those captured in the Lower Balonne and the seine was relatively unsuccessful. The species list and total abundance is fairly representative of results from this site. Single specimens of long neck turtle were recorded from gill and fyke nets.

■ **Table 3-19.2 Results of fishing the Moonie River at Nindigully in May 2004.**

Species	Common name	Gill nets	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	7	2	4			13
<i>Nematolosa erebi</i>	Bony Bream	4	2	2			8
<i>Tandanus tandanus</i>	Eel-tailed catfish			1			1
<i>Cyprinus carpio</i>	Common Carp	3		5			8
<i>Carrasius auratus</i>	Goldfish		1				1
Total Numbers		14	5	12	0		31

3.19.4 Macroinvertebrates

Surber samples were collected from compact mud substrate with some organic matter. Thirteen discrete taxa were identified (**Table 3-19.3**). Ceratopogonids and copepods dominated the catch. Fourteen *Macrobrachium* were captured in bait traps.

■ **Table 3-19.3 Numbers of aquatic macroinvertebrates recorded from Nindigully**

	Edge surber	
	Mean	Stddev
Ostracoda	0.6	0.5
Copepoda	28.6	8.4
Cladocera	0.6	0.9
Palaemonidae	3.4	2.9
s-f Chironominae	2.2	1.8
s-f Tanypodinae	2.6	1.3
Ceratopogonidae	113.2	22.3
Simuliidae	0.2	0.4
Baetidae	0.2	0.4
Caenidae	1.6	0.9
Corixidae	3.0	2.2
Epiproctophora	0.2	0.4
Oligochaeta	4.4	0.9
Taxa	9.2	1.3
Abundance	160.8	24.3
Total taxa		13

3.20 Moonie River at Fenton

Not sampled.

3.21 Lower Plains Lagoon

This site had not previously been sampled and along with Beardie Lagoon, was added in order to include sites within the Balonne River Floodplain (the section between St George and Whyenbah) which is listed within the Directory of Important Wetlands in Australia. The sites were chosen based on landholder comments regarding the degree of modification from natural and the flow thresholds which led to inundation. Many of the lagoons named in the directory have been significantly modified so were not preferred as sampling sites.

The Lower Plains site is part of an ancient anabranch or floodway and is reached when flooding at St George exceeds 50,000ML/d. Prior to the early 1990's the part of the floodway which was sampled was used as a water storage but the weir was then removed. Dead standing coolibah are remnants of the days as a storage. The sampling site is adjacent (50-100m to bunds) to cultivated fields in one direction and a constructed water storage in the other (300m). The lagoon has a shallow profile and a substrate of sandy clay. This section of the floodway is about 500m long, 15-20m wide and generally less than 1m deep. The outer edge of the meander has significant numbers of young coolibah and cooba while the inner edge shows the dead older coolibah near the water and surviving trees at a greater distance. The grassy understorey provides good cover along with roly-poly, some Noogoora Burr and Nardoo near the water. The water line when sampled was about 1m below the herb line.

There were few snags in the water, no macrophytes, no algal ring and very little leaf litter. Several wader species and ducks were seen at the site.

3.21.1 Water Quality

Spot water quality data are shown in **Table 3-21.1**.

■ **Table 3-21.1 Spot water quality readings –Lower Plains Lagoon May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
1330	Surface	15.9	104	228	230	8.3
	1.0	15.9	100	229	330	8.3

The water column was well mixed and oxygenated but with high conductivity and pH, indicating it is isolated and drying out.

3.21.2 Fish

Two gill nets were not deployed at this site due to the water depth. Four native species and two introduced were captured. The Bony bream in the gill nets tended to be between 190 and 230mm in length while in the fyke and seine nets they were as small as 46mm. Yellowbelly tended to be around the 100mm mark. Two long neck turtles were captured in fyke nets.

Table 3-21.2 Results of fishing Lower Plains Lagoon in May 2004.

Species	Common name	Gill nets (2)	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly			8			8
<i>Nematolosa erebi</i>	Bony Bream	56	8	14			78
<i>Leiopotherapon unicolor</i>	Spangled Perch	1		11			12
<i>Melanotaenia fluviatilis</i>	Rainbowfish			2			2
<i>Cyprinus carpio</i>	Carp	2		8			10
<i>Gambusia holbrooki</i>	Mosquitofish		35	1			36
Total Numbers		59	43	44	0		146

3.21.3 Macrophytes

No macrophytes were observed though just downstream of this site was a section which is apparently not as permanent and it contained much more sedge and Nardoo.

3.21.4 Macroinvertebrates

Surber samples were collected from mud / sand substrate. No dip net samples were collected. Fourteen discrete taxa were identified with the most common being ceratopogonids while several of the other taxa were of very similar abundances. Bait traps returned a zero catch. *Alathyria* (mussel) was common on the water's edge.

■ **Table 3-21.3 Macroinvertebrates captured at Lower Plains Lagoon in May 2004**

	Edge surber	
	Mean	Stddev
Corbiculidae	0.8	1.8
Dytiscidae	41.6	58.1
Ostracoda	47.2	31.9
Copepoda	84.8	47.8
Cladocera	44.8	56.0
s-f Chironominae	86.4	23.8
s-f Tanypodinae	30.4	12.5
Ceratopogonidae	581.6	735.7
Tabanidae	4.0	6.9
Baetidae	5.6	3.6
Physidae	0.8	1.8
Corixidae	71.2	41.4
Nematoda	46.4	32.8
Leptoceridae	9.6	4.6
Taxa	11.2	1.6
Abundance	1055.2	919.4
Total taxa		14

3.22 Beardie Lagoon

Like Lower Plains Lagoon, this site was added as an example of a wetland in the Balonne River Flooplain. Beardie Lagoon is a well known former channel of the Balonne River which is now reached via both specific breakout channels from Sandy Creek and via overland flow when the flow at St George is about 50,000ML/d. The western edge of the lagoon abuts a rapidly rising sandy grey-red ridge which is effected in part by significant erosion. The eastern edge is very flat and consists of floodplain abutting Sandy Ck and continuing to the present-day river. At the sample site some 1km of lagoon was visible and continued to the south. Two adjacent concentric arcs of former river channel are clearly visible and are separated by a row of “islands” which once would have been the eastern riparian edge of the most western channel arc and the western most edge of the eastern arc. The total width of the combined channels is about 80-100m and the depth was generally 50-75cm with occasional deeper pockets.

The “islands” contain a mix of coolibah, lignum and sedge. Some of the coolibah were partly submerged at the time of sampling and occasional dead, presumedly drowned trees were still standing. Some of these had fallen over and provided snag and bird roosting habitat. The riparian zone to the east was very thin, the land behind being cleared for grazing, as it is to the north also. To the west the riparian zone was about 10m wide and included coolibah with occasional red gum. There was then a clear gap of about 20m before a band of uniform aged coolibah (about 6-8m in height). There had been recent significant germination of eucalypts over a 2m wide band at the flood line. Sedges and lignum cover about 50% of the waters edge. Much of the lignum consisted of dead branches with numerous new shoots. *Lemna*, some *Ludwigia* and eucalypt flowers were common along the waters edge. Noogora Burr, *Sesbania* and roly-poly were common.

The lagoon has been dry since about mid-2001 and apparently holds water for up to a year in normal seasons. The water had receded about 4m (or a height of about 10cm) since the flood peak. Several waterbird species were seen at the site.

3.22.1 Water Quality

Spot water quality data are shown in **Table 3-22.1**. The water column was well mixed and the lagoon shows signs of drying out.

■ **Table 3-22.1 Spot water quality readings – Beardie Lagoon in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
1200	Surface	18.5	87	292	219	8.2
	0.5	18.4	81	295	300	8.2

3.22.2 Fish

All nets were deployed at this site. Five native species (including two carp gudgeons) and two introduced were captured. The seine net sample was subsampled with two X ¼ sub-samples being analysed. The table shows a full sample count. The lack of Yellowbelly is unusual; as was the dominance of the gill net catch by large carp. The number of Rainbowfish was also unusually high. The Bony bream covered a range of

sizes but were predominantly between 45 and 65mm. The Spangled Perch ranged from 57 to 134mm (fork length) but were mainly between 100 and 120mm. A short-necked turtle (*Emydura macquarii*) was captured in a fyke net.

■ **Table 3-22.2 Results of fishing Beardie Lagoon in May 2004.**

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Leiopotherapon unicolor</i>	Spangled Perch			26			26
<i>Nematolosa erebi</i>	Bony Bream		8	123			131
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		18				18
<i>Hypseleotris sp.4</i>	Carp gudgeon		2				2
<i>Melanotaenia fluviatilis</i>	Rainbowfish		62				62
<i>Cyprinus carpio</i>	Carp	38					38
<i>Gambusia holbrooki</i>	Mosquitofish		306	1			307
Total Numbers		38	396	150	0		584

3.22.3 Macrophytes

Ludwigia occurred in small patches and sedges were common. *Lemna* was common on the waters edge.

3.22.4 Macroinvertebrates

Surber samples were collected from the western edge amongst coarse eucalypt debris or from silt with finer debris and algal / eucalypt flower-scum. A dip net sample was taken amongst *Ludwigia* / sedge. Twenty-one discrete taxa were collected with 19 by the surbers and 14 by the dip net. Micro-crustacea, particularly copepods, dominated both catches. Ceratopogonids and corixids were also common. Bait traps returned a zero catch though a few *Macrobrachium* were captured in fyke nets.

■ **Table 3-22.3 Macroinvertebrates captured at Beardie Lagoon in May 2004**

	Edge surber		Tree
	Mean	Stddev	root dip
Acarina	1.0	1.0	6
Dytiscidae	10.2	10.5	
Hydraenidae	0.2	0.4	6
Hydrophilidae			6
Staphylinidae	0.2	0.4	
Ostracoda	37.8	12.1	320
Copepoda	808.4	330.1	22106
Cladocera	43.6	38.9	1920
s-f Chironominae	18.6	9.2	286
s-f Tanypodinae	14.8	7.8	73
s-f Orthoclaadiinae	0.2	0.4	26
Ceratopogonidae	127.4	125.6	73
Tipulidae	0.6	1.3	
Baetidae	3.0	2.7	86

Corixidae	50.6	23.9	6
Nematoda			6
Protoneuridae	0.2	0.4	
Oligochaeta	1.6	1.9	
Antipodoeciidae	0.4	0.5	
Calamoceratidae	0.2	0.4	
Leptoceridae	2.8	4.1	66
Taxa	12.6	1.5	14
Abundance	1121.8	287.2	24993
Total taxa			21

3.23 Whyenbah Lagoon

This lagoon is adjacent the Balonne River at Whyenbah and fills when flows reach approximately 23,000ML/d. The most recent flood appeared to peak about 60cm above the current water level. The landholder said the lagoon dries occasionally including during the recent drought. The site has been sampled once previously, in November 2001 but it had dried shortly afterwards. The lagoon is approximately 2km long and 20-25m across. The sides are of black clay, are very steep and it is currently about 3m in vertical distance from the water to the top of the bank. A farm road runs on the western side just 5m from the top of the bank. The riparian zone is largely restricted to the sloping bank and comprises coolibah, cooba, sally wattle and lignum. Grass cover is about 30%. The riparian zone is thicker and wider to the east. *Ludwigia* and Spiny Mud Grass grew along about 90% of the waters edge and extended 1-2m out over the water surface. A few small snags were in the water but no fibrous root habitat (as there were no tea trees). The water had an obvious green tinge and a slight algal fringe was present. The surrounding area is grazed.

3.23.1 Water Quality

Results from spot water quality sampling are shown in **Table 3-23.1**. The low turbidity suggests the sediment carried in on flood flows has settled out. The water column is well mixed and the relatively low dissolved oxygen levels probably reflect the time of day, the lack of flow or wind-induced circulation and the likely high productivity of the lagoon, given the macrophytes and green colouration.

■ **Table 3-23.1 Spot water quality readings – Whyenbah Lagoon in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
0800	Surface	16.4	67	199	27	7.9
	1.0	16.4	58	203	33	7.7
	1.5	16.3	54	204	51	7.7

3.23.2 Fish

All nets were deployed at this site. Seven native species and two introduced were captured. The Agassiz's glassfish is a rare catch and this is a threatened species. Most species were represented by a range of size classes, particularly Bony bream, Spangled Perch and Yellowbelly. When last sampled in November 2001, Hyrtl's

tandan, Agassiz's glassfish and Mosquitofish were not captured but Goldfish was. A long-neck turtle was captured in a fyke net.

■ **Table 3-23.2 Results of fishing Whyenbah Lagoon in May 2004.**

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	5		7			12
<i>Nematolosa erebi</i>	Bony Bream	4	9	8			21
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		34				34
<i>Leiopotherapon unicolor</i>	Spangled Perch		2	8			10
<i>Ambassis agassizii</i>	Agassiz's glassfish			1			1
<i>Melanotaenia fluviatilis</i>	Rainbowfish		2	2			4
<i>Neosilurus hyrtlilii</i>	Hyrtil's tandan			1			1
<i>Cyprinus carpio</i>	Carp	8		1			9
<i>Gambusia holbrooki</i>	Mosquitofish		88				88
Total Numbers		17	135	28	0		180

3.23.3 Macrophytes

Ludwigia and Spiny Mud Grass grew along about 90% of the waters edge and extended 1-2m out over the water surface.

3.23.4 Macroinvertebrates

Surber samples were collected from mud with algae and leaf litter. A dip net sample was taken amongst *Ludwigia*. Twenty-four taxa were collected; 18 by dip net and 21 by surber. The most common taxa were ceratopogonids, oligochaetes and chironomids. Bait traps captured three *Macrobrachium* and two *Cherax*.

■ **Table 3-23.3 Macroinvertebrates captured at Whyenbah Lagoon**

	Edge surber		Macrophyte
	Mean	Stddev	dip
Acarina	1.0	2.2	20
Dytiscidae	2.4	4.3	
Hydraenidae			13
Ostracoda	14.2	15.2	7
Copepoda	21.0	8.2	200
Cladocera	9.8	7.4	40
Atyidae			7
Palaemonidae	0.4	0.9	
s-f Chironominae	91.2	86.4	153
s-f Tanypodinae	63.0	38.7	320
Ceratopogonidae	184.8	111.1	320
Tipulidae	0.4	0.9	7
Baetidae	0.4	0.9	20
Caenidae	2.8	2.7	

Ancylidae	11.8	10.5	7
Corixidae	41.8	12.0	
Veliidae			7
Hydridae	2.8	4.4	
Nematoda	5.2	6.1	13
Epiproctophora	2.0	4.5	
Libellulidae	1.4	2.2	
Zygoptera	3.6	2.1	120
Oligochaeta	143.0	70.3	173
Ecnomidae	0.4	0.9	
Leptoceridae	10.0	12.6	153
Trichoptera	2.0	2.7	33
Taxa	14.4	1.7	18
Abundance	615.4	339.5	1613
Total taxa			24

3.24 Police Lagoon

This site was sampled in April 2001 but was dry by November of that year. Observations made when it was dry showed it had a very uniform bottom profile and no major snags. The lagoon apparently requires flows in excess of 60-65,000ML/d at St George to fill it. The western side or outer edge of the meander is very steep and the water is about 1m below the top. There are no ledges or benches. The eastern side is often more gradual. The riparian zone is thin and consists largely of wattles and small shrubs with occasional coolibah. Beyond this is open woodland with lignum and clumps of grass. The water body is up to 40m wide, at least 1km long and up to 3m deep. There is a tarzan swing at the site. A significant backwater exists at the entry point on the western side and the water body divides at the southern end. Tree roots were common in the water but there is no Tea Tree here so fibrous roots were not present.

3.24.1 Water Quality

Both spot and logged water quality data were collected from this site (**Table 3-24.1**). Temperature varied little with depth but dissolved oxygen rapidly declined from the surface. This may improve during the day though depth may be prohibitive. Turbidity was generally relatively low except at the very bottom.

■ **Table 3-24.1 Spot water quality readings – Police Lagoon in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
0815	Surface	17.3	80	196	127	8.1
	1.0	16.9	52	194	127	7.7
	2.0	16.8	35	198	143	7.6
	3.0	16.9	9	201	468	7.5

Overnight logging of water quality parameters showed some variation in dissolved oxygen and pH. The probe was set at approximately 20cm depth so recorded basically surface variation. The recorded ranges for each parameter were:

Temperature: 17.3 – 20.2°C

Dissolved oxygen: 61 – 100 % sat; 5.6 – 9.5mg/l

pH: 7.7 – 8.4

Conductivity: 193 – 198 µS/cm

Turbidity: 124 – 143 NTU.

3.24.2 Fish

All nets were deployed at this site. Five native species and two introduced were captured. Introduced species were very abundant in the seine and gill nets. In April 2001, Goldfish, Eel-tailed catfish, Rainbowfish and Agassiz's glassfish were captured but Smelt, Spangled Perch and Yellowbelly were not. Bony bream dominated the catch at that time (511 individuals out of a total of 541).

■ **Table 3-24.2 Results of fishing at Police Lagoon in May 2004.**

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly			2			2
<i>Nematolosa erebi</i>	Bony Bream	5					5
<i>Leiopotherapon unicolor</i>	Spangled Perch		2	21	1		24
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		1				1
<i>Retropinna semoni</i>	Smelt		7				7
<i>Cyprinus carpio</i>	Carp	28		2			30
<i>Gambusia holbrooki</i>	Mosquitofish		770	2	1		773
Total Numbers		33	780	27	2		842

3.24.3 Macrophytes

Nardoo occurred in patches, one covering an area of about 25m x 10m on a shallow bank on the eastern side. Sedges also occurred in patches. On the second day of sampling a green scum, possibly *Volvox*, covered most of the water surface.

3.24.4 Macroinvertebrates

Surber samples were collected from fine mud with significant amounts of coarse litter. A dip net sample was taken amongst *Nardoo*. Twenty-six taxa were collected; 19 by dip net and 20 by surber. The most common taxa were micro-crustacea, corixids and chironomids. No macro-crustaceans were captured in bait traps or any nets.

■ **Table 3-24.3 Macroinvertebrates captured at Police Lagoon**

	Edge surber		Macrophyte
	Mean	Stddev	dip
Acarina	2.0	4.5	8
Dytiscidae	0.8	0.8	
Elmidae			24
Hydrophilidae	0.2	0.4	

Ostracoda	1.8	1.3	332
Copepoda	148.4	319.5	16
Cladocera	327.4	711.5	12
s-f Chironominae	44.0	65.1	40
s-f Tanypodinae	63.8	24.0	160
s-f Orthoclaadiinae	0.6	1.3	8
Ceratopogonidae	18.8	23.7	24
Simuliidae	0.2	0.4	
Tabanidae	2.0	4.5	
Tipulidae	0.2	0.4	8
Baetidae	3.4	4.0	204
Caenidae			8
Physidae			8
Corixidae	158.8	62.4	32
Mesoveliidae			4
Libellulidae	0.4	0.5	
Protoneuridae			20
Oligochaeta	9.4	12.0	28
Antipodoeciidae	0.2	0.4	
Calamoceratidae			4
Ecnomidae	0.2	0.4	
Leptoceridae	1.0	1.4	108
Taxa	11.2	1.3	19
Abundance	783.6	1162.5	1048
Total taxa			26

3.25 Belah Waterhole

This site was sampled in November 2001 and November 2003 and it is described in earlier reports. The water level in May 2004 was about one metre below the surrounding ground level though the banks in backwaters gently sloped to meet it. Little or no erosion was evident. Trees grew to the waters edge and the lignum was sometimes partly submerged. Belah, wattle and occasional coolibah dominated the riparian zone for a width of about 15m then gave way to thick lignum. Ground cover was often sparse under the trees, particularly the Belah. There were quite a few dead trees, mainly Belah, in the riparian zone and plenty of snags in the water. The channel was generally about 25m wide, up to 1.4m deep and the pool is at least 1km long. At the south-eastern end of the sampled area the lagoon splits around an island while at the northern end a significant side channel / backwater is evident. The lagoon had dried completely in 2002 and re-filled from the small flow event of April 2003.

3.25.1 Water Quality

Results from spot water quality sampling are shown in Table 3-25.1. Like many sites, low dissolved oxygen and high turbidity characterised the bottom layer but there was no evidence of thermal stratification.

■ **Table 3-25.1 Spot water quality readings – Belah Waterhole in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
1145	Surface	16.6	87	206	150	7.6
	1.0	16.2	45	206	215	7.5
	1.5	16.2	45	204	468	7.7

3.25.2 Fish

All nets were deployed at this site. Seining was very difficult due to the large amount of organic debris and lack of clear edges. Five native species and two introduced were recorded. Many of the fish captured in fyke nets were small e.g. Yellowbelly between 57 and 81mm and this mirrors other sampling events at this site. In November 2003 the catch comprised Yellowbelly (6), Bony bream (12), Carp gudgeon (3), Rainbowfish (1) and Mosquitofish (4) while in November 2001 the catch comprised Bony bream (19), Spangled Perch (4), Carp (1) and Goldfish (11). Six native species and three introduced have now been captured here, generally in low numbers and often of a small size. Eight long-neck turtles were recorded in fyke nets and one in a gill net.

■ **Table 3-25.2 Results of fishing Belah Waterhole in May 2004.**

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	3		9			12
<i>Nematolosa erebi</i>	Bony Bream	9		14			23
<i>Leiopotherapon unicolor</i>	Spangled Perch			12			12
<i>Hypseleotris klunzingeri</i>	Western carp gudgeon		2				2
<i>Neosilurus hyrtlii</i>	Hyrtl's tandan			2			2
<i>Cyprinus carpio</i>	Carp		3	3	8		14
<i>Gambusia holbrooki</i>	Mosquitofish		47		3		50
Total Numbers		12	52	42	11		115

3.25.3 Macrophytes

No macrophytes were recorded but sedges occurred in patches. No bath-tub ring was observed.

3.25.4 Macroinvertebrates

Five surber samples were collected from firm silt substrate with significant amounts of organic debris (**Table 3-25.3**). A dip net sample was collected from lignum. Twenty-five discrete taxa were identified, 18 from surbers and 15 from the dip net. The most common elements were ceratopogonids, chironomids and micro-crustaceans. Bait traps captured 9 *Cherax*. *Macrobrachium* were recorded in fyke nets.

■ Table 3-25.3 Macroinvertebrates captured at Belah Waterhole

	Edge surber		Macrophyte
	Mean	Stddev	dip
Acarina			5
Dytiscidae	0.2	0.4	
Hydraenidae			55
Hydrophilidae			5
Ostracoda	1.4	1.7	
Copepoda	11.0	2.1	1580
Cladocera	0.8	0.8	540
Atyidae			5
s-f Chironominae	27.0	9.9	260
s-f Tanypodinae	3.8	3.3	
s-f Orthoclaadiinae	0.2	0.4	30
Ceratopogonidae	65.6	18.1	
Culicidae			5
Tipulidae	0.2	0.4	
Baetidae	4.8	5.4	20
Caenidae	0.2	0.4	
Ancyliidae	1.2	1.6	
Corixidae	8.2	4.0	
Mesoveliidae			5
Nepidae	0.2	0.4	
Zygoptera			5
Oligochaeta	3.8	3.3	5
Antipodoeciidae	0.4	0.5	
Hydroptilidae	0.6	1.3	
Leptoceridae	9.4	4.6	55
Trichoptera			10
Taxa	10.6	2.5	15
Abundance	139.0	29.9	2585
Total taxa			25

3.26 Clyde Lagoon

This site was sampled in November 2001 but was dry prior to the flow of April 2003. During the dry period the lagoon had been dredged and cleaned. The spoil had been placed on both banks, but primarily the western. The lagoon still has no snags and only has riparian vegetation between the fences at the windmill. *Ludwigia* regrowth has occurred but to a limited extent. Cattle were accessing the lagoon during sampling.

3.26.1 Water Quality

Spot water quality readings were taken at this site (**Table 3-26.1**). The water was well oxygenated but relatively turbid and with higher conductivity and lower pH than in November 2003.

■ **Table 3-26.1 Spot water quality readings –Clyde Lagoon, in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
1320	Surface	18.6	87	211	375	7.9
	1.0	16.5	79	210	380	7.9
	2.0	15.8	73	210	460	7.9

Overnight logging of water quality parameters showed some variation in temperature and dissolved oxygen. The probe was set at approximately 20cm depth so recorded basically surface variation. The recorded ranges for each parameter were:

Temperature: 14.5 – 19.6°C

Dissolved oxygen: 72 – 92 % sat; 7.2 – 8.5mg/l

pH: 8.1 – 8.4

Conductivity: 206 – 211 µS/cm

Turbidity: 361 – 378 NTU.

3.26.2 Fish

All nets were set at this site (**Table 3-26.2**). Five native species and one introduced were captured. Size ranges in the fyke and seine nets were: Hyrtl's tandan 79-125mm; Yellowbelly 47-152mm; Bony bream 39 – 147mm and Spangled Perch 58 – 184mm. The catch in November 2003 was very different (Bony bream, Carp gudgeon, Smelt, Carp, Goldfish and Mosquitofish) and dominated by Smelt (97 of 117). *Tandanus tandanus* was captured here in November 2001 along with three other native species (Yellowbelly, Bony bream and Spangled Perch) and three introduced. Eight native species have now been captured here.

■ **Table 3-26.2 Results of fishing Clyde lagoon in May 2004.**

Species	Common name	Gill nets	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	5	1	5	2		13
<i>Nematolosa erebi</i>	Bony Bream		6	46			52
<i>Leiopotherapon unicolor</i>	Spangled Perch		1	9			10
<i>Melanotaenia fluviatilis</i>	Rainbowfish			1			1
<i>Neosilurus hyrtlil</i>	Hyrtl's tandan		1	50			51
<i>Cyprinus carpio</i>	Carp	1	1	2			4
Total Numbers		6	10	113	2		

3.26.3 Macrophytes

Ludwigia occurred over approximately 10% of the edge. No algal ring was evident.

3.26.4 Macroinvertebrates

Surber samples were collected from fine sand/silt substrate. No algae and very little leaf litter were encountered. A dip net sample was collected from *Ludwigia*.

Twenty-four discrete taxa were identified (**Table 3-26.3**), 21 from the dip net and 12 from the surbers. The fauna was dominated by micro-crustacea, ceratopogonids,

chironomids and zygopterans. Thirty-six *Macrobrachium* and one *Cherax* were captured in bait traps and *Macrobrachium* were common in the seine hauls.

■ **Table 3-26.3 Macroinvertebrates captured at Clyde Lagoon**

	Edge Mean	Surber Stdev	Macrophyte dip
Acarina	1.0	0.7	
Collembola			7
Ostracoda	4.2	4.7	46
Copepoda	26.8	16.7	646
Cladocera	0.2	0.4	1201
Atyidae			7
Palaemonidae	0.8	0.8	7
s-f Chironominae			100
s-f Tanypodinae	3.4	1.5	31
s-f Orthoclaadiinae	0.2	0.4	46
Ceratopogonidae	4.6	3.1	354
Culicidae			30
Baetidae			30
Caenidae	0.4	0.5	
Corixidae	2.4	3.7	
Mesoveliidae			69
Notonectidae			7
Lepidoptera			15
Epiproctophora			23
Caenogrionidae			23
Libellulidae			7
Zygoptera			146
Oligochaeta	2.2	1.3	54
Leptoceridae	0.8	0.8	
Temnocephalidae			7
Taxa	9.4	1.1	21
Abundance	57.6	28.7	2863
Total taxa			24

3.27 Pilgra Lagoon Upstream

The western side of the lagoon is about 100m from the cotton field levee while on the eastern side it is over a kilometre to the fields. The riparian zone is mainly coolibah, cooba and lignum with some roly-poly. Trees and shrubs of various ages, including recent recruits, were present. The sides were of a gentle slope and showed minor erosion at gully entrance points. The lagoon was at least 800m long, 30m wide and up to 1.5m deep. Only a few minor snags were present and there was no algal fringe.

The site had been sampled in April and November 2001 and had not received flow since about November 2000.

3.27.1 Water Quality

Overnight logging of water quality parameters showed little variation, possibly because of the overcast and rainy conditions (35mm overnight). The dissolved oxygen readings may not be correct. The recorded ranges for each parameter were:

Temperature: 15.7 - 18.5°C

Dissolved oxygen: 117 – 139 % sat; 10.9 – 14.1mg/l

pH: 8.1 – 8.2

Conductivity: 233 – 238 µS/cm

Turbidity: 375 – 388 NTU.

3.27.2 Fish

All nets were deployed at this site. Three native species and three introduced were captured. Specimens were often small, e.g. Yellowbelly 42-97mm and Spangled Perch 44-210mm (though most < 100mm). Carp in the fyke net measured 135 – 234mm but in the seine were 59 and 61mm. The species complement is similar to previous sampling events though small numbers of Smelt were captured in both April and November 2001 and Yellowbelly were not captured in November.

■ Table 3-27.2 Results of fishing Pilgra Lagoon Upstream in May 2004.

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	3		34			37
<i>Nematolosa erebi</i>	Bony Bream	1	13	10			24
<i>Leiopotherapon unicolor</i>	Spangled Perch		1	31			32
<i>Cyprinus carpio</i>	Carp		2	29	4		35
<i>Carrasius auratus</i>	Goldfish			11			11
<i>Gambusia holbrooki</i>	Mosquitofish		6				6
Total Numbers		4	22	115	4		145

3.27.3 Macrophytes

No macrophytes were present.

3.27.4 Macroinvertebrates

Three surber samples were collected from black clay with leaf litter and two from clean clay. No dip net samples were collected. Nineteen discrete taxa were recorded

with the most common being ceratopogonids and chironomids. Bait traps captured four *Macrobrachium* and one *Cherax*. *Macrobrachium* were also present in the seine haul. Shells and burrows of *Holthuisana* (crab) were noted as were shells of *Alathyria*.

■ **Table 3-27.3 Macroinvertebrates captured at Pilgra Lagoon Upstream**

	Edge surber	
	Mean	Stddev
Acarina	0.2	0.4
Dytiscidae	0.4	0.9
Elmidae	0.4	0.9
Staphylinidae	0.4	0.9
Ostracoda	3.0	4.5
Copepoda	18.0	8.5
Cladocera	1.6	2.1
s-f Chironominae	9.4	3.1
s-f Tanypodinae	19.8	5.4
Ceratopogonidae	199.4	88.9
Tabanidae	0.2	0.4
Tipulidae	0.6	0.5
Baetidae	2.8	1.6
Caenidae	0.2	0.4
Ancylidae	2.0	1.6
Corixidae	12.8	7.5
Epiproctophora	0.6	0.9
Oligochaeta	3.2	1.5
Leptoceridae	5.6	6.1
Taxa	12.4	1.1
Abundance	280.6	82.4
Total taxa		19

3.28 Pilgra Lagoon Downstream

This site is about 100m east of Field 58 on Cubbie Station. The substrate is black/grey clay and the profile shows gently sloping edges on both sides. The lagoon was at least 600m long, 40m wide and up to 1.5m deep. The riparian zone is thin, moreso to the east. Coolibah and cooba are most common and the understorey is either bare, sparse lignum, or roly-poly. Some eucalypt and wattle regeneration has occurred. Cattle pugging and droppings were common inside the fence and on the eastern bank. Few snags were visible and only a few significant tree roots were in the water, mainly at the fence line.

The site had been sampled in April and November 2001.

3.28.1 Water Quality

Spot water quality data are shown in **Table 3-28.1**. The dissolved oxygen result may not be reliable so are not shown. The results more reflect those of April 2001 than those of November, when the water body was smaller, and conductivity reached 1060 μ S/cm and turbidity 1600NTU.

■ **Table 3-28.1 Spot water quality readings –Pilgra Lagoon downstream in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (μ S/cm)	Turbidity	pH
1135	Surface	16.1		345	213	8.3
	1.0	16.0		346	290	8.3

3.28.2 Fish

All nets were deployed at this site. Three native species and two introduced were captured. On the two previous sampling occasions Mosquitofish were not captured but Goldfish were. Higher numbers of natives, particularly Bony bream (111), were captured in April 2001 but only 24 individuals (16 introduced) were captured in November 2001.

■ **Table 3-28.2 Results of fishing Pilgra Lagoon Downstream in May 2004.**

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	4					4
<i>Nematolosa erebi</i>	Bony Bream		5	14			19
<i>Leiopotherapon unicolor</i>	Spangled Perch		2	8			10
<i>Cyprinus carpio</i>	Carp	6		33			39
<i>Gambusia holbrooki</i>	Mosquitofish		4				4
Total Numbers		10	11	55	0		76

3.28.3 Macrophytes

No macrophytes were present.

3.28.4 Macroinvertebrates

Surber samples were collected from compact mud and three contained leaf litter. No dip net sample was collected. Seventeen taxa were collected. The most common were ceratopogonids, micro-crustacea and oligochaetes. Bait traps captured one *Cherax* and 10 *Macrobrachium*. *Macrobrachium* were also captured in fyke and seine nets.

■ **Table 3-28.3 Macroinvertebrates captured at Pilgra Lagoon Downstream**

	Edge surber	
	Mean	Stddev
Dytiscidae	0.2	0.4
Hydrophilidae	0.4	0.9
Ostracoda	25.4	17.5
Copepoda	152.0	117.6

Cladocera	11.4	5.4
s-f Chironominae	11.8	9.3
s-f Tanypodinae	2.2	4.9
s-f Orthocladiinae	2.4	3.6
Ceratopogonidae	366.2	188.2
Tabanidae	0.4	0.9
Baetidae	1.4	1.9
Ancylidae	0.2	0.4
Corixidae	25.8	27.7
Nematoda	1.4	1.3
Zygoptera	0.2	0.4
Oligochaeta	72.0	91.7
Leptoceridae	4.6	4.2
Taxa	10.6	1.5
Abundance	678.0	320.4
Total taxa		17

3.29 Chinaman Creek

The small flows of April 2003 entered the upstream end of the Chinaman Creek floodplain but only reached the first cross floodplain channel on Cubbie. Only the most upstream of the three floodplain sampling sites on this system received any water at that time. Prior to the flow, the site had been reduced to one very small pool. At the time of sampling in May 2004 the full length of this floodplain system had been inundated by the floods of January. The exposed sand/mud bar on which melaleucas had germinated following the April 2003 flow, was now fully inundated and the trees were dead or dying. Few snags were visible, no macrophytes were recorded and only one red gum had significant roots in the water. The filamentous algal ring was well developed. A green surface scum covered about 1/3 of the water surface. The creek was about 25m wide and up to 2.5m deep. A major flood mark was about 1m above the present water level. Coarse debris was common along the edge.

3.29.1 Water Quality

Spot water quality data are reported in **Table 3-29.1**. Temperature and dissolved oxygen declined somewhat with depth but other parameters remained stable.

■ **Table 3-29.1 Spot water quality readings – Chinaman Creek in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
1400	Surface	18.8	93	189	326	7.7
	1.0	15.7	70	187	338	7.6
	2.0	15.7	65	189	345	7.6

3.29.2 Fish

All nets were deployed at this site. Five native species and three introduced were captured. Single long-neck turtles were captured in a fyke net and a bait trap. Carp

gudgeon and Smelt were captured in November 2003 but Mosquitofish was not. In November 2001, Western Carp Gudgeon contributed 145 individuals to a total catch of 176. The catch in April 2001 was just 32 individuals and was dominated by Bony Bream (22).

■ **Table 3-29.2 Results of fishing Chinaman Creek in May 2004.**

Species	Common name	Gill nets	Seine net (1)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly		2	3	1		6
<i>Nematolosa erebi</i>	Bony Bream	7	13	8			28
<i>Leiopotherapon unicolor</i>	Spangled Perch		1	3			4
<i>Melanotaenia fluviatilis</i>	Rainbowfish		2	1			3
<i>Neosilurus hyrtlil</i>	Hyrtl's tandan			2			2
<i>Cyprinus carpio</i>	Carp		1		5		6
<i>Carrasius auratus</i>	Goldfish			1			1
<i>Gambusia holbrooki</i>	Mosquitofish		5				5
Total Numbers		7	24	18	6		55

3.29.3 Macrophytes

No macrophytes were present but the bath-tub ring of filamentous green algae was well developed.

3.29.4 Macroinvertebrates

Surber samples were collected from fine mud with coarse organic matter. Seventeen taxa were collected with the most common being micro-crustacea, chironomids, oligochaetes and caenids. Bait traps captured 85 *Macrobrachium* and four *Cherax*.

■ **Table 3-29.3 Macroinvertebrates captured at Chinaman Creek**

	Edge surber	
	Mean	Stddev
Acarina	1.0	1.7
Ostracoda	3.8	4.0
Copepoda	269.8	95.9
Cladocera	22.6	23.4
Palaemonidae	4.6	4.4
s-f Chironominae	154.4	75.4
s-f Tanypodinae	5.8	7.6
Ceratopogonidae	39.6	35.5
Baetidae	3.2	1.8
Caenidae	58.6	50.9
Ancylidae	2.4	3.6
Corixidae	0.8	1.8
Gerridae	1.0	1.7
Veliidae	0.8	1.8
Nematoda	10.2	10.4

Oligochaeta	60.8	53.4
Leptoceridae	3.0	5.2
Trichoptera	4.2	3.8
Taxa	12.2	2.4
Abundance	646.6	233.9
Total taxa		17

3.30 Walla Lagoon

The site had been sampled in April 2001 but was dry by November of that year and has been dry since. The small flows of April 2003 did not reach this site but the January 2004 flows continued through the floodplain to rejoin the Culgoa River downstream of Woolerbilla. The site is 200m from cotton fields and 50m of this distance was cleared on the outside of the farm levee. It is now largely covered by *Sesbania* and coolibah regrowth. Beyond this point the woodland is largely natural and consists of coolibah, wattle and lignum and clumps of thick tall grass. The understorey is very sparse under riparian trees. The lagoon has a reasonably variable shaped edge, a generally shallow edge profile and has a firm base of black clay. There are limited small snags in the water and only a few significant tree roots. The lagoon is currently about 50m wide, up to 1.5m deep and at least 300m long. The water appeared clear but with a green tinge. There was no sign of recent use of the site by cattle but goats and pigs were seen in the area.

3.30.1 Water Quality

Results from spot water quality sampling are shown in **Table 3-30.1**. The dissolved oxygen sensor malfunctioned so results are not available. The water column was well mixed with relatively low turbidity but high conductivity and pH, suggesting the site has been isolated and steadily drying since originally flooded in January.

■ **Table 3-30.1 Spot water quality readings – Walla Lagoon in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
1630	Surface	17.9		354	34	8.6
	1.0	17.9		354	68	8.6

3.30.2 Fish

All nets were deployed at this site. Three native species and three introduced were captured (**Table 3-30.2**). The fish captured in fyke nets were generally small: Yellowbelly 49-88mm; Carp 101-143mm; Spangled Perch 27-178 (mainly 60-80 and 120-143). In April 2001, single specimens of Rainbowfish and Smelt were recorded but Yellowbelly was not. The catch at that time was dominated by Bony bream (105 of 152 individuals) though Carp (19) and Goldfish (10) were also in good numbers.

■ Table 3-30.2 Results of fishing Walla Lagoon in May 2004.

Species	Common name	Gill nets	Seine net	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Macquaria ambigua</i>	Yellowbelly	1		26			27
<i>Nematolosa erebi</i>	Bony Bream	2		2			4
<i>Leiopotherapon unicolor</i>	Spangled Perch			21			21
<i>Cyprinus carpio</i>	Carp			38			38
<i>Carrasius auratus</i>	Goldfish			2			2
<i>Gambusia holbrooki</i>	Mosquitofish		14		3		17
Total Numbers		3	14	89	3		109

3.30.3 Macrophytes

No macrophytes were observed but *Schoenoplectus* and sedges occurred in small patches. The bath-tub ring of filamentous green algae was poorly developed.

3.30.4 Macroinvertebrates

Surber samples were collected from firm clay with eucalypt leaf litter and twigs. Seventeen taxa were collected with the most common being micro-crustacea, ceratopogonids and chironomids. Bait traps captured five *Macrobrachium* and one *Holthuisana* (freshwater crab). Crab holes were common above the water line amongst lignum and around tree bases. Low numbers of *Macrobrachium* were captured in fyke nets.

■ Table 3-30.3 Macroinvertebrates captured at Walla Lagoon

	Edge surber	
	Mean	Stddev
Acarina	0.4	0.9
Dytiscidae	6.2	10.4
Ostracoda	130.2	39.8
Copepoda	208.6	97.1
s-f Chironominae	60.0	44.6
s-f Tanypodinae	69.0	52.0
s-f Orthocladiinae	0.4	0.9
Ceratopogonidae	124.6	61.8
Tipulidae	0.4	0.9
Baetidae	8.0	6.2
Physidae	0.8	1.8
Corixidae	43.4	18.7
Coenagrionidae	0.8	1.8
Libellulidae	0.4	0.9
Oligochaeta	3.8	6.9
Hydroptilidae	0.4	0.9
Leptoceridae	23.4	20.1
Taxa	10.2	1.3
Abundance	680.8	76.3
Total taxa		17

3.31 Woolerbilla Lagoon

Woolerbilla lagoon is adjacent to the Woolerbilla shearing shed, which has not been used for some years. The eastern bank is very gradually sloping with a thin riparian zone of coolibah, wattle, some lignum and grass. The trees barely overhang the water though based on the flood line they would have been inundated during the flood. Further from the bank the area is very bare and compact, possibly from holding sheep in the area. The western bank is steeper, though not steep, and better treed. The western edge is the deeper, reaching about 1.3m. It also contains more leaf and twig litter as the water abuts the riparian zone. This is a very clean lagoon, with no evidence of recent grazing, only wader footprints and no snags or macrophytes. The substrate was compact clay with a fine surface coating of recently settled sediment. A smear of algae and eucalypt flowers coated the substrate near the shore. The pool is isolated, about 200m long, 60m wide and up to 1.3m deep, though most is much shallower. The water was clean with a green tinge.

The site had been sampled in April 2001 but was dry by November of that year and no flows had reached it till January 2004.

3.31.1 Water Quality

Spot water quality data were collected from this site (**Table 3-31.1**). The dissolved oxygen meter malfunctioned so no data are available. The lagoon showed low turbidity but high conductivity and pH, characteristic of a waterbody which is stable and drying out.

■ **Table 3-31.1 Spot water quality readings – Woolerbilla Lagoon in May 2004**

Sampling Time	Depth (m)	Temp. (°C)	DO (% sat.)	Conductivity (µS/cm)	Turbidity	pH
1630	Surface	17.8		446	85	9.1
	1.0	17.7		446	91	9.1

3.31.2 Fish

All nets were deployed at this site. Three native species and two introduced were captured. Mosquitofish and Spangled Perch were dominant. Spangled Perch ranged between 48 and 150mm in length, with many in the 50-85mm range. On the only other sampling occasion, the fish catch was: Bony bream (23), Spangled Perch (16), Carp gudgeon (1), Carp (27), Goldfish (57) and Mosquitofish (4). Five Eastern Snake-necked turtles (*Chelodina longicollis*) were captured in fyke nets.

■ **Table 3-31.2 Results of fishing Woolerbilla Lagoon in May 2004.**

Species	Common name	Gill nets	Seine net (2)	Fyke nets	Bait traps	Dip net	Total Numbers caught
<i>Nematolosa erebi</i>	Bony Bream		5	2			7
<i>Leiopotherapon unicolor</i>	Spangled Perch		3	125	3		131
<i>Melanotaenia fluviatilis</i>	Rainbowfish		1				1
<i>Cyprinus carpio</i>	Carp	4					4
<i>Gambusia holbrooki</i>	Mosquitofish		60	1	81		142
Total Numbers		4	69	128	84		285

3.31.3 Macrophytes

No macrophytes were present.

3.31.4 Macroinvertebrates

Three surber samples were collected from the western bank and two from the eastern. Those from the western bank contained significant amounts of coarse litter. Thirteen taxa were collected with the most common being micro-crustacea, ceratopogonids and chironomids. Bait traps captured no macroinvertebrates though two *Cherax* and some *Macrobrachium* were captured in a fyke net. *Alathyria* (mussels) were noted near the edge. Dragonfly castes were common on tree trunks near the water, as they were at many sites, and numerous flying ants were dead on the water surface on the second day.

■ Table 3-31.3 Macroinvertebrates captured at Woolerbilla Lagoon

	Edge surber	
	Mean	Stddev
Acarina	1.6	2.2
Dytiscidae	20.8	23.2
Hydrophilidae	0.8	1.8
Ostracoda	49.6	55.3
Copepoda	995.2	1596.1
s-f Chironominae	85.6	47.0
s-f Tanypodinae	299.2	166.5
Ceratopogonidae	602.4	620.5
Baetidae	41.6	84.2
Corixidae	62.4	76.7
Nematoda	0.8	1.8
Libellulidae	2.4	3.6
Zygoptera	0.8	1.8
Leptoceridae	36.8	13.7
Taxa	9.8	1.5
Abundance	2200.0	1533.9
Total taxa		13

3.32 Big Holes

Not sampled.

4. Discussion

4.1 Water quality

The range of the various parameters recorded overnight was often very small, indicating a well mixed water column without significant algal productivity and responding to generally small atmospheric variations.

Table 4-1.1 summarises the results from all sites sampled in May 2004. Shading highlights individual river systems. Ranges are given where time series data are available. To be comparable, only surface records are given for sites where time series data were not available. The Warrego tends to show similar pH and conductivity to the Lower Balonne but Shannonvale shows much lower turbidity and this is commonly the case. This may be because the site is just below the weir, is relatively deep and often not flowing. The site at Tinnenburra is much shallower and probably easily disturbed, hence shows higher turbidity. The Nindigully site on the Moonie River shows higher turbidity but lower conductivity and this is a more consistent result through time.

The floodplain sites often show relatively high pH and conductivity but the turbidity tends to be either very high or very low. It appears that at the most isolated sites, if not disturbed through stock access, the sediment will settle out and produce very low turbidity water along with apparently increased production by suspended algae. If stock are allowed to access shallow sites, turbidity can be very high.

On this occasion there appeared no trend for conductivities to increase in a downstream direction, perhaps reflecting the flushing by the January flood and the mixing effect of the dam release flow. The dam release flow appears to have made the water quality throughout the system rather uniform, breaking any pattern of natural drying. The status of isolated floodplain areas or of Briarie Ck, which is itself isolated, appears to support the hypothesis. These small flows may also be part of the reason for higher turbidities near the bottom, though disturbance by fish may also be a cause.

4.2 Macrophytes

Macrophytes were very limited in their distribution and *Ludwigia* remains the most commonly encountered species. *Azolla* is occasionally seen but was not significant at any site. The fringe of filamentous green algae was a common though not uniform sight and development was often not pronounced.

■ **Table 4-1.1 Summary Water Quality Data for May 2004.**

	Temperature °C	Dissolved O ₂ % sat	Conductivity µS/cm	pH	Turbidity NTU
Balonne-St George	18.2-19.9	78-86	126-130	7.7-7.8	219-221
Balonne-Mooramanna	20.5	101	146	8.2	160
Balonne at Whyenbah	16.4-19.6	64-74	148-153	7.7-7.7	150-155
Culgoa at Whyenbah	16	97	129	7.8	228
Culgoa at Cubbie	15.5-19.3	61-96	139-145	7.6-7.9	200-209
Culgoa at Woolerbilla	13.6-16.5	84-104	148-154	7.9-8.0	181-187
Culgoa at Balandool	15.6	NA	149	7.7	186
Balonne Minor-Meigunyah	16.4	90	128	7.7	229
Balonne Minor-Trafalgar	14.1-16.0	73-86	149-153	7.6-7.7	179-194
Narran at Donegri	15.3-16.1	87-90	126-131	7.6-7.7	213-231
Narran at Clyde	15.1	77	147	7.6	267
Narran at Booligar	15.3	108	165	7.5	258
Balandool on Cubbie	16.3	99	136	7.4	210
Balandool at Euraba	15.0-15.9	91-98	131-136	7.7-7.8	212-229
Bokhara at Kirrima	15.0	91	148	7.6	201
Bokhara at Koala	13.1-15.4	77-83	135-140	7.7-7.9	363-381
Briarie Ck	16.0	93	303	8.6	468
Warrego-Shannonvale	14.5-16.6	64-78	164-169	7.7-7.7	86-93
Warrego-Tinnenburra	14.5	100	168	7.8	195
Moonie at Nindigully	13.7	88	128	7.3	461
Beardie Lagoon	18.5	87	292	8.2	219
Lower Plains	15.9	104	228	8.3	230
Sevels Lagoon	16.4	67	199	7.9	27
Police Lagoon	17.3-20.2	61-100	193-198	7.7-8.4	124-143
Belah Creek	16.6	87	206	7.6	150
Clyde Lagoon	14.5-19.6	72-92	206-211	8.1-8.4	361-378
Pilgra U/S	15.7-18.5	NA	233-238	8.1-8.2	375-388
Pilgra D/S	16.1	NA	345	8.3	213
Chinaman Creek	18.8	93	189	7.7	326
Walla Lagoon	17.9	NA	354	8.6	34
Woolerbilla Lagoon	17.8	NA	446	9.1	85

Note: Ranges are from logged data. Single data points are surface recordings from stratification data. River systems are denoted by shading.

4.3 Fish

In a total catch of 4861 individuals, eleven native species of fish (with *Hypseleotris* pooled) were identified from sites in the Lower Balonne and eight from the three reference sites. The number of taxa is in accord with historical sampling. The overall abundance is very similar to that captured in November 2003 even though 30% more sites were sampled. The main differences are that the number of Smelt has reduced from 2544 to 30, and the number of *Gambusia* has increased from 704 to 1883.

Table 4-3.1 summarises the fish catch across all sites. Shading in the table marks each river and sites are placed from upstream to downstream within each river. The number of native species recorded at test sites varied between two and seven and at reference sites between five and seven (note only three reference sites were sampled compared to 28 test sites). The number of individuals captured varied from 20 to 842 at test sites and from 62 to 337 at reference sites. It should be remembered that the use of the seine and the proportion of total habitat sampled, that is, the size of the available pools, also varied among sites and this can significantly affect the total catch.

The most diverse and abundant fauna was found at Shannonvale on the Warrego River, the Cubbie site on the Culgoa River, Mooramanna on the Balonne Minor and at Whyenbah Lagoon. Shannonvale has reported very good results since May 2002 and this may reflect that prior to that time the Warrego was in drought but an above average summer flood in 2000/2001 has been followed by good summer flows each year since. The least diverse and abundant fauna was recorded at Culgoa at Woolerbilla, Bokhara at Kirrima, Narran at Clyde, Balonne Minor at Trafalgar and several floodplain sites; Pilgra U/S and D/S, Walla, Woolerbilla Lagoon and Briarie Ck. These sites do not appear to share any obvious physical characteristics which might explain the result, for example the Woolerbilla, Kirrima and Clyde sites generally lack habitat diversity but Trafalgar certainly does not. The lagoon sites all represent temporary habitat to various degrees.

The most commonly encountered species at test sites were Bony Bream (all sites), Yellowbelly (all but one site) and Spangled Perch, Carp and Mosquitofish (each all but five sites). The most abundant species at test sites were Mosquitofish (43.5% of the total catch), Bony bream (27.2%), Spangled Perch (8%), Carp (6.8%) and Yellowbelly (6.7%). Introduced species contributed 50.8% of the catch at test sites and 13.2% at reference sites. Both figures are a significant increase on the samples from November 2003 and the highest for test sites recorded to date. Fewer Carp and Goldfish were captured at river sites than is usually the case. The least common species were Murray Cod, Silver Perch and Agassiz's glassfish (each with 1 individual), and Eel-tailed catfish (5 individuals). Interestingly Spangled Perch was one of the least common fish in the November 2003 samples and Smelt was the most common (only 30 individuals captured in May 2004).

Test lagoons produced on average 239 fish per site compared to 84 fish per test river site. Mosquitofish and Carp were far more common at lagoon sites, as were Spangled Perch and small Yellowbelly. As many of the floodplain sites had been dry for variable periods of time prior to the flows of January 2004, considerable recolonisation of the habitats has occurred. The flood was at a level which by-passed most of the physical barriers in the region hence allowed considerable movement within the main channels and floodways and laterally to the anabranches and floodplain. Many more large Yellowbelly were captured at test river sites than in recent times. This indicates either that our prior regional sampling failed to detect the number of large individuals remaining there during the drought or that the fish have migrated from outside our sample area.

The patchy distribution of many species in both time and space shows that programs which do not sample at an intensity or frequency similar to that used here will fail to detect the rarer species or will not be able to relate numbers of species or individuals to environmental conditions.

■ 4-3.1 Summary of fish catch by site; May 2004

Site	<i>Maccullochella peelii peellii</i>	<i>Macquaria ambigua</i>	<i>Leiopotherapon unicolor</i>	<i>Bidyanus bidyanus</i>	<i>Nematalosa erebi</i>	<i>Hypseleotris spp</i>	<i>Melanotaenia fluviatilis</i>	<i>Retropinna semoni</i>	<i>Tandanus tandanus</i>	<i>Neosilurus hyrtii</i>	<i>Ambassis agassizi</i>	<i>Cyprinus carpio</i>	<i>Carrasius auratus</i>	<i>Gambusia holbrooki</i>	Total count	Natives	Introduced
St George	0	4	1	0	232	26	0	13	1	0	0	1	0	5	283	6	2
Mooramanna	1	4	0	0	60	12	0	5	0	0	0	0	0	132	214	6	1
Whyenbah	0	3	0	0	9	11	3	1	0	0	0	1	0	13	41	6	2
Culgoa at Whyenbah	0	7	1	0	65	8	1	0	0	0	0	0	0	71	153	5	1
Culgoa at Cubbie	0	18	0	1	18	2	3	4	0	1	0	1	0	0	48	7	1
Culgoa at Woolerbilla	0	21	0	0	7	0	0	0	0	0	0	0	0	2	30	2	1
Culgoa at Balandool	0	11	2	0	12	0	0	0	0	0	0	2	0	34	61	3	2
Meigunyah	0	5	6	0	24	4	1	0	1	0	0	10	0	5	56	6	2
Trafalgar	0	5	2	0	45	0	0	0	0	0	0	3	0	73	128	3	2
Balandool on Cubbie	0	16	7	0	27	0	0	0	0	1	0	2	1	0	54	4	2
Balandool at Euraba	0	3	4	0	2	0	0	0	0	0	0	0	0	11	20	3	1
Bokhara at Kirrima	0	6	2	0	14	0	0	0	0	2	0	0	1	0	25	4	1
Bokhara at Koala	0	10	1	0	10	0	0	0	0	0	0	4	2	1	28	3	3
Donegri Ck	0	16	2	0	28	0	0	0	2	3	0	11	2	4	68	5	3
Narran at Clyde	0	7	0	0	49	0	0	0	0	2	0	4	1	2	65	3	3
Narran at Booligar	0	20	5	0	28	0	0	0	1	0	0	6	2	0	62	4	2
River summary	1	156	33	1	630	63	8	23	5	9	0	45	9	353	1336	10	3
Briarie Ck	0	7	13	0	123	0	0	0	0	0	0	18	0	49	210	3	2
Beardie Lagoon	0	0	26	0	131	20	62	0	0	0	0	38	0	307	584	5	2
Lower Plains	0	8	12	0	78	0	2	0	0	0	0	10	0	36	146	4	2
Sevels Lagoon	0	12	10	0	21	34	4	0	0	1	1	9	0	88	180	7	2
Belah Waterhole	0	12	12	0	23	2	0	0	0	2	0	14	0	50	115	5	2
Police Lagoon	0	2	24	0	5	1	0	7	0	0	0	30	0	773	842	5	2
Clyde Lagoon	0	13	10	0	52	0	1	0	0	51	0	4	0	0	131	5	1
Pilgra U/S	0	37	32	0	24	0	0	0	0	0	0	35	11	6	145	3	3
Pilgra D/S	0	4	10	0	19	0	0	0	0	0	0	39	0	4	76	3	2
Chinaman Ck	0	6	4	0	28	0	3	0	0	2	0	1	1	5	50	5	3
Walla Lagoon	0	27	21	0	4	0	0	0	0	0	0	38	2	17	109	3	3
Woolerbilla Lagoon	0	0	131	0	7	0	1	0	0	0	0	4	0	142	285	3	2
Lagoon summary	0	128	305	0	515	57	73	7	0	56	1	240	14	1477	2873	8	3
Test site summary	1	284	338	1	1145	120	81	30	5	65	1	285	23	1830	4209	11	3
Shannonvale	0	20	4	0	34	18	2	1	0	173	0	1	0	0	253	7	1
Tinnenburra	0	14	1	0	23	0	20	0	0	1	0	1	0	2	62	5	2
Nindigully	0	34	18	0	200	0	0	0	1	2	0	28	3	51	337	5	3
Reference summ	0	68	23	0	257	18	22	1	1	176	0	30	3	53	652	8	2

4.4 Macroinvertebrates

Table 4-4.1 summarises the macroinvertebrate data for all sites. A trend observed in the May 2002 and November 2003 data wherein both the number of taxa and the number of individuals per surber sample increased downstream within each test river, is evident in the Bokhara and Balandool rivers but not others. This probably reflects the differential effect of the dam release flows and the timing of our sampling relative to those flows. Some sites were not affected by the flows at all while others ranged from very recently affected to being affected several days ago. For example Mooramanna and St George were sampled on consecutive days but St George was very recently affected by the rise in water levels but Mooramanna was not at all.

The 155 surber samples produced 76,626 individuals while the 18 dip net samples added a further 65,187 individuals. Fifty-two discrete taxa were recorded in total. Surber samples recorded 40 taxa at test river sites and 25 at reference sites (many fewer reference sites were sampled). Only two taxa were recorded at reference sites which were not recorded at test sites, and these were in very low numbers. Surbers from lagoon sites produced 42 taxa with nine not found in test river samples. Seven taxa found in test river samples were not found at lagoon sites. These were all in low abundances. Dip net samples produced 48 taxa but again the differences related to relatively uncommon taxa.

As has been suggested previously, the pool of taxa available in the region is about 60 at the current level of discrimination and the number at any one site tends to be between 20 and 30 at any one time when it is stable.

In all summary statistics (surbers in “test” and “reference rivers”, “lagoon sites” and “dip nets”) the two most common taxa provided between 54 and 72% of the fauna by abundance. The most common 5-10 taxa tended to be the same in each sample type and to be in similar order of relative abundance, though cladocerans showed higher relative abundance in dip net samples. The most common taxa were copepods, ceratopogonids, chironominae, tanypodinae, cladocera and caenids. Taxa such as Odonata, Trichoptera, Hemiptera, Coleoptera, Atyidae, Palaeomonidae and Lepidoptera tended to be more common in dip net samples.

Faunal abundance per unit area was generally an order of magnitude less than when last sampled in November 2003 and more like the results following the fluctuating compensation flows of May 2002. This may reflect the concentration of the fauna which occurred at the height of the drought and/or the inability of the fauna to react to rapidly changing water levels as abundance and diversity were higher at the more stable sites, such as floodplain sites.

Clyde lagoon recorded the poorest of the floodplain results and it is noticeable that most taxa were found in the small area of available macrophyte habitat. This may indicate that the lagoon is still recovering from having been dredged while it was dry. As many floodplain sites had been dry for some time before sampling, the degree of recolonisation has been considerable.

■ **Table 4-4.1 Summary of macroinvertebrate data**

	Taxa (Surbers)	Taxa (dip nets)	Taxa Total	Individuals (surber)
Balonne at St George	7.2+/-0.4	17	12(19)	58+/-29
Balonne at Mooramanna	13.2+/-1.1	21	20(24)	514+/-220
Balonne at Whyenbah	11.6+/-2.1	20	21(26)	375+/-144
Culgoa at Whyenbah	7.4+/-1.9		13(21)	96+/-40
Culgoa at Cubbie	10.0+/-2.2	15	16(22)	447+/-208
Culgoa at Woolerbilla	8.2+/-1.3		11	126+/-17
Culgoa at Balandool	7.2+/-1.9	11	14(16)	29+/-16
Balonne Minor at Meigunyah	8.2+/-2.7	10	13(16)	75+/-67
Balonne Minor at Trafalgar	6.8+/-1.1	18	14(21)	68+/-27
Narran at Donegri	7.6+/-1.1	18	16(23)	36+/-24
Narran at Clyde	10.8+/-1.3		16	399+/-385
Narran at Booligar	4.2+/-0.4		11	62+/-18
Balandool on Cubbie	5.0+/-0.7		8	21+/-13
Balandool on Euraba	6.4+/-1.3		13	63+/-11
Bokhara at Kirrima	5.4+/-1.3		10	39+/-17
Bokhara at Koala	10.8+/-0.8	24	12(26)	1893+/-883
Briarie Ck	11.8+/-0.8		17	982+/-480
Beardie Lagoon	12.6+/-1.5	14	19(21)	1122+/-287
Lower Plains Lagoon	11.2+/-1.6		14	1055+/-919
Sevels Lagoon	14.4+/-1.7	18	23(24)	615+/-340
Belah Creek	10.6+/-2.5	15	18(25)	139+/-30
Police Lagoon	11.2+/-1.3	19	20(26)	784+/-1162
Clyde Lagoon	9.4+/-1.1	21	13(24)	58+/-29
Pilgra U/S	12.4+/-1.1		19	281+/-82
Pilgra D/S	10.6+/-1.5		17	678+/-320
Chinaman Ck	12.2+/-2.4		18	647+/-234
Walla Lagoon	10.2+/-1.3		17	681+/-76
Woolerbilla Lagoon	9.8+/-1.5		14	2200+/-1534
Warrego at Shannonvale	10.8+/-1.3	19	22(26)	571+/-258
Warrego at Tinnenburra	8.4+/-1.3		15	252+/-118
Moonie at Nindigully	9.2+/-1.3		13	161+/-24

Note: Taxa total column shows the surber total then site total in brackets.

4.5 Current Status

This sampling event was undertaken nearly four months after a moderate summer flood had broken an extreme drought. It was concluded following the sampling of November 2003, conducted at the height of the drought, that the fish and macroinvertebrate fauna appeared to have survived the drought and would be available to recolonise when the drought broke. This seems to have occurred.

Recolonisation by fish and macroinvertebrates was rapid and substantial both within the river and on the floodplain. The species complement was similar to that from before the drought but the relative abundance of species changed, reflecting the reactions of different species to the changed circumstances. Floodplain sites reacted differently to river sites, though there was a continuum of variable similarities. It

would be expected following the drought that the fauna would take some time to re-establish throughout the system and to re-build population levels, particularly as much of the fauna is associated with algae or macrophytes and these needed to re-establish first.

The reactions noted here are similar to, but not the same as, those seen following the series of compensation flow releases in early 2002. Those flows did not reach the floodplain but did stimulate faunal re-distribution and breeding in the river.

The data collected to date suggests that during times of drought the river can be stimulated to a significant extent by flows as low as compensation releases. It also appears that once a small flood or compensation flow has stimulated the river, rapidly changing water levels in the few months following associated with further flows, natural or otherwise, can disturb the succession and could be detrimental to floral and faunal development. In this particular case the flow was in natural sequence though reduced in size through the dam taking water into storage. The Intermediate Disturbance Hypothesis suggests that occasional disturbances are beneficial to biodiversity by not allowing any particular species to dominate the ecosystem so in the long term such disturbances should be construed as beneficial. However, considering that in this circumstance the drought and a moderate flood had already disturbed the river, perhaps the short-term benefits of stability outweighed the long-term benefits of further disturbance.

The sampling program to date has been able to show these possible benefits and costs of small dam releases, including compensation flows, to the river but sampling following a range of flow levels which reach various parts of the floodplain will be required in order to better define the benefits of moderate and large floods. The events sampled to date could be termed “bust” and “small boom”.

Smartdrivers should consider approaching the appropriate management group regarding ecological consequences of the timing of natural flow or compensation flow releases. In the circumstance where the dam is already full and a natural inflow occurs then there is no management action possible so the question to consider is with respect to the case of a natural inflow when there is room in the dam to store it. In most cases the likely best management action would be that which was undertaken in May 2004, that is, take some into storage but release some in natural sequence. In some cases however, such as after a drought and flood sequence, it may be best to release as little as possible in order that recovery is not disturbed and save the water for release as a compensation flow in spring which would also serve the purpose of stimulating the river at an appropriate time of year. The adaptive approach to flow management in the Lower Balonne would appear to allow consideration of such issues.

5. References

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