Eastern Mount Lofty Ranges – reviewing the need to restore flows

DEWNR Technical note 2018/43

Government of South Australia
Department of Environment, Water and Natural Resources

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on behalf of
Department of Environment, Water and Natural Resources

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1 Context

1.1 Introduction and purpose

This report has been prepared on behalf of the South Australian Murray-Darling Basin Natural Resources Management Board (SAMDB NRM Board) to provide a summary of scientific evidence related to the impact of development of surface water resources on ecologically important parts of the flow regime across the Eastern Mount Lofty Ranges catchments. It draws on information from a number of monitoring programs and investigations undertaken by the SAMDB NRM Board and other agencies related to changes in the flow regime across the Eastern Mount Lofty Ranges, catchment health and the decline in native fish species.

The purpose of this report is to provide a summary of existing literature relating to the impacts of altered flow regimes on catchment health in the area. This summary provides context for monitoring programs assessing the effectiveness of water management responses, such as securing low flows and managing high demand (see section 4), as part of the monitoring, evaluation, review and improvement program for water planning in the area.

1.2 Background

The Eastern Mount Lofty Ranges (which includes the Eastern Mount Lofty Ranges and Marne Saunders Prescribed Water Resources Areas) is a distinct and outlying section of the Murray–Darling Basin. This Mediterranean-climate region naturally experiences long hot summers and low to moderate rainfall (ranging between 300–900mm: CSIRO 2007), predominantly falling in winter and early spring months. The region was once densely covered with native vegetation, and whilst most streams only flowed intermittently, sections of permanent water maintained water-dependent ecosystems that supported a diversity of aquatic plants and animals (Hammer 2004, O'Connor et al. 2008). These ecosystems included flowing stream sections as well as wetlands and swamps, such as the critically endangered swamps of the Fleurieu Peninsula. Sufficient stream flow also ensured more frequent connection of aquatic habitats in the Eastern Mount Lofty Ranges with the River Murray and Lower Lakes (including the internationally recognised Coorong and Lakes Alexandrina and Albert wetland Ramsar site), via the confluences of Currency Creek and the Finniss, Angas and Bremer Rivers.

The region's water-dependent ecosystems have been impacted due to European settlement and many are now under stress. These impacts include:

1. Clearance of native vegetation resulting in an estimated less than 10% of pre-European vegetation extent remaining (O'Connor et al. 2008).
2. Development of surface water and groundwater resources. For example, over 8000 dams have been constructed across the region (CSIRO, 2007). The amount of water held by dams across the region has increased over time. In the Marne River catchment, dam capacity more than doubled in the 1990s (from 1123 to 2422ML over 1991–1999: Savadamuthu 2002).
3. Urban and agricultural development with 77% of the region defined with a land use of grazing and cropping.
4. Establishment of introduced plants and animals.

While the condition of water-dependent ecosystems in the Eastern Mount Lofty Ranges has been severely impacted by cumulative effect of these changes to the landscape, changes to the flow regime is acknowledged as one of the more significant drivers (Hammer 2004, VanLaarhoven and van der Wielen 2009, SAMDB NRM Board 2013).

2 Flow in the Eastern Mount Lofty Ranges

2.1 Impacts to flow regime

The flow regime of a stream is the characteristic pattern (quantity, timing and variability) of its flow across the year (Poff et al. 1997). In Eastern Mount Lofty Ranges streams, flow regimes follow distinct 'flow seasons': low flow season over summer to mid-autumn and high flows over late winter to spring, with associated transition periods, where flows increase or decrease, between them (Figure 2.1) (VanLaarhoven and van der Wielen 2009). The key measures across these flow seasons are how often and long flow periods occur, (i.e. zero flows, low flows, freshes (small pulse flows) and high flows), all of which are critical to water-dependent ecosystems.

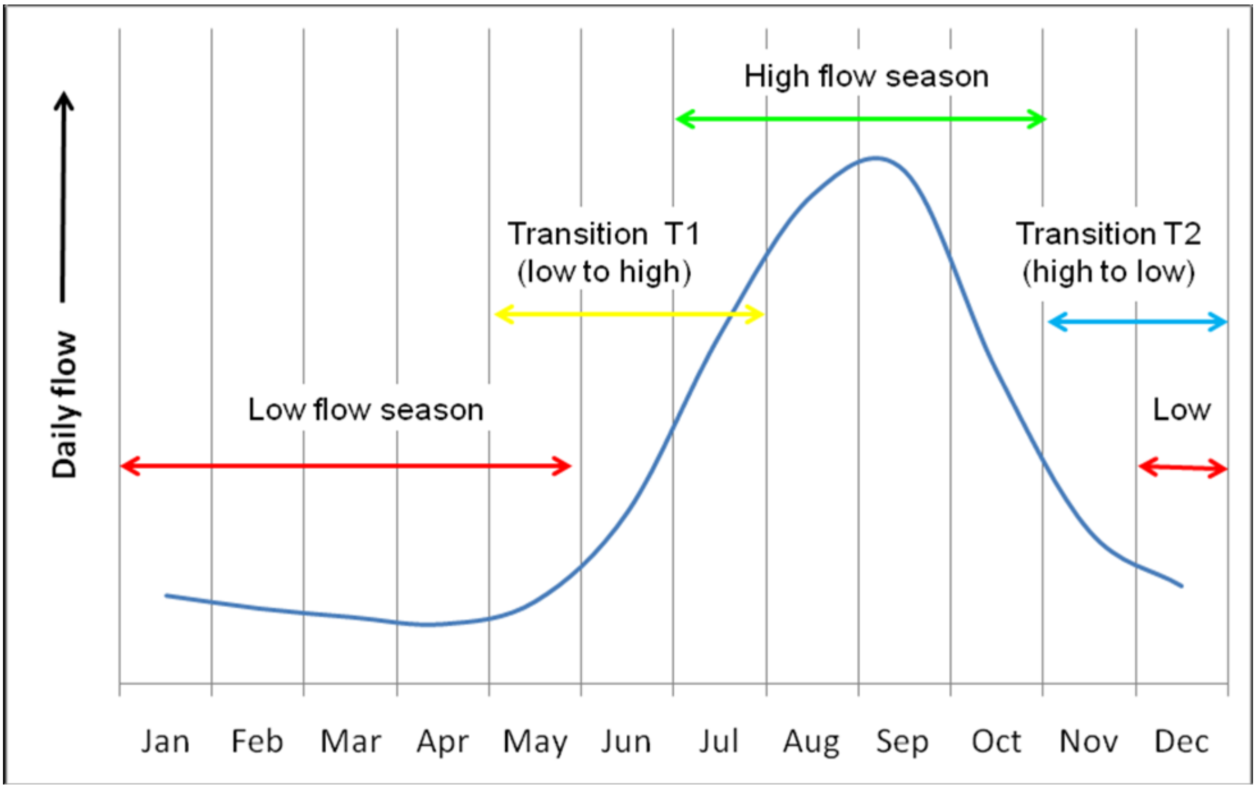

Figure 2.1 Typical range of flow seasons in the Mount Lofty Ranges against relative daily flow.

The impacts of surface water resource development have been observed through monitoring of flow gauging stations across the catchment, together with flow modelling that simulates what the flow regime would have been without dams and diversions (Alcorn et al. 2008, VanLaarhoven and van der Wielen 2009). Using this information, it has been possible to assess the effects of current surface water resource development on key measures of the flow regime at 135 sites across the whole Mount Lofty Ranges (VanLaarhoven and van der Wielen 2009). Table 2.1 summarises these results, showing the impact on key measures of the flow regimes are not uniform across the flow seasons, highlighting the percentage of occasions that these flow measures are considered to fail against ecological targets (when comparing current flow with flows estimated without dams or diversions over the same years). Under current conditions, the length of time with no (zero) flow is longer. In addition, low flows, when they occur, are smaller (fewer events, lower volume and shorter duration) throughout the year. This results in around a third of sites failing measures related to zero and low flows through all flow seasons. Freshes or small pulse flows are shorter and happen less often under current conditions, with negative impacts strongest in the low flow season, and least effect in the high flow season. High flows, which occur throughout the year, have been affected less, with 4% of sites failing these measures under current conditions.

These measures also assess the timing of the start and end of the primary flow period, which starts at the transition from low to high flow season, and ends after the transition from high to low flow season. The measure of timing of the start of the flow season failed under current conditions at almost three quarters of sites, showing a delay to the start of the flow season. The measure of timing of the end of the flow season failed under current conditions at more than half of sites, showing an early end to the flow season.

In summary, the main impacts experienced under the current flow regimes are:

- **Shorter flowing season**: the flow season starts later and ends sooner
- **Zero flow days**: times of zero flow happen more often and last longer
- **Low flows**: low levels of flow, when they occur, are smaller throughout the year
- **Freshes or small pulse flows:** happen less often and are shorter outside the high flow season.

The changes to the flow regime occur because flow is captured by dams until they fill and spill, delaying or reducing downstream stream flow. This is particularly apparent during the low flow season and the transition seasons when there is less water in dams due to use and evaporation. This impact can be exacerbated by direct extraction from streams. Dams are nearer capacity in the high flow season, so they spill sooner and have less impact on downstream flows.

Table 2.1 Summary of percentage of Mount Lofty Range sites failing flow measures in different seasons under current conditions. Data provided by VanLaarhoven and van der Wielen (2009) based on flow models described in Alcorn *et al.* (2008).

<table>
<tr><th rowspan="2">Flow season</th><th colspan="4">Percentage (%) of sites failing measures under current flows</th></tr>
<tr><th>Zero and low flows</th><th>Freshes</th><th>High flows</th><th>Seasonal timing</th></tr>
<tr><td>Low flow season</td><td>39</td><td>70</td><td rowspan="4">4</td><td rowspan="3">72</td></tr>
<tr><td>Transition from low to high flow</td><td>32</td><td>34</td></tr>
<tr><td>High flow season</td><td>28</td><td>10</td></tr>
<tr><td>Transition from high to low flow</td><td>37</td><td>34</td><td>53</td></tr>
</table>

Source: Data is summarised from Table 3 from VanLaarhoven and van der Wielen (2009), comparing values for flow measures under current conditions and modelled no dams flow across 135 sites over 1974–2006, averaged across flow measures for flow types.

To further illustrate these changes, it is again useful to compare average current flows with those predicted under modelled flow without dams or diversions scenarios. Using the Bremer River at Hartley (Gauge A4260533) as an example, it is possible to explore the percentage (%) reduction in average flow by month (Figure 2.2) as well as the increase in the number of zero flow days (Table 2.2) under the current flows (based on the period from 1974 to 2012). Figure 2.2 shows that the greatest reduction in flow occurs during the low flow season (reduction in flow ranged between 10.3–61.1%), with moderate reductions in the transitional times (low flow to high flow transition: range between 35.4–45.4%; transition from high to low flow season was 21.2%) and the least change during the high flow season (ranged between 4.3–16.0%). Table 2.2 indicates that Bremer River at Hartley now experiences an average of 67.5 zero flow days per year whereas modelled flow without dams or diversions suggests there would have only been an average of 9.7 zero flow days each year over this period. Furthermore, 84.6% of years have periods of zero flow under current flows, but without dams or diversions, only 28.2% of years were predicted to have zero flows.

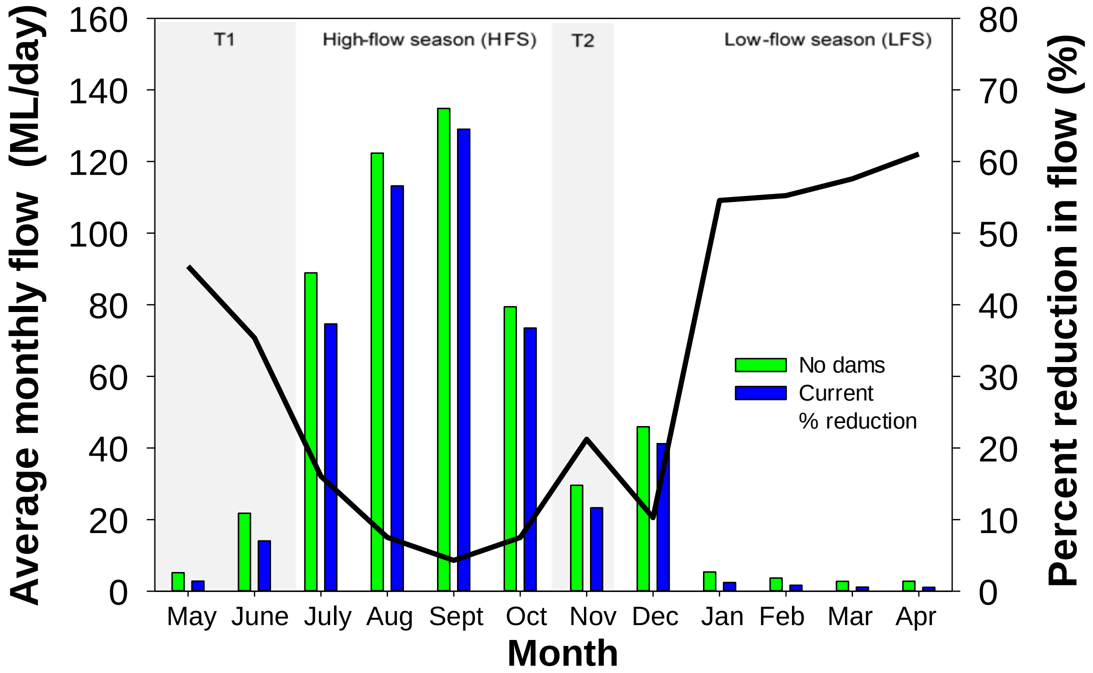

Figure 2.2 Average monthly flow (ML/day) and percent reduction (%) in flow between modelled no dams and actual current flow for the Bremer River at Hartley (Gauge A4260533) based on daily flow averaged over 1974 to 2012. Flow seasons are: high flow season (HFS), transition between high to low flows (T2), low flow season (LFS) and transition between low and high flows (T1). Data provided by Department of Environment, Water and Natural Resources (DEWNR) based on flow models described in Alcorn *et al.* (2008) and Alcorn (2011).

Table 2.2 Comparison of number of zero flow days per year under modelled no dams and actual current flow for the Bremer River at Hartley (Gauge A4260533) based on daily flow for 1974 to 2012. Data provided by DEWNR based on flow models described in Alcorn *et al.* (2008) and Alcorn (2011).

Year	Number of zero flow days	
	No dams	Current
1974	0	0
1975	0	0
1976	0	31
1977	0	98
1978	76	102
1979	0	29
1980	0	9
1981	0	79
1982	41	58
1983	36	80
1984	0	52
1985	0	74

Year	Number of zero flow days	
	No dams	Current
1986	33	107
1987	0	0
1988	0	54
1989	0	108
1990	0	90
1991	38	115
1992	0	0
1993	0	0
1994	0	134
1995	2	121
1996	0	22
1997	0	16
1998	0	114
1999	0	95
2000	0	60
2001	0	5
2002	0	111
2003	10	83
2004	0	102
2005	0	113
2006	10	70
2007	38	138
2008	24	165
2009	69	116
2010	0	0
2011	0	4
2012	0	76
Average	***9.7***	***67.5***
Max per year	*76*	*165*
Min per year	*0*	*0*
Percentage of years with zero flows	***28.2%***	***84.6%***
Total	*377*	*2631*

2.2 Flow as a driver of ecosystem condition

Flow plays a critical role in all aspects of water-dependent ecosystems, with changes in flow linked to the decline of aquatic plants and animals (Poff et al. 1997, Bunn and Arthington 2002). Flow governs many processes and functions over different spatial and temporal scales, such as the transport of sediments and nutrients, ecological functioning and water quality of ecosystems, and lateral and longitudinal connection. For aquatic plants and animals, flow regulates the amount of physical habitat and food resources available, the connection between habitats and populations, and many life history traits which have evolved to be linked to natural flows. These flow-dependent processes determine how aquatic plants and animals grow, reproduce, recruit and move (or disperse) across the ecosystem. So natural flows are critical to the survival and viability of all aquatic plants and animals. Figure 2.3 illustrates the key components – overbank and bankfull flows, low flows, the influence of groundwater and freshes – of the flow regime that support aquatic plants and animals.

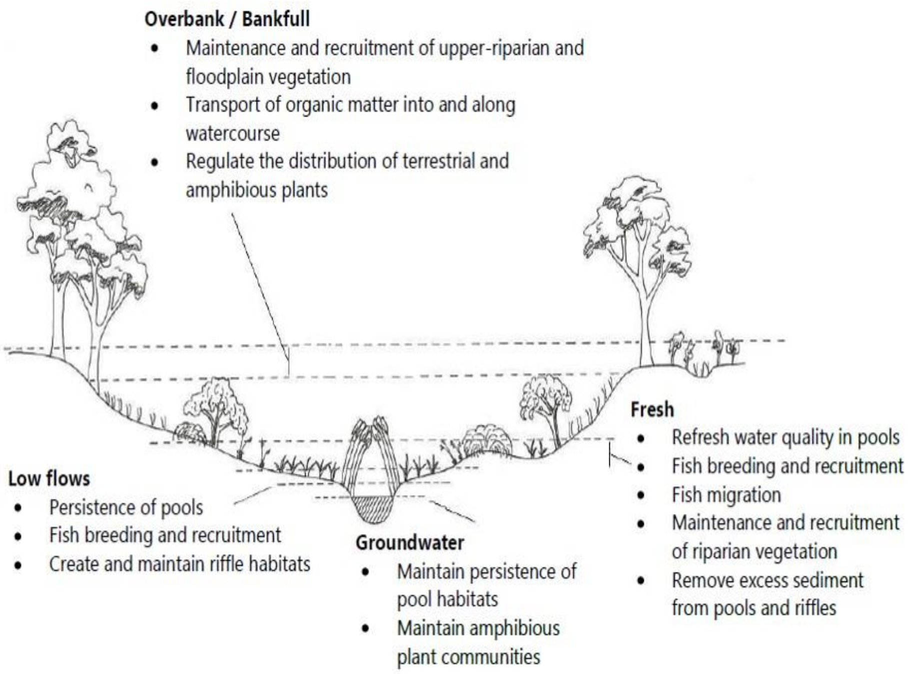

Figure 2.3 Component of flow regimes of a stream that influence water-dependent species. Taken from Favier et al. (2004).

A number of projects have recently explored the links between flow and aquatic animals across the Eastern Mount Lofty Ranges. For example, it has been demonstrated that macroinvertebrate communities across the region are strongly linked to prevailing flows, with zero flow days particularly significant to understanding these responses (Green et al. 2014, Maxwell et al. in prep). The number of macroinvertebrate species (called 'taxa richness') and flow-dependent groups declines significantly as the percentage of zero flow days increases, based on data collected from the region over the past 10 years (Figure 2.4). Similar relationships have been revealed for fish species, including for mountain galaxias *Galaxias olidus*, a small-bodied (up to 140 mm) native species occurring across the upland and mid-reaches of the region. It was demonstrated that the abundance of this fish species declines significantly as the number of zero flow days across the low flow season increases (Whiterod et al. 2017).

The responses of water-dependent plants and animals as flow regime changes relate to both resistance and resilience mechanisms. It is anticipated that:

- The shorter flowing seasons and increase in zero flow days act to make low flow season refuge habitats more likely to deteriorate and dry out (i.e. influencing the ability of species to 'resist' through the cease to flow period).
- Reduced flows during the low flow season disrupts migration and breeding in flow-dependent plants and animals (i.e. influencing ability of species to increase abundance e.g. resilience).
- Shorter flowing season means that aquatic plants and animals have less time to complete their lifecycle.

Understanding of the ecology of water-dependent plants and animals, and how they interact, helps to describe which aspects of the flow regime are most important to restore, in order to give, for instance populations of mountain galaxias, the best chance to be maintain and/or improved through enhanced survival and recruitment.

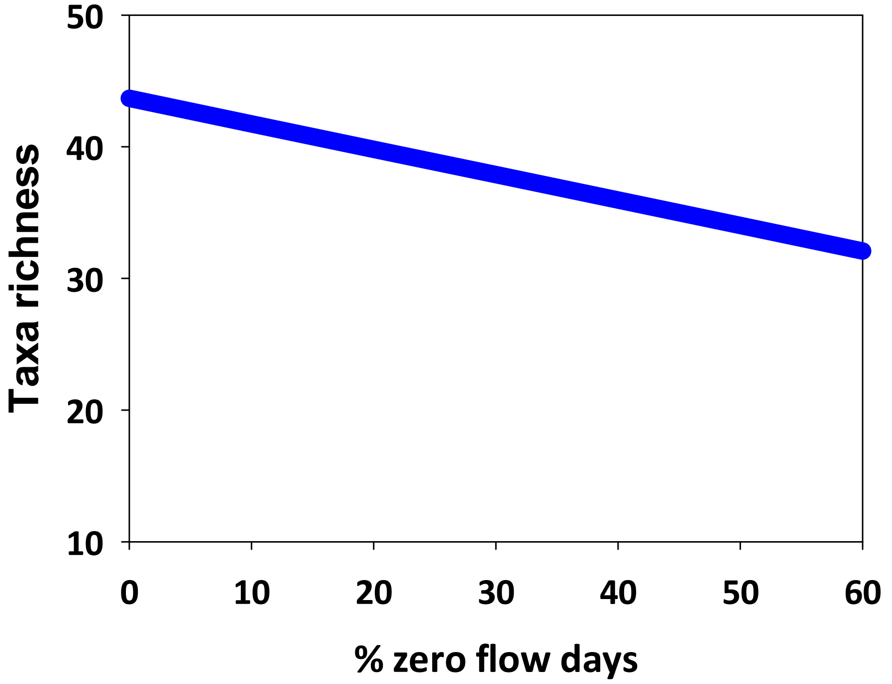

Figure 2.4 Significant relationship (based on generalised linear model) between macroinvertebrate taxa richness and flow intermittency over 10 years (expressed as percentage of zero flow days). Modified from Maxwell et al. (in prep).

3 Current condition of Eastern Mount Lofty Ranges streams

Water-dependent ecosystems of the Eastern Mount Lofty Ranges have changed profoundly since European settlement. These changes stem from a range of impacts, including clearance of native vegetation, urban and agricultural development, the establishment of introduced plants and animals, and water resource development, which has acted to alter flow regimes. The alteration of flow regimes is acknowledged as one of the most significantly drivers of changes to water-dependent ecosystems due to its impact on biological and ecological processes and functions (Bunn and Arthington 2002; Poff et al. 1997).

The South Australian Environment Protection Authority (EPA) Aquatic Ecosystem Condition Reports assesses water quality and aquatic ecosystem health at sites and describes the major disturbances and stressors affecting them. Using the biological condition gradient approach (Davies and Jackson 2006) for the streams and wetlands, the reports assign one of possible six condition ratings to each site, with 'excellent' representing natural (or undisturbed) conditions to 'very poor' representing severely altered conditions. The 2010 Aquatic Ecosystem Condition Report indicated that the majority of the 36 assessed sites across the Eastern Mount Lofty Ranges were in poor (33%) or fair (50%) conditions, with few in good (14%) or very good (3%) condition (no sites were excellent or very poor condition) (Table 3.1). In the 2015 Aquatic Ecosystem Condition Report, based on 14 sites across the region, the majority of sites were again deemed as poor (43%) or fair (36%) with the remaining in good (21%) condition (there were no excellent, very good or very poor sites) (Table 3.2 and Figure 3.1). Both of these reports indicate that most sites have experienced moderate to major changes to the way ecosystems functioned compared to expected natural conditions. It is also acknowledged that it is not possible to ever return these ecosystems to natural conditions, but rather it is hoped that ecosystems can be maintained or improved from their current condition.

Table 3.1 Condition for Eastern Mount Lofty Ranges sites assessed during South Australian EPA Aquatic Ecosystem Condition Report, 2010

Location	Condition
Tookayerta Creek, near Nangkita	Very good
Blackfellows Creek, near Mount Magnificent Conservation Park	Good
Bull Creek, near Ashbourne	Good
Finniss River, near Mount Observation	Good
Finniss River, near Yundi	Good
Tookayerta Creek, near Mount Compass	Good
Angas River, near Strathalbyn	Fair
Baker Creek, near Kitticoola Mine	Fair
Bremer River, near Callington	Fair
Bremer River, near Harrogate	Fair
Currency Creek, near Currency Creek	Fair
Currency Creek, near Mosquito Hill	Fair
Currency Creek, near Scott Conservation Park	Fair
Dawson Creek, near Strathalbyn	Fair
Finniss River, near Finniss	Fair
Giles Creek, near Finniss	Fair

Location	Condition
Harrison Creek, near Kitticoola Mine	Fair
Marne River, near Cambrai	Fair
Meadows Creek, near Kuitpo Forest	Fair
Nairne Creek, Nairne	Fair
Reedy Creek, near Caloote	Fair
Saunders Creek, near Saunderston	Fair
Somme Creek, near Eden Valley	Fair
Tookayerta Creek, near Mount Observation	Fair
Gorge Creek, near Tepko	Poor
Kanappa Creek, near Kanappa Hill	Poor
Marne River, near Walker Flat	Poor
Middle Creek, near Strathalbyn	Poor
Mitchell Gully Creek, near Rockleigh	Poor
Mosquito Creek, near Langhorne Creek	Poor
Mt Barker Ck, near Mount Barker	Poor
One Tree Hill Creek, near Springton	Poor
Paris Creek, south of Macclesfield	Poor
Rodwell Creek, near Wheal Ellen mine	Poor
Salt Creek, near Rockleigh	Poor
Turvey's Drain, near Milang	Poor

Source: South Australian EPA Aquatic Ecosystem Condition Report, 2010

Table 3.2 Condition score for Eastern Mount Lofty Ranges sites assessed during South Australian EPA Aquatic Ecosystem Condition Report, 2015

Location	Condition score
Finniss River, near Yundi	Good
Blackfellows Creek, near Kyeema Conservation Park	Good
Ti Tree Creek, near McHarg Creek	Good
Bremer River, near Callington	Fair
Deep Creek, Deep Creek Road	Fair
Meadows Creek, near Meadows	Fair
Rodwell Creek, west from Woodchester	Fair
Mount Barker Creek, Salem	Fair
Paris Creek, south of Macclesfield	Poor
Gould Creek, Macclesfield	Poor
Nairne Creek, near Petwood	Poor
Dry Creek, west from Monarto Zoo	Poor
Marne River, near Cambrai	Poor
Western Flat Creek, Mount Barker	Poor

Source: South Australian EPA Aquatic Ecosystem Condition Report, 2015.

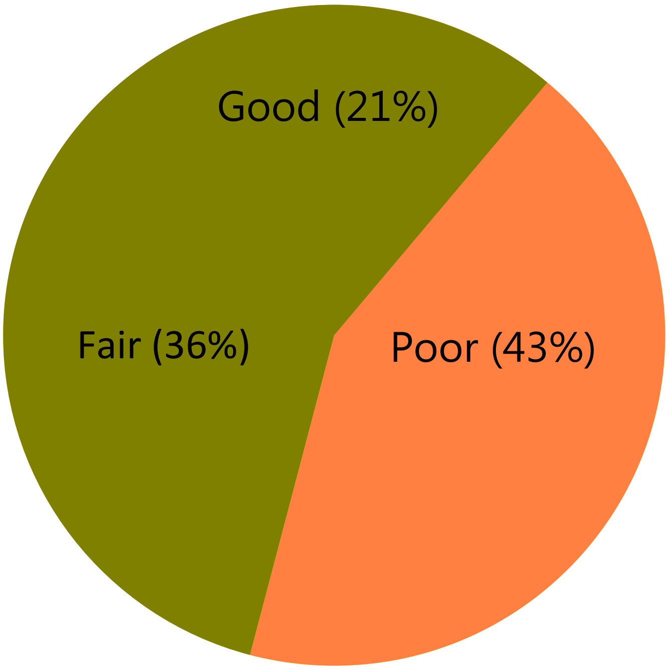

Figure 3.1 Stream condition across the Eastern Mount Lofty Ranges based on South Australian EPA Aquatic Ecosystem Condition Report, 2015.

3.1 Changes in native fish communities

Freshwater fishes are important indicators of the condition of water-dependent ecosystems as they are reliant on water for survival and many species have specific flow requirements. As the streams of the Eastern Mount Lofty Ranges have been affected by human uses and activities, native fish communities have declined considerably. The following sections illustrate the changes that have been observed in fish communities and their distribution across the region.

3.1.1 Status and condition of fish species

Contemporary fish fauna of the Eastern Mount Lofty Ranges consists of 29 native and eight introduced species (37 species in total: Table 3.3) (Hammer 2004, Hammer et al. 2009, Whiterod et al. 2015). Three species historically found in the region are now considered regionally extinct (Murray cod, silver perch and chanda perch: Hammer et al. 2009). Eleven of the remaining native fish species were considered threatened – three *critically endangered*, five *endangered* and three *vulnerable* species – according to conservation assessments undertaken as part of the 2009 Action Plan for South Australian Freshwater Fishes (Hammer et al. 2009) and two of these species threatened nationally (Murray hardyhead and Yarra pygmy perch). Annual monitoring since this time has allowed ongoing assessment of the condition of fish communities (Hammer 2007, Hammer 2009, Whiterod and Hammer 2014, Whiterod 2015, Whiterod 2016, Whiterod 2017). As of 2017, the overall condition of fish communities across the region has somewhat improved from 2009, which following significant drought conditions. However, almost a quarter of assessed catchments were deemed to be in poor condition as of 2017 (Table 3.4). Preliminary revision of conservation status in 2016 by the state threatened species schedule review showed consistent results in that eleven native fish species were recommended to a threatened status.

Table 3.3 Fish species established in the Eastern Mount Lofty Ranges under historical and current conditions, and their status at state (as per 2009 Action Plan for South Australian Freshwater Fishes) and national level (under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act))

CR = critically endangered, EN = endangered, VU = vulnerable, RA = rare

Common name	**Scientific name**	*Historical*	*Recorded since 2000*	*State (2009 Action Plan)*	*National (EPBC Act 1999)*
Native species					
Australian smelt	*Retropinna semoni*	Y	Y		
Bony herring	*Nematalosa erebi*	Y	Y		
Carp gudgeons*	*Hypseleotris spp.*	Y	Y		
Chanda perch	*Ambassis agassizii*	Y	N	CR	
Climbing galaxias	*Galaxias brevipinnis*	Y	Y	RA	
Common galaxias	*Galaxias maculatus*	Y	Y		
Congolli	*Pseudaphritis urvillii*	Y	Y	VU	
Dwarf flathead gudgeon	*Philypnodon macrostomus*	Y	Y		
Flathead gudgeon	*Philypnodon grandiceps*	Y	Y		
Freshwater catfish	*Tandanus tandanus*	Y	Y	EN	
Lagoon goby	*Tasmanogobius lasti*	Y	Y		
Mountain galaxias**	*Galaxias olidus*	Y	Y	VU	
Murray cod	*Maccullochella peelii*	Y	N	EN	VU
Murray hardyhead	*Craterocephalus fluviatilis*	Y	Y	CR	EN
Murray rainbowfish	*Melanotaenia fluviatilis*	Y	Y		
Murray-Darling golden perch	*Macquaria ambigua ambigua*	Y	Y		
Obscure galaxias**	*Galaxias oliros*	Y	Y	VU	
Pouched lamprey	*Geotria australis*	Y	Y	EN	
River blackfish	*Gadopsis marmoratus*	Y	Y	EN	
Shortfinned eel	*Anguilla australis*	Y	Y	RA	

Common name	Scientific name	Historical	Recorded since 2000	State (2009 Action Plan)	National (EPBC Act 1999)
Shortheaded lamprey	*Mordacia mordax*	Y	Y	EN	
Silver perch	*Bidyanus bidyanus*	Y	N	EN	CR
Smallmouthed hardyhead	*Atherinosoma microstoma*	Y	Y		
Southern purple-spotted gudgeon	*Mogurnda adspersa*	Y	Y	CR	
Southern pygmy perch	*Nannoperca australis*	Y	Y	EN	
Tamar goby	*Afurcagobius tamarensis*	Y	Y		
Unspecked hardyhead	*Craterocephalus stercusmuscarum fulvus*	Y	Y		
Western bluespot goby	*Pseudogobius olorum*	Y	Y		
Yarra pygmy perch	*Nannoperca obscura*	Y	Y	CR	VU
Introduced species					
Brook trout	*Salvelinus fontinalis*		Y		
Brown trout	*Salmo trutta*		Y		
Common carp	*Cyprinus carpio*		Y		
Eastern gambusia	*Gambusia holbrooki*		Y		
Goldfish	*Carassius auratus*		Y		
Rainbow trout	*Oncorhynchus mykiss*		Y		
Redfin	*Perca fluviatilis*		Y		
Tench	*Tinca tinca*		Y		
		29	34		

Source: Action Plan for South Australian Freshwater Fishes (Hammer et al. 2009) and Department of the Environment and Energy (2017). *Recent analyses suggest at least four species and many hybrids (Thacker et al. 2007), but taxonomic uncertainty remains so they are grouped as carp gudgeons for the present report. **Taxonomic resolution of the mountain galaxias species complex has recognised two species in the Eastern Mount Lofty Ranges, mountain galaxias (*Galaxias olidus*) and obscure galaxias (*Galaxias oliros*). Both species are included in the table and the state conservation status assigned in 2009 used for both as species-specific conservation assessment has not occurred.

Table 3.4 Overall status of reaches and catchments of the Eastern Mount Lofty Ranges – a comparison of the reach and catchment level performance of fish indicators over previous assessments (2009, 2013, 2015 and 2016) with the most recent assessment (2017). Condition scores (out of 9) are defined as good (>6, green), moderate (3 to 6, orange) and poor (<3, red). Reaches are headwaters (HW), upper pool-riffle (UC), mid pool-riffle (MC), gorge (GO), lowland (LO) and terminal wetlands (TW) with reaches historically not sampled denoted with n/s. See Whiterod and Hammer (2014) for details. Note that the reach assigned to some monitoring sites was revised in 2017 and the condition scores recalculated accordingly for all years, leading to some minor differences with previously published scores.

		Condition score										
No	Catchment	Reach						Overall				
		HW	UC	MC	GO	LO	TW	2017	2016	2015	2013	2009
1	Angas	n/s	3.0	2.0	n/s	5.0	0.5	3.0	3.0	4.0	5.5	4.0
2	Bremer	n/s	2.8	3.0	3.0	3.0	2.0	3.0	2.0	2.5	3.0	0.5
3	Currency	n/s	4.0	7.0	n/s	3.0	2.5	3.5	4.5	2.8	3.5	3.5
4	Finniss	n/s	7.0	4.8	n/s	3.0	4.0	4.0	4.0	5.0	2.5	4.0
5	Marne	n/s	9.0	2.0	5.0	2.5	n/s	3.3	0.0	2.3	2.0	0.0
6	Reedy	n/s	n/s	0.5	7.5	n/s	n/s	4.0	3.0	3.5	3.8	2.0
7	Salt, Premimma & Rocky Gully	n/s	n/s	n/s	n/s	n/s	2.0	2.0	3.0	3.0	1.0	2.5
8	Saunders	n/s	n/s	n/s	n/s	7.0	n/s	7.0	n/s	5.0	2.0	0.0
9	Tookayerta	n/s	2.0	3.5	n/s	0.0	4.0	2.8	3.3	2.5	3.5	3.0
								2017	2016	2015	2013	2009
	2017	n/s	4.0	2.5	5.0	3.0	2.0	3.3	3.0	3.0	3.0	2.5

3.1.2 River blackfish decline

The decline in river blackfish provides a case study of the long-term decline of native fish across the region.

The native river blackfish – a medium-sized nocturnal predatory fish growing to 350 mm – historically occurred widely across the streams of the Eastern Mount Lofty Ranges and even the River Murray (Figure 3.2 and Figure 3.3) (Hammer 2004, Hammer et al. 2009). Anecdotal reports from local landowners collated in the Eastern Mount Lofty Ranges fish inventory detail '*catches of 40 to 50*' at a time, others remember they were '*very common*' and '*virtually in every stream*' (Hammer 2004). Yet, river blackfish have declined in range and numbers, have disappeared from many catchments and now persists as small, restricted populations in only the Tookayerta, Angas, Bremer and Marne catchments (Whiterod and Hammer 2014). Nowadays, river blackfish is considered *endangered* in South Australia on the basis of assessment in the Action Plan for South Australian Freshwater Fishes (Hammer et al. 2009). Recent monitoring indicates the species continues to decline, with two of the remaining populations at risk of localised extinction (Whiterod and Hammer 2014, Whiterod 2015, Whiterod 2016, Whiterod 2017). This species is an obligate freshwater specialist that is dependent on flow (Hammer 2009, VanLaarhoven and van der Wielen 2009) with the improvement of flows considered one approach to address the decline of the species.

Figure 3.2 River blackfish (Michael Hammer).

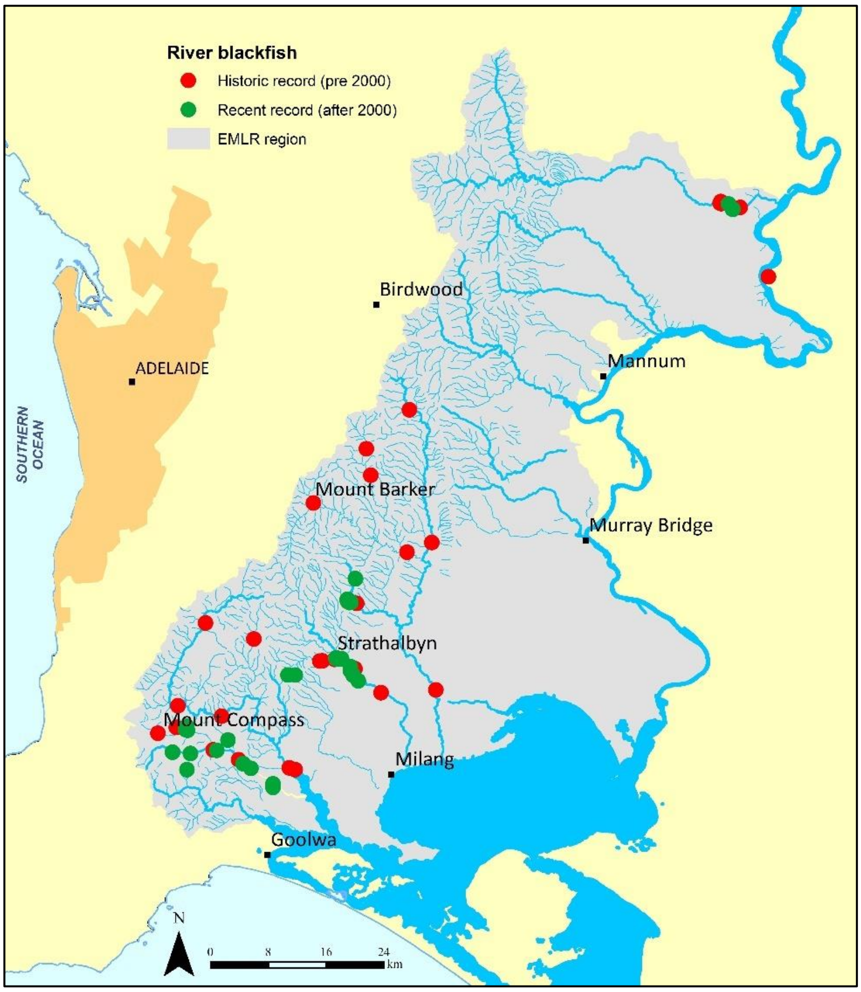

Figure 3.3 River blackfish records across the Eastern Mount Lofty Ranges (from Hammer et al 2009)

4 Management strategies to restore flows

Detrimental impacts to water-dependent ecosystems has placed plants and animals that rely on these ecosystems under stress. Without redressing these impacts, these aquatic plants and animals are anticipated to continue to decline with reductions in number and range expected to occur. Ultimately, localised extinctions will result. Wide-ranging strategies are required to help maintain and improve water-dependent plants and animals across the region. Impacts to flows are being addressed through the implementation of the Eastern Mount Lofty Ranges and Marne Saunders water allocation plans and water licensing processes, with key areas including:

- Securing low flows: The Securing Low Flows project is a key element of water management policy in the Mount Lofty Ranges. It aims to give the 74 catchments across the Mount Lofty Ranges small amounts of water at critical times in the seasonal cycle, while maintaining current water allocations. Under the program low flows below certain threshold flow rates will be required to pass downstream of some dams and diversions in order to maintain catchment health.
- Managing areas of high water demand: In some areas of the Eastern Mount Lofty Ranges, the demand for water is higher than the amount of water available for extraction and use. These are called high demand zones. In these high demand zones there is concern that water resources are declining in quantity and quality, or at serious risk that they will be if all licence holders use their full water allocations. The goal for managing high demand zones is to bring the demand for water back towards sustainable limits in a way that has the least impact to the environment, businesses and the community.
- Monitoring, evaluation, review and improvement: Monitoring and evaluating the condition of water resources is an important activity in the Eastern Mount Lofty Ranges. We use this data to track the health of the water resource and make decisions about how the resource is managed. Reports and data on water resources can be found at www.waterconnect.sa.gov.au. Water licensees are periodically asked to provide information such as groundwater samples for salinity testing, meter reads and water use information.

Managing high demand for water and securing low flows to the environment are important and complementary actions necessary to manage water in the Eastern Mount Lofty Ranges for current and future generations. Securing low flows aims to address impacts to key low components of the flow regime, while managing high demand aims to address impacts to key higher flow components and overall flow volume. These actions will be implemented in consultation with water users and the community.

Implementation of actions in these key areas will help to reduce impacts on flow regimes of water-dependent ecosystems across the region. It is intended that these strategies will enable key parts of the flow regime to be returned to streams so that they flow for longer periods across the year and that refuge pools are maintained over the low flow season. Restoring more natural flow regimes will benefit native aquatic animals and plants. Restoring flow regimes across the region is a long-term commitment and associated benefits may take many years to be realised. It is also acknowledged these benefits will also be influenced by other impacts to the region, such as the clearance of native vegetation, urban and agricultural development and the establishment of introduced species, which will need to be addressed by complementary actions.

For more information, visit http://www.naturalresources.sa.gov.au/samurraydarlingbasin/water.

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