Mallee Catchment Management Authority

Regional Context Document for Environmental Water Management Plans

Mallee CMA Region

28 July 2014

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Regional Context Document for Environmental Water Management Plans

Mallee CMA Region

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for

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1.0 Introduction

1.1 Purpose

This Regional Context Document for Environmental Water Management Plans (EWMPs) has been prepared by Sunraysia Environmental for the Mallee Catchment Management Authority. It provides background context to the region itself, the significant wetlands and rivers present in the region, and sources of environmental water available in the region. It also provides explanatory material that would otherwise be duplicated in individual EWMPs such as policy, legislative, and planning frameworks relating to environmental watering.

This document is intended to be read in conjunction with individual EWMPs, which provide more targeted information regarding the environmental values, ecological and hydrological objectives, and other site-specific details for a river, wetland, or complex.

2.0 Limitations

The EWMPs developed for the Mallee CMA region are intended as planning documents for environmental watering. They are not intended to be holistic management plans for sites and are limited to issues relating to the management of water dependent values and environmental water.

3.0 The Region

3.1 Location and Region

The Mallee CMA region is situated in the north-west of Victoria and has an area of more than 39,000 km^2 (3.9 million ha). The regional population is estimated to be 65,000 with 60% residing in Mildura, Red Cliffs and Merbein. Other population centres include Birchip, Hopetoun, Rainbow, Sea Lake, Ouyen, Murrayville, Nyah, Manangatang and Robinvale.

The climate is semi-arid with the mean annual rainfall varying from approximately 250mm/annum in the far north-west to 350mm/annum in the south. Enjoying a "Mediterranean" climate, summers are hot and winters are cold. However the dominating feature of the climate is variability of rainfall in both the short and longer term. This feature is well-demonstrated by the eight year drought which occurred between 2002 and 2010. The run of dry years was followed in 2011 by the wettest year on record for much of the region, which caused widespread flooding. From time to time the region experiences extremes in temperature, wind, frost and hail (Mallee CMA 2013a).

The Mallee CMA region covers almost one fifth of Victoria, making it the largest area managed by a Catchment Management Authority in the state (Mallee CMA 2013a). Approximately 38% of the land area within the Mallee CMA boundary is public land, consisting mainly of national parks, reserves, wilderness areas and large tracts of riverine and dryland forests (Mallee CMA 2013a).

Major public land blocks are located on the sandier soils in the north and west of the region. The largest public land blocks include the Murray Sunset National Park, Wyperfeld National Park, Big Desert Wilderness and the Hattah-Kulkyne National Park. There are approximately 500 other "small" reserves, the largest being the Annuello Flora and Fauna Reserve. The small reserves are scattered through agricultural land. In some farming areas, road reserves provide remnant corridors of native vegetation. The Murray River comprises the entire northern boundary of the Mallee CMA region and is the border of Victoria and New South Wales (Figure 1). The Victorian (southern) bank of the Murray River forms part of the River Murray Reserve, with a minimum width of 60 metres.

The better class soils, which are in the south and east, have been largely cleared and developed for dryland agriculture. Irrigated horticulture is located along the Murray River corridor to access water.

Accounting for approximately 60% of the Mallee by area (Mallee CMA 2013a), dryland farming includes the production of cereals, grain legumes and oilseeds, supplemented by fat lambs and beef cattle. Almost all agricultural and horticultural production occurs on private land. There is a significant investment in irrigation of grapes, citrus, almonds, olives, and vegetables along the Murray River corridor which contributes over 40% of the value of agricultural production for the region from less than 1% of the land (Mallee CMA 2013a).

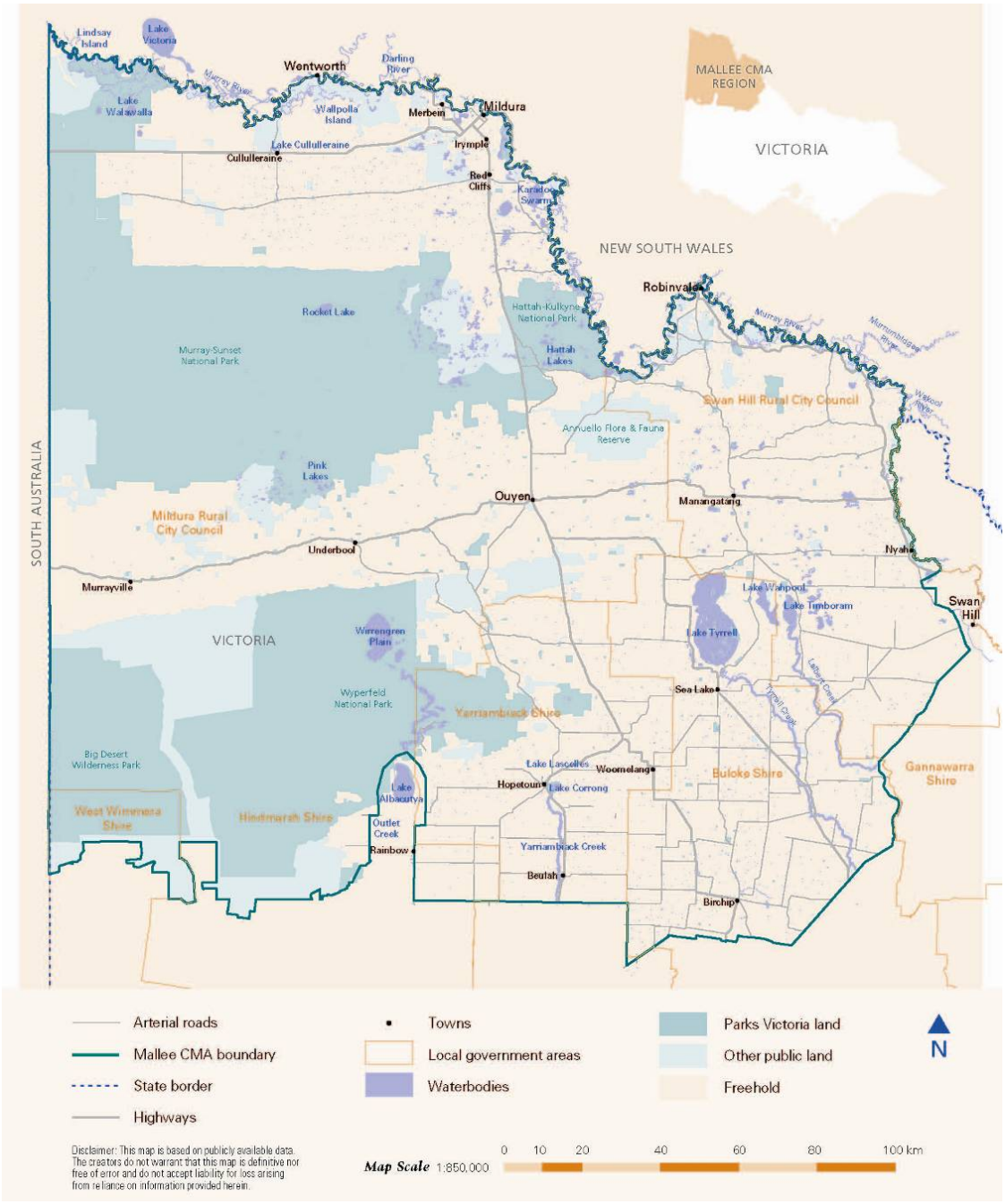

Figure 1: Map of the CMA Region

The region consists of two broad land types:

- riverine plains of the Murray River and several intermittent streams in the southern Mallee
- Mallee dune fields.

The Murray River is a significant local feature and associated with anabranches, billabongs and wetlands on the floodplain within the dune fields. The sandy soils of the dune fields and semi-arid climate has led to the absence of a defined surface drainage pattern for most of the region. Exceptions are the six north-flowing intermittent streams, three of which flow to terminal lakes (ephemeral wetland complexes) within the dune fields (see section 4.0).

3.2 Land Status and Management

There are approximately 2,170 km of waterways in the Mallee (Mallee CMA 2013a). The Murray River forms the northern boundary of the region as well as the State border. With the border recognised as the top of the southern bank, the river channel is under the jurisdiction of New South Wales, and the southern floodplain lies within Victoria (Kernebone 1993).

Murray River operations are under control of the Murray Darling Basin Authority, with construction, operation and maintenance of structures for water regulation and delivery are carried out within the Mallee CMA region by State Constructing Authorities (MDBA 2014a) as outlined in Table 1.

Table 1: Murray River Operations

WMU #	WMU Name(s)	Water Delivery Manager	Structures Manager
1-6	Nyah to (part of) Bumbang (Robinvale)	Goulburn-Murray Water	No structures
6, 13	Bumbang, (part of) Wallpolla (Wentworth)	Goulburn-Murray Water	State Water (NSW), Locks 10 (Wentworth) and 15 (Euston)
7-13	Happy Valley to Wallpolla	Goulburn-Murray Water	Goulburn-Murray Water Lock 11 (Mildura)
13-15	Wallpolla – SA Border	Goulburn-Murray Water	SA Water, Locks 7, 8 & 9 (Rufus River, Wangumma & Kulnine)

(MDBA 2014b)

The Mallee CMA is responsible for planning and managing environmental water in the waterways and wetlands within its region, and will need to consult with the landholders and land managers, licensees, the holder of the water, the manager of the river and local Government.

There are more than 900 wetlands greater than one hectare in the Mallee region, 14 of which are listed as 'nationally significant' (Mallee CMA 2013a). Eighty-two per cent of wetlands by area occur on public land with the remainder on private land. Parks Victoria manages the majority of public land surrounding the wetlands (Mallee CMA 2013a). Some wetlands are independent of the waterways of the region as they relate to saline groundwater inflows (Mallee CMA 2013a). Pink Lakes, Rocket Lake and Raak Plains are examples (Macumber 1980, cited in Ross 1981).

In the south of the region the northern flowing intermittent streams (Outlet Creek, Yarriambiack Creek and Dunmunkle Creek) are distributaries of the Wimmera River (Mallee CMA 2013a). The two former creeks terminate into wetland complexes. Tyrrell Creek (which is joined by Dunmunkle Creek) and Lalbert Creek are effluent streams from the Avoca River (Mallee CMA 2013a), terminating in large saline wetlands (Lakes Tyrrell and Timboram respectively). Agencies with a role in managing these waterways and flows include Grampians Wimmera-Mallee Water, and the Mallee, North Central and Wimmera CMAs.

Throughout the southern Mallee there are low points in the dune fields which historically would have been intermittent wetlands fed by local runoff. During European settlement these sites were often deepened to provide more reliable water storage for consumptive use, with annual top ups from the stock and domestic channel system. As the channels have been replaced by a piped system the top ups are to be renegotiated with GWM Water. The Mallee CMA has a role in assisting with the planning process

3.3 Neighbouring Catchment Management Authorities

The Mallee CMA region is adjoined to the south by the Wimmera CMA region between the South Australian border and south of Birchip. The North Central region boundary extends from south of Birchip to Tyntynder, downstream of Swan Hill. On the New South Wales side of the Murray River there are two recently formed organisations – Western Local Land Services and Murray Local Land Services. Their boundaries intersect the Murray River near Balranald.

The western boundary is formed by the South Australian Border. The South Australian Murray-Darling Basin Natural Resource Management Board is the equivalent neighbouring authority (Figure 2).

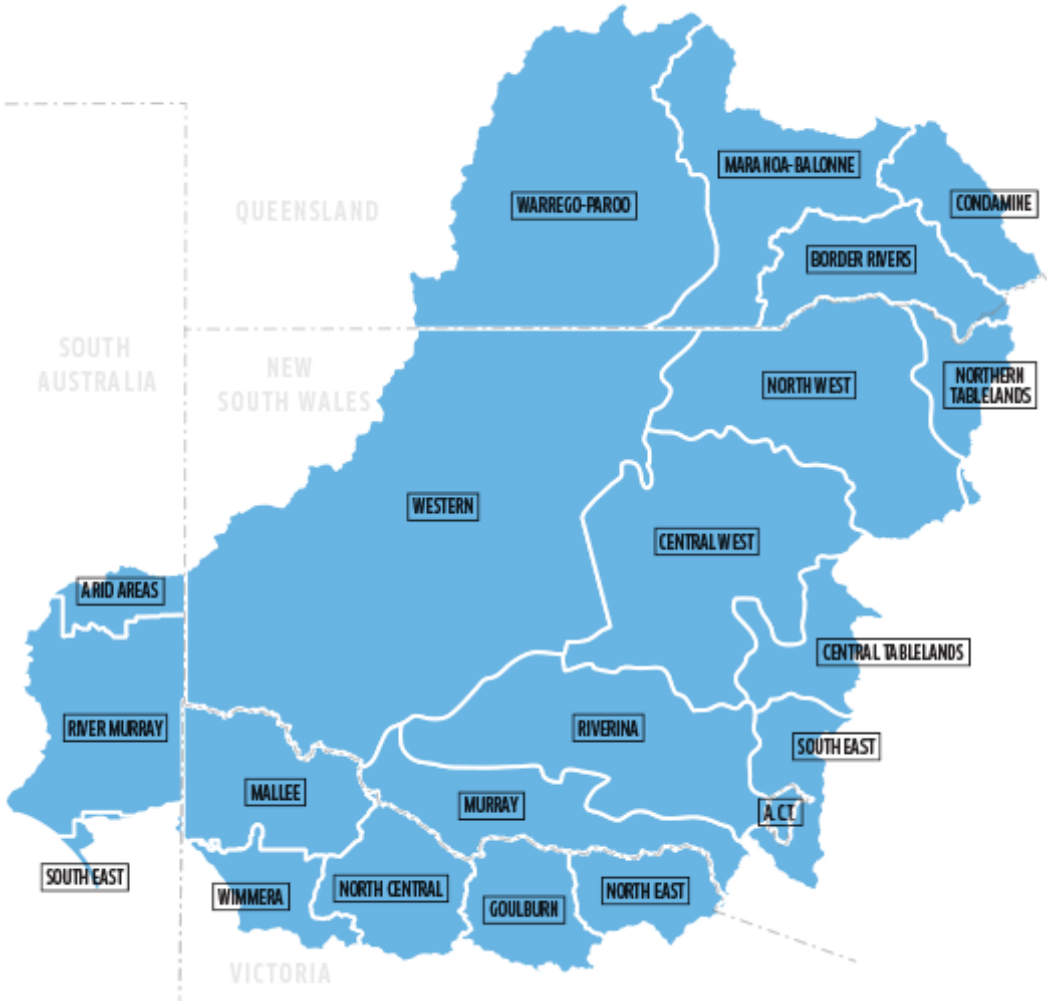

Figure 2 Neighbouring Authorities
(MDBA 2014c)

4.0 Rivers

The Murray River flows east to west and forms the northern boundary of the Mallee CMA region. The Murray, combined with the Darling River forms the third longest navigable river in the world (Australian Government 2013), from Mt Kosciusko it flows some 2,500 km westerly to the sea at Lake Coorong in South Australia.

The Murray River has many tributaries along its length, but none within the Mallee CMA region. However in New South Wales, the Wakool, the Murrumbidgee and the Darling Rivers flow into the Murray River at points adjacent to the Mallee region.

The Wimmera River originates in the Pyrenees, in the Wimmera CMA region, and flows northwards through Horsham to Lake Hindmarsh. When Lake Hindmarsh fills to capacity, it flows via Outlet Creek to Lake Albacutya, then again via Outlet Creek (this time in the Mallee CMA region) to terminate on the Wirrengren Plain in Wyperfeld National Park. The Wimmera River is the largest river in Australia that does not flow to the sea (Wimmera CMA 2014) and is listed as a Heritage River (refer Section 8.3.3).

The Yarriambiack Creek is an episodic distributary of the Wimmera River that commences near Longerenong in the Wimmera CMA and flows northerly, terminating at Lake Coorong, near Hopetoun, in the Mallee CMA. Weir pools are established on the Yarriambiack Creek providing a focus for water based recreation (Wimmera CMA 2013), such as the Beulah Weir Pool, which receives supplementary water from the Wimmera Mallee Pipeline.

The Dunmunkle Creek consists of two separate waterways located in the Avoca and Wimmera river basins (Mallee CMA 2014). The southern section flows north from Glenorchy in the Wimmera CMA towards Lascelles in the Mallee CMA. The northern section begins south of Birchip and flows north to Tyrell Creek (Mallee CMA 2014).

The Dunmunkle Creeks are episodic waterways that are reliant on local or upstream runoff from their respective river catchments (Mallee CMA 2014). Tyrell and Lalbert Creeks are intermittent creeks that flow northwest from the Avoca River in the North Central CMA region, to Lakes Tyrrell and Timboram respectively. Flows in the Avoca River are sufficient every two or three years on average to commence flows to these creeks (Mallee CMA 2014).

4.1 Condition Assessment in the Mallee CMA Region

The Index of Stream Condition (ISC) is a benchmark condition assessment undertaken in Victoria for river condition. During the most recent ISC benchmark, approximately 29,000 km of rivers and streams were assessed across Victoria. The ISC process is explained in Appendix 1.

In the Mallee CMA, the most recent assessment was conducted in 2010 and 73 individual reaches were assessed, representing 1,450 km of rivers (Mallee CMA 2014).

The Mallee (basin 14) is the largest river basin in Victoria but contributes the least to annual stream flow in Victoria (DEPI 2013a). Parts of the Avoca (basin 8) and Wimmera (basin 15) river basins lie in the southern and eastern part of the CMA region.

The index of stream condition assessment in the Avoca Basin (Table 2) included a total of six reaches including Lalbert Creek (2), Tyrrell Creek (2), Yarriambiack Creek (1) and Outlet Creek (1) (DEPI 2013a).

Table 2 Index of Stream Condition Scores for the Avoca Basin

Reach	River	ISC Score	Comment Specific
21	Lalbert Creek		Insufficient Data
22	Lalbert Creek		Insufficient Data
23	Tyrrell Creek		Insufficient Data
24	Tyrrell Creek		Insufficient Data
25	Murray River	25	Moderate
26	Parnee Malloo Creek	25	Moderate

(DEPI 2013a)

There is insufficient data for the reaches of the Lalbert and Tyrrell Creeks assessed to comment on their overall condition. The paucity of reaches studied in lower Avoca Basin also makes it difficult to provide a meaningful general comment on condition apart from the indicative conditions scores of ‘moderate’.

For the Mallee Basin, the index of stream condition assessment was conducted on 65 reaches in the Murray corridor (Table 3) including the Murray River (16), Unnamed Creeks (11), Burra Creek (2), Heywoods Creek (1), Wakool Creek (1), Narcooyia Creek (2), Chalka Creek (2), Cantala Creek (1), Inlet Creek (1), Towrie and Outlet Creek (3), Butlers Creek (1), Wallpolla Creek (3), Sandy Creek (3), Willpenance Creek (1), Ranka Creek (1), Mullroo Creek (1), Milky Creek (1), Finnigans Creek (1), Potterwalkagee Creek (2), Lindsay River (5), Mullaroo Creek (2), Toupnein Creek (2), Thompson Creek (1), and Boy Creek (1).

Table 3 Index of Stream Condition Scores for the Mallee Basin

Reach	River	ISC Score	Comment Specific	Reach	River	ISC Score	Comment Specific
1	Murray River	28	Moderate	48	Butlers Creek	16	Very Poor
2	Murray River	27	Moderate	50	Wallpolla Creek	17	Very Poor
3	Murray River	23	Poor	51	Wallpolla Creek (East)	16	Very Poor
4	Murray River	21	Poor	52	Wallpolla Creek	20	Poor
5	Murray River	21	Poor	53	Unnamed Creek	17	Very Poor
6	Murray River	20	Poor	54	Unnamed Creek	17	Very Poor
7	Murray River	21	Poor	55	Unnamed Creek	16	Very Poor
8	Murray River	21	Poor	56	Sandy Creek	16	Very Poor
9	Murray River	21	Poor	57	Sandy Creek	13	Very Poor
10	Murray River	21	Poor	58	Sandy Creek	20	Poor
11	Murray River	21	Poor	59	Willpenance Creek	20	Poor
12	Murray River	17	Very Poor	60	Ranka Creek	20	Poor
13	Murray River	17	Very Poor	61	Mullroo Creek	20	Poor
14	Murray River	20	Poor	62	Milky Creek	20	Poor
15	Murray River	20	Poor	63	Finnigans Creek	16	Very Poor
16	Murray River	17	Very Poor	64	Potterwalkagee Creek	16	Very Poor
17	Unnamed Creek	17	Very Poor	65	Potterwalkagee Creek	20	Poor
18	Burra Creek	22	Poor	66	Unnamed Creek	16	Very Poor
19	Burra Creek	22	Poor	67	Lindsay River	16	Very Poor
20	Unnamed Creek	17	Very Poor	68	Lindsay River	16	Very Poor
21	Heywoods Creek	18	Very Poor	69	Lindsay River	13	Very Poor
22	Wakool Creek	21	Poor	70	Lindsay River	16	Very Poor
24	Narcooyia Creek	21	Poor	71	Lindsay River	20	Poor
25	Narcooyia Creek	22	Poor	72	Mullaroo Creek	20	Poor
39	Chalka Creek	21	Poor	73	Mullaroo Creek	20	Poor
40	Cantala Creek	18	Very Poor	74	Unnamed Creek	17	Very Poor
41	Chalka Creek	21	Poor	75	Toupnein Creek	16	Very Poor
42	Inlet Creek	21	Poor	76	Toupnein Creek	19	Very Poor
43	Towrie & Outlet Creek	21	Poor	77	Thompson Creek	20	Poor
44	Towrie & Outlet Creek	18	Very Poor	78	Unnamed Creek	16	Very Poor
45	Towrie & Outlet Creek	14	Very Poor	79	Unnamed Creek	12	Very Poor
46	Unnamed Creek	24	Poor	81	Boy Creek		Insufficient Data
47	Unnamed Creek	22	Poor				

For the Murray Basin, no reaches scored higher than moderate condition. Two reaches scored moderate and these were both at the upstream extremity of the basin. Thirty-three reaches scored poor and 29 reaches scored very poor. One reach had insufficient data provided.

The index of stream condition assessment in the Wimmera Basin included a total of two reaches including Yarriambiack Creek (1) and Outlet Creek (1) (DEPI 2013a) (Table 4).

Table 4 Index of Stream Condition Scores for the Wimmera Basin

Reach	River	ISC Score	Comment Specific
24	Yarriambiack Creek	18	Very Poor
91	Outlet Creek		Insufficient Data

(DEPI 2013a)

The paucity of reaches studied in lower Wimmera Basin makes it difficult to provide a meaningful general comment on condition apart from repeating the specific comments that the conditions score was very poor (DEPI 2013a). The second site had insufficient data.

5.0 Wetlands

5.1 Wetland Classification

The system of wetland classification used across Victoria was developed by Corrick and Norman (1980). It recognises six naturally occurring wetland types, based upon water depth, frequency of inundation, salinity and dominant vegetation. Table 5 provides descriptions of each wetland type.

Table 5 Wetland Classification in Victoria

Wetland Type	Description Summary
Freshwater Meadow	These include shallow (up to 0.3m) and temporary (less than four months duration) surface water, although soils are generally waterlogged throughout winter.
Shallow freshwater marsh	Wetlands that are usually dry by mid-summer and fill again with the onset of winter rains. Soils are waterlogged throughout the year and surface water up to 0.5m deep may be present for as long as eight months.
Deep freshwater marsh	Wetlands that are generally inundated to a depth of 1-2m throughout the year.
Permanent open freshwater	Wetlands that are usually more than 1m deep. They can be natural or artificial. Wetlands are described as permanent if they retain water for longer than 12 months, however they can have periods of drying.
Semi-permanent saline	These wetlands may be inundated to a depth of 2m for as long as eight months each year. Saline wetlands are those in which salinity exceeds 3,000mg/L throughout the whole year.
Permanent saline	These wetlands may be inundated to a depth of 2m for as long as eight months each year. Saline wetlands are those in which salinity exceeds 3,000mg/L throughout the whole year.

(DEPI 2014)

5.2 Current Number, Extent and Rarity in the Mallee CMA Region

Victoria's wetlands are currently mapped and are contained within a state wetland database.

Mapping was undertaken from 1981 using 1:25,000 colour aerial photographs, along with field checking. This is commonly known as the 1994 wetland layer. At the same time, an attempt was made to categorise and map wetland areas occupied prior to European settlement. This was largely interpretive work and uses only the primary category, based on water regime. This is known as the 1788 layer. A 2013 update of the wetland datasets is available (DEPI 2013c).

The state database contains the following information:

- categories (primary) based on water regime and
- subcategories based on dominant vegetation

According to the Wetlands 2013 layer, the most common type of wetland in the CMA area is semi-permanent saline. This is also the most extensive type; conversely the rarest type and smallest extent is shallow freshwater marsh (DEPI 2013c). Most wetlands located on river floodplains are freshwater meadows, marshes and permanent open freshwater wetlands (Mallee CMA 2014). A summary of all types and their total extent is provided in Table 6 below.

Table 6 Wetland Types in the Mallee CMA Region

	Current (2013) number in Mallee CMA	Current (2013) extent (ha) in Mallee CMA
Freshwater Meadow	194	4,937
Shallow Freshwater Marsh	137	2,257
Deep Freshwater Marsh	144	3,558
Permanent Open Freshwater	173	5,204
Semi-permanent Saline	259	27,020
Permanent Saline	0	0
Sewage Oxidation Pond	9	95
Total	**916**	**43,071**

(DEPI 2013c)

5.3 Wetland Types: Depletion in the Mallee CMA Region

Comparing the number and extent of different wetland types in the 1788 and 1994 or 2013 layers shows which wetland types have been most impacted by European settlement.

Across Victoria, approximately one-third of the state's wetlands have been lost since European settlement. Many of those remaining are threatened by continuing degradation from salinity, drainage and agricultural practices (ANCA 1996). The greatest decreases in area have been for freshwater meadows (43 per cent decrease), shallow freshwater marsh (60 per cent decrease) and deep freshwater marsh (70 per cent decrease) categories (DNRE 1997).

Within the Mallee CMA, the pattern is similar, with approximately one third of the region's wetlands lost: a significant decrease in freshwater meadows and deep freshwater marshes; and an increase in semi-permanent saline wetlands (Table 7). Also showing an increase is the permanent open freshwater type; this may be a result of river regulation and the subsequent and weir pool influence on backwaters (Meredith & Beesley 2009).

Since European settlement, semi-permanent wetlands have increased in size and number, due to:

- changed hydrological regimes, primarily river regulation;
- clearing of native vegetation;
- changes in surrounding land use;
- disposal of saline drainage water; and
- interception of saline groundwater (Mallee CMA 2006)

Table 7 Depletion of Wetland Categories (Extent) by Bioregion

Wetland Category	Change in Area since 1788 (%)							
	Victoria	Mallee CMA Region	Lowan Mallee	Murray Mallee	Wimmera	Robinvale Plains	Murray Scroll Belt	Murray Fans
Freshwater Meadow	-43	-80	0	-15	0	-1	0	-63
Shallow Freshwater Marsh	-60	-6	19	-9	0	-4	0	-10
Deep Freshwater Marsh	-70	-45	-1	-100	0	-37	-19	-6
Permanent Open Freshwater	-6	5	0	73	0	-1	-7	0
Semi-permanent Saline	-7	9	100	2	0	100	100	100
Permanent Saline	-2	-	-	-	-	-	-	-
Sewage Oxidation Pond	100	100	-	100	-	-	100	-
Total	**-37**	**-34**	**3**	**1**	**1**	**-16**	**-1**	**-12**

((Mallee CMA 2006), rounded up to the nearest whole number)

5.4 Condition Assessment - of Index of Wetland Condition in the Mallee CMA Region

The standard means for assessing the condition of individual wetlands in Victoria is to use the Index of Wetland Condition (IWC). The IWC process is explained in Appendix 2.

The 2009-10 IWC assessed 587 high value wetlands, of which 71% were on public land and 29% on private land. On-site visits were used to score condition at the wetlands during spring and summer of 2009-10. Wetlands in the marine or estuarine environment were not assessed as the IWC is not designed for wetlands with a marine water source. In 2011-12, a representative set of a further 12,400 wetlands were assessed.

For high value wetland systems that include many individual wetlands, assessments were undertaken at a representative set of wetlands within the system, rather than at every wetland.

In the Mallee basin, 81 wetlands have been assessed, with 5% assessed to be in poor condition, 42% in moderate condition, and 53% in excellent condition (Mallee CMA 2014). Full details of the condition category for each assessed wetland are provided in Table 8.

With only 81 of the region's more than 900 wetlands assessed, it is difficult to comment on the overall condition of wetlands in the CMA. Those wetlands that were assessed as being in excellent condition are also representative of a wetland type that has increased in number since 1884: semi-permanent saline. Many of the wetlands assessed are also located in the Living Murray Icon sites (Chowilla Floodplain and Hattah Lakes), which may skew the results to suggest other wetlands are in better condition than they might actually be.

Table 8 Wetland Condition Values - Mallee Basin

Wetland ID	Condition	Wetland ID	Condition
Lindsay 665	Good	Wallpolla near Horseshoe	Good
Lindsay 660	Moderate	Lake Hattah	Good
Lindsay 663	Good	Lake Mournpall	Good
North Berribee	Good	Lake Konardin	Moderate
South of Pollards Island	Poor	Lake Bulla	Good
South of Pollards Island	Moderate	Lake Arawak	Good
Mullaroo	Good	Lake Lockie	Good
Websters Lagoon	Moderate	Lake Yerang	Good
East Lindsay 710	Excellent	Lake Yelwell	Moderate
East Lindsay	Good	Lake Brockie	Good
East Lindsay	Good	Lindsay 657	Moderate
Lindsay	Moderate	Lignum Plain	Moderate
Lake Wallawalla	Moderate	Raak Plain State Forest	Excellent
Lindsay 694	Good	Raak Plain Private	Moderate
East Lindsay	Good	Raak Plain State Forest	Excellent
Lindsay	Good	Raak Plain State Forest	Excellent
Lindsay 697	Moderate	Lake Ranfurly	Poor
East Lindsay	Moderate	Woorlong Wetlands (Basin 12)	Moderate
Mullaroo	Moderate	Kings Billabong Marina	Good
Mulcra 726	Good	Ducksfoot Lagoon	Moderate
Mullaroo	Moderate	Kings Billabong	Poor
East Lindsay	Good	Kings Billabong Backwater	Good
Mulcra	Good	Lake Tyrrell	Excellent
Mulcra 730	Good	Lake Carpul	Good
Mulcra	Moderate	Narcooyia West Wetland	Moderate
Snake Lagoon	Moderate	Carp Hole Wetland	Good
Unnamed Wetland, Mulcra	Good	Cattle Yard Wetland	Good
Ned's Corner	Moderate	Toma Michel Road Wetland	Good
Wallpolla 794	Good	Parnee Malloo North Wetland	Moderate
Wallpolla 758	Moderate	Parnee Malloo Mid Wetland	Moderate
Wallpolla 789	Moderate	Major Mitchell Lagoon	Moderate
Wallpolla 800	Moderate	Burra Creek	Moderate
Wallpolla	Good	Burra Creek	Moderate
Wallpolla West 804	Good	Lake Bitterang	Good
Wallpolla	Moderate	Lake Cantala	Moderate
Wallpolla	Good	Lake Kramen	Moderate
Wallpolla 819	Good	Waitchie FFR Wetland	Good
Wallpolla 821	Moderate	Cardross Lakes	Poor
Wallpolla	Moderate	Lindsay 666	Good
Wallpolla	Good		

(Mallee CMA 2014)

6.0 Rivers and Wetlands of Significance

6.1 Ramsar Sites

There are 11 Ramsar Sites in Victoria. Within the Mallee CMA, Hattah-Kulkyne Lakes was listed as a Ramsar site in 1982. The Hattah-Kulkyne Lakes are a series of 20 lakes within the Hattah-Kulkyne National Park, 12 of which form the Ramsar site. These lakes are classified as permanent freshwater lakes and seasonal intermittent lakes (DoE 2011a), subject to flooding under significant flows (36,700 ML/day at Euston (Butcher & Hale 2011)) from the Murray River. The interconnected lake system is the most extensive lake system along the Murray River, and meets five of the nine Ramsar Criteria: 1, 2, 3, 4, and 8 (DoE 2011a). Refer to Appendix 3 for details of the criteria.

South of the Mallee CMA, within the Wimmera CMA region, is Lake Albacutya, selected as a Ramsar site in 1982 as meeting Criteria 1, 2, 3, 5 and 6 (Appendix 3) (DoE 2011b). Whilst Lake Albacutya does not lie within the Mallee CMA region, Outlet Creek receives water when Lake Albacutya is full, and allows flow to continue to the Wirrengren Plain. Outlet Creek is an extension of the Wimmera River, which is listed under the *Heritage Rivers Act 1992* (Refer Section 8.3.3).

The Mallee CMA's north western border is formed by the Murray River and the South Australian border. Downstream from this point are the Ramsar sites:

- Riverland;
- Banrock Station; and
- Coorong and lakes Alexandrina and Albert.

6.2 Living Murray Icon Sites

Two of the six Living Murray Icon Sites are located in the Mallee CMA region: the Chowilla Floodplain (Lindsay Island, Mulcra Island and Wallpolla Island) and the Hattah Lakes. These Icon Sites support rare and endangered species (MDBC 2006) and have been the subject of many studies and on-ground works to improve the health of each site.

6.3 Directory of Important Wetlands

Table 9 outlines sites in the Mallee CMA that are listed in *A Directory of Important Wetlands in Australia*[1]. All sites are located in the Murray-Darling Depression IBRA Region. Refer to Appendix 4 for details of wetland types and criteria for inclusion.

Table 9 Important Wetlands in the Mallee CMA

Wetland Name	Reference No.	Area (ha)	Wetland Type(s)	Criteria for Inclusion
Belsar Island	VIC004	2,500	B4	2
Tyrrell Creek & Lalbert Creek Floodplains	VIC006	530	B2, B14	1,2
Cardross Lakes	VIC123	296	B5, B7	1,3,5
Hattah Lakes	VIC007	1018	B6, B14	1,2,3,6
Heywoods Lake	VIC009	228	B6	6
Kings Billabong Wetlands	VIC010	502	B4	1,6
Lake Ranfurly	VIC014	265	B7	3,4
Lake Tyrrell	VIC015	20,860	B8, C4	1,2
Lake Wallawalla	VIC016	828	B6	1,3
Lindsay & Mulcra Islands	VIC017	15,000	B4	1,2,3
Major Mitchell Lagoon	VIC018	9	B5	6
Pink Lakes	VIC022	393	B8	1,6
Raak Plain	VIC023	550	B8	1,5
Wallpolla Island	VIC025	9,200	B4	1,2,3
Wargan Basins	VIC026	690	C4	1,2,3
Wimmera River (Outlet Creek & Wirrengren Plains Section)	VIC147	56,020	B1, B2 B5, B6	1,2,3,4,5,6

(Environment Australia 2001)

[1] **Wetlands of National Importance**

A Directory of Important Wetlands in Australia is a cooperative project involving the Australian and state and territory governments. The Directory was first published in 1993, with subsequent editions in 1996 and 2001. It identifies nationally important wetlands, and provides a substantial knowledge base of what defines wetlands, their variety, and the flora and fauna species that depend on them. The Directory also contains information about their social and cultural values and some of the ecosystem services and benefits they provide.

Victoria has 159 wetlands listed in A Directory of Important Wetlands in Australia (Environment Australia, 2001).

7.0 Environmental Water and Watering

Environmental Water is a legally recognised amount of water set aside to meet environmental needs. It can include minimum river flows, unregulated flows and specific environmental entitlements. Environmental entitlements can be called out of storage when needed and delivered to wetlands or streams to protect their environmental values and health.

The Victorian Minister for Environment and Climate Change has appointed Commissioners to Victoria's first independent body for holding and managing environmental water – the Victorian Environmental Water Holder (VEWH) - to be responsible for holding and managing Victoria's environmental water entitlements, and making decisions on their use.

Environmental water is provided through three forms:

- **Environmental water entitlements:** a volume of water held by the environment in perpetuity. In general, the entitlements are a share of the available resource (inflows) in storages that can be released to meet specific environmental needs.
- **Obligations on consumptive entitlements (passing flows):** the volume of water that water corporations or licensed diverters are obliged to provide out of storage or past a diversion point before water can be taken for consumptive use.
- '**Above cap' water:** the water available above limits on consumptive volumes of surface water and groundwater. Most water available to the environment is 'above cap' water, which can be a very unreliable source of water.

Environmental water for a particular wetland or river reach may come from a number of sources (see below).

In regulated systems, environmental water is set aside mainly through environmental water entitlements. In unregulated rivers, environmental water is provided primarily through management of existing diversions via licence conditions, rostering and restriction rules.

7.1 Environmental Water Sources – Federal

7.1.1 Commonwealth Environmental Water Holder (CEWH)

The *Commonwealth Water Act 2007* established the Commonwealth Environmental Water Holder (the CEWH) to manage the Commonwealth's environmental water holdings for the purpose of protecting or restoring the environmental assets of the Murray-Darling Basin, and of other areas outside the Basin where the Commonwealth holds water, so as to give effect to relevant international agreements. Water held in the Murray-Darling Basin is required to be managed in accordance with the environmental watering plan, part of the Basin Plan being developed by the MDBA in consultation with state governments and stakeholders. Further information on the CEWH and the holdings is at www.environment.gov.au/water/policy-programs/cewh

7.2 River Murray Unregulated Flow (RMUF)

Unregulated flows in the River Murray system are defined as water that cannot be captured in Lake Victoria and is, or will be, in excess of the required flow to South Australia. If there is a likelihood of unregulated flow event in the River Murray system, the Murray-Darling Basin Authority (MDBA) provides this advice to jurisdictions. The Upper States then advise the Authority on altered diversion rates and environmental releases within their existing rights to unregulated flows.

Based on the information received from jurisdictions, the Authority reassesses the event and, if necessary, limits the upper states' access to ensure that the unregulated flow event is not over committed. The Authority then issues formal unregulated flow advice to jurisdictions including any limits to states' access.

Depending on the volume of water remaining, the Authority advises on the availability and volume of RMUF. Whilst there is a range of measures that can be undertaken by the upper states as part of their 'prior rights' during unregulated flows, RMUF events are prioritised solely for the environment.

7.3 Environmental Water Sources – State

7.3.1 Victorian Environmental Water Holder (VEWH)

The VEWH is responsible for holding and managing Victorian environmental water entitlements and allocations and deciding upon their best use throughout Victoria. Operating independently from the Victorian Government, the VEWH works with catchment management authorities and Melbourne Water to ensure environmental water entitlements are used to achieve the best environmental outcome with the water that is available. The environmental entitlements held by the VEWH are listed at www.vewh.vic.gov.au/managing-the-water-holdings

7.3.2 River Murray Flora and Fauna Bulk Entitlement

The VEWH manages the *Bulk Entitlement (River Murray – Flora and Fauna),* a 27.6 GL entitlement of environmental water for the Murray River. The entitlement aims to benefit flora and fauna of wetlands along or with access to the Murray River system.

7.3.3 GMW Connections Project - Mitigation Water

The Goulburn Murray Water (GMW) Connections Project is an irrigation modernisation project developing an improved water delivery network across northern Victoria.

The Connections Project is funded by the Victorian Government, Commonwealth Government and Melbourne Water and each investor will receive a defined share of the water savings achieved from improving the efficiency of the channel delivery network. The Commonwealth and Victorian Governments' shares of the water savings will deliver environmental benefits.

While improving irrigation efficiency, the Connections Project will reduce outfall volumes to wetlands. Under the statuary approvals, the Connections Project must ensure there is no net impact on high environmental values. 'Mitigation water' will therefore be delivered to support environmental values. Mitigation water is defined as the volume of water required to offset the impact of the Connections Project on wetlands that have become reliant on outfalls. Mitigation water will be represented as an obligation in the water corporation's Bulk Entitlement and will be deployed according to an Environmental Watering Plan.

7.4 Environmental Water Sources – Other

7.4.1 Donations

People who hold water entitlements sometimes donate water to their local catchment management authority for environmental use. Additionally, people have donated money to non-governmental organisations to buy temporary water allocations for environmental use. While the scale of donated water is generally small relative to other water sources, it can provide a valuable contribution, especially in times of critical needs.

7.5 Seasonally Adaptive Approach

Adaptive and integrated management are key components in Victoria's approach to environmental management. In environmental watering, this is the 'seasonally adaptive' approach, which was developed through the Northern Region Sustainable Water Strategy (DSE, 2009b) and incorporated into the VWMS.

The seasonally adaptive approach identifies the priorities for environmental watering, depending on the amount of water available in a given year. It is a flexible way to deal with short-term climatic variability (i.e. yearly to decadal, as opposed to long-term climate change) and helps to guide annual priorities and manage droughts. The approach is outlined in Table 10 over page.

In drier periods, restricted water resource availability will potentially limit the number of ecological objectives which can realistically be provided through environmental water management. However, these ecological objectives can be achieved in wetter periods as water resource availability increases.

Table 10: The Seasonally Adaptive approach to River and Wetland Management

	Drought	Dry	Average	Wet to very wet
Long-term ecological objectives	Long-term objectives to move towards ecologically healthy rivers – set through regional river health strategies and sustainable water strategies and reviewed through the 15-year resource review			
Short-term ecological objectives	• Priority sites have avoided irreversible losses and have capacity for recovery	• Priority river reaches and wetlands have maintained their basic functions	• The ecological health of priority river reaches and wetlands has been maintained or improved	• The health and resilience of priority rivers and wetlands has been improved
Annual management objectives	• Avoid critical loss • Maintain key refuges • Avoid catastrophic events	• Maintain river functioning with reduced reproductive capacity • Maintain key functions of high priority wetlands • Manage within dry-spell tolerances	• Improve ecological health and resilience	• Maximise recruitment opportunities for key river and wetland species • Minimise impacts of flooding on human communities • Restore key floodplain linkages
Environmental water reserve	• Water critical refuges • Undertake emergency watering to avoid catastrophic events • Provide carryover (for critical environmental needs the following year) • If necessary, use the market to sell or purchase water	• In priority river reaches provide summer and winter baseflows • Water high priority wetlands • Provide river flushes where required to break critical dry spells • Provide carryover (for critical environmental needs the following year) • If necessary, use the market to sell or purchase water	• Provide all aspects of the flow regime • Provide sufficient flows to promote breeding and recovery • Provide carryover to accrue water for large watering events • If necessary, use the market to sell or purchase water	• Provide overbank flows • Provide flows needed to promote breeding and recovery • If necessary, use the market to sell or purchase water
River and wetland catchment activities	• Protect refuges (including stock exclusion) • Increase awareness of the importance of refuges • Enhanced monitoring of high risk areas and contingency plans in place • Investigate feasibility of translocations • Environmental emergency management plans in place • Protect high priority river reaches and wetlands through fencing; pest, plant and animal management; and water quality improvement works • Implement post-bushfire river recovery plans	• Protect refuges • Protect high priority river reaches and wetlands through fencing, revegetation, pest plant and animal management, water quality improvement and in-stream habitat works • Environmental emergency management plans in place • Improve connectivity • Implement post-bushfire river recovery plans	• Protect and restore high priority river reaches and wetlands through fencing, revegetation, pest plant and animal management, water quality improvement and works • Monitor and survey wetland condition • Improve connectivity between rivers and floodplain wetlands	• Protect and restore high priority river reaches and wetlands through fencing, revegetation, pest plant and animal management, water quality improvement and habitat works • Monitor and survey river and wetland condition • Improve connectivity between rivers and floodplain wetlands • Emergency flood management plans in place • Implementation of post-flood river restoration programs

(DSE 2009b)

8.0 Legislative Frameworks and Agreements

8.1 International

8.1.1 Ramsar Convention on Wetlands (Ramsar)

The Convention on Wetlands of International Importance was adopted in 1971 in the Iranian city of Ramsar, and is now referred to as the 'Ramsar Convention'. The Australian Government is a contracting party to this international treaty. The convention's mission is "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".

There are 11 Ramsar sites in Victoria, and one, Hattah-Kulkyne Lakes, is located in the Mallee CMA region. Lake Albacutya is a Ramsar site to the south, located in the Wimmera CMA region. When this lake reaches capacity, Outlet Creek in the south of the Mallee region receives water.

8.1.2 Bilateral Migratory Bird Agreements

Australia is a signatory to the following international bilateral migratory bird agreements:

- Japan-Australia Migratory Bird Agreement (JAMBA);
- China-Australia Migratory Bird Agreement (CAMBA); and
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

These agreements require that the parties protect migratory birds by:

- limiting the circumstances under which migratory birds are taken or traded;
- protecting and conserving important habitats;
- exchanging information; and
- building cooperative relationships.

Species listed under migratory bird agreements are protected under the *EPBC Act 1999* (refer section 8.2.1). A search was conducted for the Mallee CMA region using the EPBC Protected Matters Search Tool and includes 17 listed migratory species (Appendix 5).

8.1.3 Convention on the Conservation of Migratory Species of Wild Animals (Bonn)

This convention (known as the Bonn Convention or CMS) aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. The Convention was signed in 1979 in Bonn, Germany, and entered into force in 1983.

8.2 Commonwealth Legislation

8.2.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC)

This is the key piece of legislation pertaining to biodiversity conservation within Australia. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places - defined in the *EPBC Act* as matters of national environmental significance.

Threatened Ecological Communities

A search conducted for the Mallee CMA region using the Protected Matters Search Tool (Appendix 5) revealed five ecological communities listed under the *EPBC Act 1999*, as shown in Table 11.

Table 11 EPBC Listed Ecological Communities in the Mallee CMA Region

Name	Status	Type of Presence
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community known to occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community likely to occur within area
River Murray and associated wetlands, floodplains and groundwater systems, from the junction with the Darling River to the sea	Approval Disallowed	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

(EPBC Protected Matters Report, Appendix 5)

8.2.2 Water Act 2007 (Commonwealth Water Act)

The *Water Act 2007* (Cth) was established to make provision for the management of the water resources of the Murray-Darling Basin, and to make provision for other matters of national interest in relation to water and water information, and related purposes.

This Act establishes the Murray-Darling Basin Authority (MDBA) with the functions and powers, including enforcement powers, needed to ensure that Basin water resources are managed in an integrated and sustainable way.

The **Basin Plan** was adopted by the Minister under the Act in 2012. The Basin Plan is a coordinated approach to water use across the Basin jurisdictions: Queensland, New South Wales, the Australian Capital Territory, Victoria, South Australia, and the Commonwealth Government. It limits water use at environmentally sustainable levels through long-term average Sustainable Diversion Limits for surface and groundwater.

8.2.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

This aims to preserve and protect areas and objects in Australia and Australian waters that are of particular significance to indigenous people from injury or desecration.

8.2.4 National Heritage Sites

The National Heritage List has been established to list places of outstanding heritage significance to Australia. It includes natural, historic and Indigenous places that are of outstanding national heritage value to the Australian nation (DoE 2014).

The National Heritage List replaces the Register of National Estate (RNE). Both are protected under the *EPBC Act 1999* (refer Section 8.2.1). As at 28 July 2014, 61 places with the Mallee CMA region were listed on the RNE (Appendix 5).

8.3 State Legislation and Listings

8.3.1 Flora and Fauna Guarantee Act 1988 (FFG)

This is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes.

8.3.2 Advisory Lists of Rare or Threatened Species in Victoria (DEPI)

Three advisory lists are maintained by DSE for use in a range of planning process and in setting priorities for actions to conserve biodiversity. Unlike other threatened species lists, there are no legal requirements or consequences that flow from inclusion of a species on an advisory list. The advisory lists comprise:

- Advisory List of Rare or Threatened Plants In Victoria – 2005
- Advisory List of Threatened Vertebrate Fauna in Victoria - 2007
- Advisory List of Threatened Invertebrate Fauna in Victoria – 2013

8.3.3 Heritage Rivers Act 1992

There are 18 Victorian rivers identified in the *Heritage Rivers Act 1992*. The Act protects public lands in specific parts of heritage rivers or river catchment areas which have significant recreation, nature conservation, scenic or cultural heritage attributes.

8.3.4 Environmental Effects Act 1978

Potential environmental impacts of a proposed development are subject to assessment and approval under this Act. A structural works program and any associated environmental impacts would be subject to assessment and approval under the Act.

8.3.5 Planning and Environment Act 1987

This controls the removal or disturbance to native vegetation within Victoria by implementation of a three-step process of avoidance, minimisation and offsetting.

8.3.6 Water Act 1989 (Victorian Water Act)

This is the key piece of legislation that governs the way water entitlements are issued and allocated in Victoria. The Act also identifies water that is to be kept for the environment under the Environmental Water Reserve. The Act provides a framework for defining and managing Victoria's water resources.

8.3.7 Aboriginal Heritage Act 2006

All Aboriginal places, objects and human remains in Victoria are protected under this Act.

8.4 Other Relevant Legislation

The preceding legislation operates in conjunction with the following other Victorian legislation to influence the management and conservation of Victoria's natural resources as well as outline obligations with respect to obtaining approvals for structural works:

- *Environment Protection Act 1970*
- *Catchment and Land Protection Act 1994*
- *Heritage Act 1995*
- *Conservation, Forests and Lands Act 1987*
- *Land Act 1958*
- *Wildlife Act 1975*
- *Murray Darling Basin Act 1993*
- *National Parks Act 1975*
- *Parks Victoria Act 1998*
- *Forests Act 1958*

9.0 Planning and Policy Frameworks

9.1 Victorian Waterway Management Strategy

The 2013 Victorian Waterway Management Strategy (VWMS) provides a single and updated framework for managing waterway health in Victoria. The focus of the VWMS is on improving the environmental condition of waterways so that they can support community needs, and strengthen partnerships between the Government and the community.

One of the key areas in the VWMS regards more efficient and effective use of environmental water. The development of EWMPs for rivers and wetlands reflects policy in the VWMS to set objectives and targets for priority sites for environmental water delivery. This includes setting environmental water objectives, defining ecological tolerances, and providing additional information regarding management arrangements and delivery constraints.

9.2 Regional Waterway Strategies

Following the launch of the VWMS, Regional Waterway Strategies (RWS) are being developed by all CMAs in which the regional priorities for management over the period 2013-20 will be established. This EWMP Context Document reflects these decisions, and complements the regional planning activities set out in the RWS.

The Mallee Waterway Strategy (2014-22) (Mallee CMA 2014) was released in May 2014 as a draft for public consultation. The period for receipt of submissions closed in early June 2014.

The management objective of the Mallee Waterway Strategy (MWS) is:

> "To protect and enhance the environmental condition of Mallee waterways, their associated riparian ecosystems and in turn, the social, cultural, economic and environmental values they provide to the community".

The strategy identifies that there are 17 individual sites within the Mallee region that have been formerly recognised as containing waterways of national and international importance. A further 55% of reaches have been recognised as priorities at the State level through legislated protection of the parks, reserves and forest in which they occur. Formally recognised waterways are described in sections 6.0. The strategy indicates that waterways with formal significance will be identified as high value in the regional priority setting process (Mallee CMA 2014).

The Mallee Waterways Strategy identified waterways as being of high value if they have one or more of the following characteristics:

- Formally recognised significance
- Present of highly threatened or rare species/communities
- Representativeness
- High naturalness values

- High social values
- High cultural values
- High economic value

Of the 281 waterways assessed the relative values were determined using a scoring system, 100% were identified as being of high value. Further filtering involved alignment with at least one of the regions long term goals, which reduced the number of high priority. This step resulted the identification of 212 (75%) of the region's high value waterways as being a priority for future management (Mallee CMA 2014).

Further assessment of the priority waterways categorised them as being high, medium or low priority ranking in regard to future management activities being undertaken to reduce threats to their values (Mallee CMA 2014).

The 212 waterways have then been grouped into 23 Waterway Management Units (WMUs) (Table 12) to recognise their interconnectedness and commonality of threats impacting on their values.

Table 12 Waterway Management Units in the (Draft) Mallee Waterway Strategy

No	Waterway Management Unit	Priority Waterways Reach (No)	No	Waterway Management Unit	Priority Waterways Reach (No)
1	Nyah	4	15	Lindsay	14
2	Burra	4	16	Raak Plain	0
3	Heywood	3	17	Pink Lakes	0
4	Boundary Bend	3	18	Wyperfeld	1
5	Belsar Yungera	6	19	Yarriambiack	1
6	Bumbang	2	20	Dunmunkle	0
7	Happy Valley	1	21	Tyrrell	2
8	Hattah	4	22	Lalbert	1
9	Nangiloc Colignan	1	23	Dispersed Wetlands:	
10	Karadoc	3		A Freshwater	-
11	Nicholls Point	4		B Saline - Natural	-
12	Merbein	1		C Saline - Irrigation	-
13	Wallpolla	21		D – Artificial Supply and Irrigation	-
14	Mulcra	6			

(Mallee CMA 2014)

9.3 Environmental Water Planning Processes

Victoria has a defined planning framework for environmental watering.

Regional Waterway Strategies (RWSs) identify priority waterways where environmental values are at risk from altered water regimes and identify high level management objectives. These management objectives take into account the other values of the waterway, including social, cultural and economic values.

To develop detailed environmental objectives for regional priority waterways where environmental water can be delivered, environmental water management plans (EWMPs) are developed. EWMPs outline longer- term management objectives for a site and detailed operational planning for use of environmental water. They are developed in consultation with regional communities (and, where possible, identify opportunities for social and cultural benefits) and include environmental watering objectives, water regime targets and ecological tolerances for the site. The EWMPs provide additional information such as management arrangements and delivery constraints. EWMPs will initially focus on individual sites but, as knowledge increases, they may extend to planning at the broader system scale.

Informed by their RWSs and EWMPs, waterway managers prepare seasonal watering proposals each year to identify annual priorities for environmental water use in their region. The Basin Plan also includes requirements for Long Term Environmental Watering Plans for environmental assets, which will be similar to Victoria's EWMPs. Victoria's EWMPs will need to be consistent with the Long Term Environmental Watering Plans.

The Victorian Environmental Water Planning Framework is set out in Figure 3 (over page). The differences between the planning documents of the regional Waterway Strategies, EWMPs, and Seasonal Watering Plans are also set out in Table 13 (page 29).

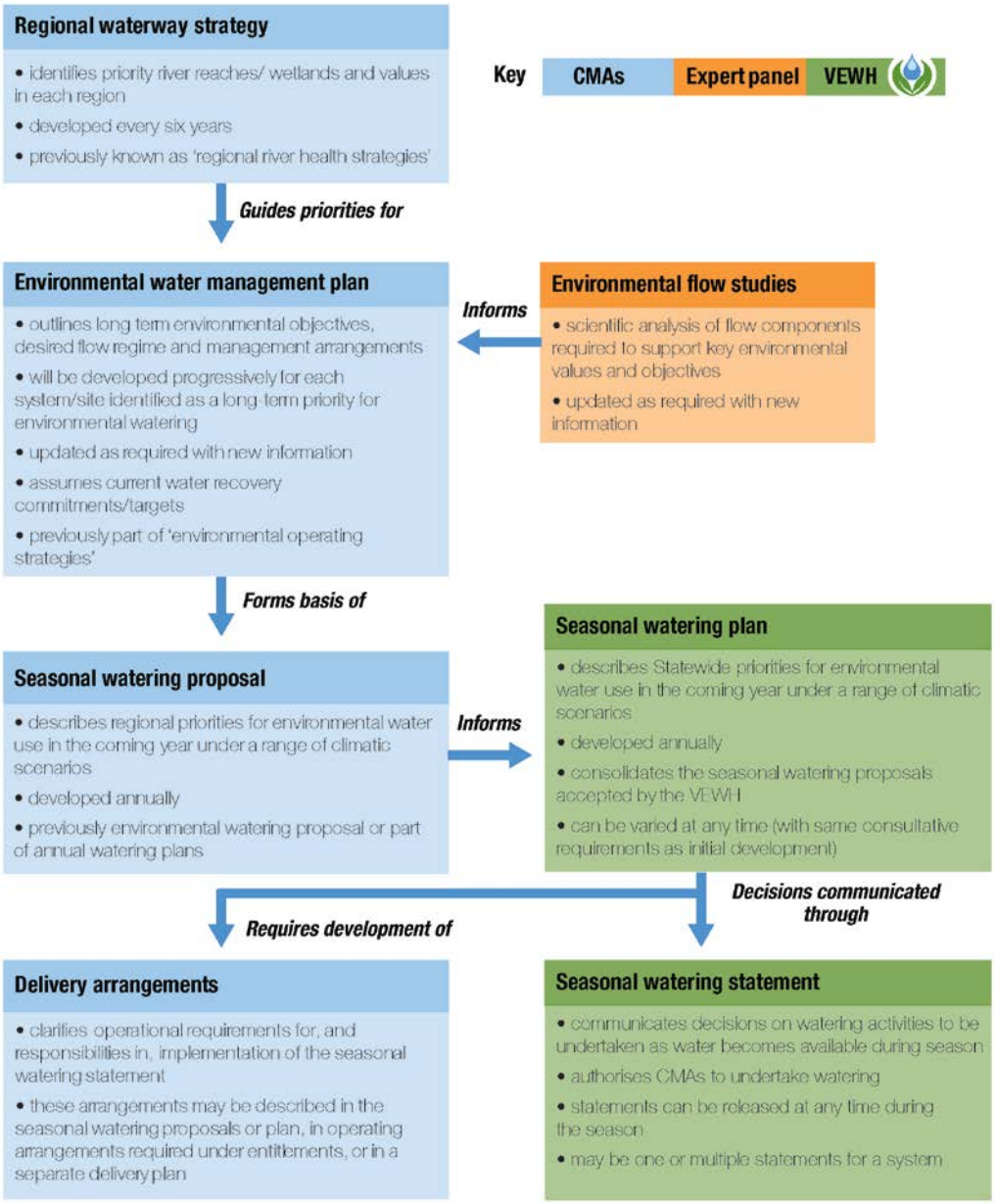

Figure 3: The Victorian Environmental Water Planning Framework
(DEPI 2013b)

Table 13: Intended Characteristics of Planning Documents

	Regional Waterway Strategy (RWS)	Environmental Water Management Plans (EWMP)	Seasonal Watering Proposals (SWP)
General			
Intent and purpose	• A strategic document identifying the region's priority river and wetland systems and values for management action for the next eight years. • Identifies the management objectives. • Identifies the priority management actions, particularly for complementary works and measures. • Identifies desired outcomes for key values.	• For priority sites or systems identified in RSHRWs as flow threatened. The focus is sites that can be actively managed with environmental water. • Identify the long-term objectives (ecological and hydrological) and environmental water requirements to support the management objectives in a RSHRW (using a range of information sources including flows studies). • Operationalise flow studies, including providing guidance on the critical flow tolerances to achieve or maintain ecological objectives. • Inform the development of seasonal watering proposals and seasonal watering plans, outlining the 'static' information, reducing the length of Seasonal Watering Proposals. • Within northern Victoria, serve as a long-term watering plan, as required under the draft Murray-Darling Basin Plan.	• Uses priorities identified in RSHRWs and EWMPs to inform environmental watering actions. • Outlines full scope of watering actions that may be required in the coming year. • Provides range of environmental watering actions based on catchment/climatic scenarios and recent watering history.
Scale	CMA region	• Individual sites or systems (wetlands and river reaches) that can be managed with environmental water.	• Individual sites or systems that can be managed with environmental water.
Document life	• Eight years.	• Up to ten years, or less with significant new information.	• Annual (July – June).
Key outcome/s (related to environmental water management)	• Identify priority sites or systems, key values at these (environmental plus social and economic), and desired outcomes for key values. • Identify priority management actions.	• Provide link between regional priorities and site-specific environmental water management. • Consolidate existing knowledge about environmental water management within a site or system, including the reasons for management (specific values, objectives etc). • Capture long-term objectives (and reasoning) for the site or system so seasonal planning can focus on the specific management actions required on an annual basis.	• Provide clarity in the proposed environmental water management actions to be undertaken using the water holdings on a seasonal basis. • Plan for environmental watering actions to work toward the achievement of ecological objectives formalised through EWMPs.

	Regional Waterway Strategy (RWS)	Environmental Water Management Plans (EWMP)	Seasonal Watering Proposals (SWP)
Endorsement	• Approved by CMA Board (or delegate). • Endorsed by the Minister for Water and the Minister for Environment and Climate Change.	• Approved by CMA Board (or delegate). • Endorsed by DEPI and VEWH (and land management if relevant)	• Proposal approved by CMA Board (or delegate) • Incorporated into Seasonal Watering Plan by VEWH Commission.
Community / stakeholder consultation	• Community and stakeholders provide input to values, via a draft for public consultation.	• Involve and collaborate with targeted community and stakeholders for each site/system. • Input to management goals, based on ecological objectives. • Stakeholder (land manager) endorsement of goals and objectives. • Engagement will vary in approach, depending on interest, site issues, seasonal conditions, or existing formal committees.	• Involve and collaborate with targeted community and stakeholders for each site/system. • Input to the development of annual priorities for environmental watering. • Community informed regarding environmental watering actions actually implemented throughout the season.
Specific information			
Objectives / Management goal	• Set clear management objectives for high value river reaches and wetlands based on the community values present.	• Establish a long-term (water-related) management goal for the site, based on the ecological and hydrological objectives developed in the plan.	• Ecological and hydrological objectives used to guide annual environmental watering actions. • Put into practice the hydrological objectives from the EWMP on an annual/seasonal basis.
Water dependent values	• Identify threats to the community values of waterways and assess risk to those values (including, but not restricted to water-dependent, flow-threatened values).	• Only developed for sites/systems with flow-threatened values that can be managed with environmental water. • Uses this information to develop specific and measurable ecological objectives and hydrological objectives for those values.	• Short-term season-specific watering actions that will lead to achievement of long-term ecological objectives.
Seasonally adaptive approach	• Acknowledges the seasonally adaptive approach will be used in setting targets for annual on-ground works and environmental water planning processes, based on seasonal variability.	• Uses the seasonally adaptive approach to outline possible environmental water management regimes under a range of wet to dry conditions, to support the ecological objectives, and to plan for multiple years. • Sets 'tolerances' (thresholds) for the identified hydrological objectives to guide annual management under different seasonal conditions. • Provides an integrated flow regime, for various ecological objectives and flow targets.	• Operational implementation of the seasonally adaptive approach based on background information developed in EWMP. • Identifies specific seasonal scenarios for the coming year and outlines environmental water management regimes under each.

	Regional Waterway Strategy (RWS)	Environmental Water Management Plans (EWMP)	Seasonal Watering Proposals (SWP)
Risk identification and assessment	• Risk identification undertaken to determine full suite of possible risks to the community values of waterways. • Based on wide range of risks to the values identified in AVIRA.	• Risk identification undertaken to indicate the range of risks from the delivery of environmental water. • Includes risks to the site/system, as well as possible impacts to third parties and other uses of the sites (e.g. recreation). • Identify general roles and responsibilities for risks given. • Detailed risk assessment and responsibilities *not* undertaken at this stage (role of Proposal).	• Detailed risk assessment completed on an annual basis based on risk identification from EWMP, and scenarios in proposal (e.g. to determine likelihood of flooding). • Mitigation options outlined. • Specific responsibilities for risk management identified.
Identification / consideration of complementary works (including infrastructure)	• Outlines a regional work program of priority management actions (including on-ground works, planning, and programs to facilitate community participation and awareness raising) • Provides the basis for investment into multi-year projects and annual work programs. • Outlines major processes to be undertaken for environmental water management (e.g. development of EWMPs, SWPs, input to local management rules etc.).	• Complementary activities that optimise environmental water outcomes are considered (can be used to guide a long term work plan on a site-by-site basis). • Explanations of short- and long-term infrastructure improvements or projects to assist environmental water delivery to the site should be included.	• Complementary works that are critical to achieving a specific environmental watering outcome for a single event are included (e.g. channel de-silting, small levee bank).
Technical work / Knowledge gaps (including monitoring)	• Inclusion of a monitoring, reporting and evaluation program with a focus on catchment monitoring.	• Identification of knowledge gaps for the site/system (e.g. review or development of EVC mapping where information is missing; tolerances of flow components not addressed in existing flows study). • Outline the monitoring framework for the site to demonstrate outcomes. This will include prioritised recommendations for outcome-based monitoring at the site/system, and monitoring specifically for outcomes associated with environmental water management in the system over the long-term.	• Identify priorities for event-based monitoring, in accordance with the ecological and hydrological objectives being targeted.

(DEPI 2014)

10.0 Monitoring Programs in Victoria

The Victorian Government currently runs a number of monitoring programs across the state for rivers and wetlands, with further programs in development. The descriptions below outline how each of these programs will be used to demonstrate the outcomes of environmental water provision in rivers.

10.1 Event Based Monitoring for Sites Provided with Callable Environmental Water

Operational Monitoring is used to determine if the hydrological objectives were achieved. At all sites that receive environmental water, the volume and extent of water delivered to the site is recorded by Catchment Management Authorities (CMAs) as part of their management of the delivery of environmental water. VEWH will fund metering where this is required to address gaps in compliance or improve the management of the Water Holdings.

Event based ecological monitoring collects data on the hydrological, physical or ecological response to environmental water being delivered to a site or system. This will be used to demonstrate if ecological outcomes of environmental watering have been achieved. The Victorian Environmental Water Holder (VEWH) will decide when this is required and will fund this monitoring. CMAs will develop monitoring proposals and manage the monitoring projects. As the VEWH's annual monitoring budget is limited, only a small proportion of events will be monitored each year.

10.1.1 Event Based Monitoring in the Mallee CMA Region

Event based monitoring is important to help measure the impact of environmental water delivery within the Mallee CMA. A few relevant positive impacts may include relevant include improved condition of native vegetation, improved water quality, improved habitat and/or breeding opportunities for aquatic, terrestrial and aerial fauna.

Negative impacts may include the spread of pest plants and animals and the movement of saline water into the Murray River.

Some of the event based monitoring programs within the Mallee CMA include:

- Fish movement during watering of Butlers Creek
- Water quality parameters including salinity during watering and discharge at Psyche Lagoon
- Inundation extent monitoring and volumes pumped at environmental water delivery sites
- Bird activity at Hattah Lakes
- Inundation extent, pumping rate/volume per day at Hattah Lakes

10.2 Understanding Linkages Between Flow and Ecological Response

The Victorian Environmental Flow Monitoring and Assessment Program (VEFMAP) is currently investigating the effect of environmental watering (and more general environmental responses to flow variation) in selected rivers throughout the State. This program will test specific hypotheses about ecological responses to particular water regimes and the application of environmental water in wetlands.

An equivalent approach for wetlands is currently under development.

There are currently no VEFMAP activities conducted in the Mallee CMA

10.3 State Condition Assessment and Monitoring

Statewide monitoring of resource condition in Victoria is undertaken using three specifically developed Indices of Condition: the Index of Stream Condition (ISC) the Index of Wetland Condition (IWC) and the pilot Index of Estuary Condition (IEC).

These Indices integrate data about the key components of rivers, wetlands and estuaries that are important from an ecological perspective. Successive assessments should broadly demonstrate the cumulative effect of management interventions across Victoria.

The Indices are not designed to be sensitive to local-scale management activities. They are intended to report across the state and within CMAs. They are used to provide a spatial 'snapshot' of condition across the state at a single point in time.

The Index of Stream Condition and Index of Wetland Condition are explained in Appendices 1 and 2.

10.3.1 Indices of Condition in the Mallee CMA Region

Within the Mallee CMA, there are 73 river reaches covering 1,450 km that are part of the ISC and 81 wetlands that have been appraised using IWC.

10.4 Water Resource Monitoring

Surface water data is collected from approximately 780 monitoring sites across the state through Victoria's Regional Water Monitoring Partnerships' program. Around 40 organisations invest in the program and the Department of Environment and Primary Industries acts as both a partner and overarching program manager. The program monitors surface water flows, volumes, quality, and extraction.

Groundwater use is tracked through monitoring and metering in Groundwater Management Areas (GMAs) across Victoria. Water levels are measured regularly in approximately 2,500 observation bores across the state.

10.4.1 Water Resource Monitoring in the Mallee CMA Region

Shallow saline groundwater (<2m) can result in land degradation, impacting on rivers, wetlands and native vegetation (Mallee CMA 2009). The Murray River "eventually receives most of the salt moving down-basin via the regional groundwater systems" (Mallee CMA 2013b). Salt Interception Schemes (SIS) are located at Mildura-Merbein in the Mallee CMA, and, in NSW at Mallee Cliffs, Curlwaa, Buronga and Rufus River. These schemes aim to intercept groundwater discharge. Groundwater is pumped to Lake Ranfurly East and the Wargan Basins from the Mildura-Merbein SIS (Telfer, Burnell & Charles 2013).

A network of 518 observation bores is regularly monitored by the Mallee CMA, assisting in the long term interpretation of interactions between climate, irrigation, land clearing and groundwater in the region.

Eighteen drainage sites within the Mallee CMA region are continuously monitored for electrical conductivity and flow. Three in-stream monitoring sites (EC and flow) exist in the Murray River, including one at Wemen and one at Lindsay Island.

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Appendix 1:

Index of Stream Condition

Appendix 1 - Index of Stream Condition

The Index of Stream Condition (ISC) provides a benchmark condition for rivers in Victoria approximately every five years. It was designed to determine the success of environmental intervention policies and management, and is a 'snapshot' of condition across the state at a point in time.

It measures condition of stream reaches (10 – 30 km in length) using five sub-indices: hydrology, physical form, streamside zone, water quality, and aquatic life. During the first ISC, sites were selected within reaches to measure the sub-indices based on representativeness of sites to reach characteristics; proximity to existing biological, physical, and water quality monitoring sites; and accessibility for sampling (DNRE, 1997). However the most recent 2010 ISC progressed to use remote sensing (aerial photography and LiDAR). This approach enabled data to be collected from both sides of the river ('census' approach).

During the 2010 ISC, 1,166 reaches totalling 29,000km were assessed.

ISC sub-indices

Descriptions of the 2010 ISC sub-indices are provided below, along with the metrics used to characterise each sub-index (and which are ultimately measured in the reaches).

2010 ISC sub-indices and metrics

Sub-index	Basis for sub-index value	Metrics within sub-index
Hydrology	Amount of water within the river channel at a particular point in time at a particular location.	Low flows High flows Zero flows Seasonality Variability
Physical Form	River bank condition, instream habitat (snags) and major barriers to fish migration (e.g. dams, artificial weirs)	Bank stability Artificial barriers Instream woody habitat
Streamside Zone	Characteristics of the woody vegetation within 40m of the river's edge.	Width Fragmentation Overhang Cover of trees and shrubs Structure Large trees Weeds
Water Quality	Assessment of key water quality parameters	Total phosphorous Turbidity Salinity (Electrical conductivity) pH (alkalinity / acidity)
Aquatic Life	Number and type of aquatic macroinvertebrates in the river	SIGNAL[2] AusRivAS[3] EPT[4] Number of Families

[2] SIGNAL: a scoring system for macroinvertebrates in Australian rivers, 'Stream Invertebrate Grade Number – Average Level'.
[3] AusRivAS: rapid prediction system to assess biological health of Australian rivers, '**Aus**tralian **Riv**er **A**ssessment **S**ystem'.
[4] EPT: Index of water quality based on abundance of three sensitive macroinvertebrate orders, Ephemeroptera, Plecoptera, and Trichoptera .

ISC scoring method

A rating system is used to assess the stream condition based on comparing the sub-index metrics with a reference state and (in the most recent 2010 ISC) a management target, such as priority watering actions. A management target reflects the objective environmental condition of a river management program, such as those set through the Seasonal Watering Plan.

For each metric, a high rating shows it is close to the reference state and/or management target. Conversely, a low rating shows it is extremely modified or distant from the reference state or management target. Ratings for each metric are summed within each sub-index (maximum of 10 per sub-index); these are then summed for the overall ISC score of between 0 and 50 (see example figure below) using a transformation known as an inverse ranking. The overall ISC score allows a condition band to be assigned – excellent, good, moderate, poor or very poor. However individual sub-indices and metrics provide the more useful details regarding issues affecting the condition of a river reach.

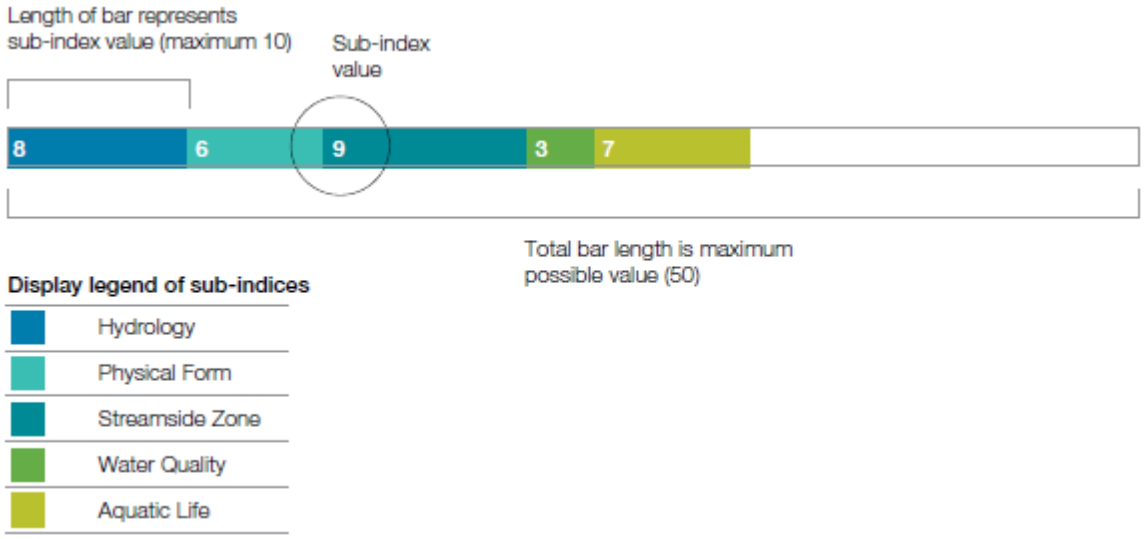


Figure: The ISC bar showing the 5 sub-indices, from DEPI (2013a).

[Source: DEPI 2014]

Appendix 2:

Index of Wetland Condition

Appendix 2 - Index of Wetland Condition

In Victoria, the standard means for assessing the condition of individual wetlands is to use the Index of Wetland Condition (IWC). The IWC is a benchmark condition assessment similar to the ISC.

The IWC is made up of six sub-indices: wetland catchment, physical form, hydrology, water properties, soils, and biota.

An initial IWC assessment was undertaken in 2009-10 of nearly 600 wetlands across the state. In 2011, a further 12,400 wetlands were also assessed. Future assessments are planned at eight yearly intervals.

IWC sub-indices

The table below shows what is measured for each sub-index and how each sub-index is scored.

IWC sub-indices and measures

Sub-index	What is measured	How it is scored
Wetland catchment	1. The intensity of the land use within 250 metres of the wetland	The more intensive the landuse the lower the score
	2. The width of the native vegetation surrounding the wetland and whether it is a continuous zone or fragmented	The wider the zone and more continuous the zone, the higher the score
Physical form	3. Whether the size of the wetland has been reduced from its estimated pre-European settlement size	A reduction in area results in a lowering of the score
	4. The percentage of the wetland bed which has been excavated or filled	The greater the percentage of wetland bed modified, the lower the score
Hydrology	5. Whether the wetland's water regime (i.e. the timing, frequency of filling and duration of flooding) has been changed by human activities	The more severe the impacts on the water regime, the lower the score
Water properties	6. Whether activities and impacts such as grazing and fertilizer run-off that would lead to an input of nutrients to the wetland are present	The more activities present, the lower the score
	7. Whether the wetland has become more saline or in the case of a naturally salty wetland, whether it has become more fresh	An increase in salinity for a fresh wetland lowers the score or a decrease in salinity of a naturally salty wetland lowers the score
Soils	8. The percentage and severity of wetland soil disturbance from human, feral animals or stock activities	The more soil disturbance and the more severe it is, the lower the score
Biota	9. The diversity, health and weediness of the native wetland vegetation	The lower the diversity and poorer health of native wetland vegetation, the lower the score

Scoring

Each subindex is given a score between 0 and 20 based on the assessment of a number of measures as outlined above. Weightings are then applied to the scores as tabulated below.

IWC sub-index	Weight
Biota	0.73
Wetland catchment	0.26
Water properties	0.47
Hydrology	0.31
Physical form	0.08
Soils	0.07

The maximum possible total score for a wetland is 38.4. For ease of reporting, total scores are normalised to an integer out of 10 (i.e. divide the total score by 38.4, multiply by 10 and round to the nearest whole number).

Condition is reported ranging from Very Poor to Excellent, by assigning the score to one of five categories. The five category approach is consistent with the number of categories used in other condition indices such as the Index of Stream Condition. There are small differences in how a score is assigned to a condition, depending on which sub-index and index is being considered. The Biota sub-index score categories were determined by expert opinion and differ to those of the other sub-indices.

Non-biota sub-index score range	Biota sub-index score range	Total score range	Wetland condition category
0-4	0-8	0-2	Very poor
5-8	9-13	3-4	Poor
9-12	14-16	5-6	Moderate
13-16	17-18	7-8	Good
16-20	19-20	9-10	Excellent
N/A	N/A	N/A	Insufficient data

[Source: DEPI 2014]

Appendix 3:

Ramsar Selection Criteria

Appendix 3 – Ramsar Selection Criteria

Group A of the Criteria: Sites containing representative, rare or unique wetland types

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B of the Criteria: Sites of international importance for conserving biological diversity

Criteria based on species and ecological communities

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Specific criteria based on waterbirds

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

[Source: DoE 2011]

Appendix 4:

Directory of Important Wetlands

Criteria for Inclusion

Wetland Type Descriptions

Appendix 4 – Criteria for Determining Important Wetlands

The criteria for determining nationally important wetlands in Australia, and hence inclusion in the Directory, are those agreed to by the ANZECC Wetlands Network in 1994 and used in the second edition.

A wetland may be considered nationally important if it meets at least one of the following criteria:

1. It is a good example of a wetland type occurring within a biogeographic region in Australia.
2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex.
3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
4. The wetland supports 1% or more of the national populations of any native plant or animal taxa.
5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
6. The wetland is of outstanding historical or cultural significance.

Directory of Important Wetlands Wetland Classification System

[Excerpt from the Directory of Important Wetlands, Environment Australia 2001]

The definition of a wetland used in the Directory continues to be that adopted by the Ramsar Convention under Article 1.1, namely:

> "wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres."

Within this broad definition, the wetland classification system used in the Directory identifies 40 different wetland types in three categories: A—Marine and Coastal Zone wetlands, B—Inland wetlands, and C—Human-made wetlands (refer below). This system has not been altered since it was agreed to by the then ANZECC Wetlands Network1 in 1994, hence it remains the same as that used in the second edition.

The system is based on that used by the Ramsar Convention in describing Wetlands of International Importance, but was modified slightly to suit the Australian situation in describing wetlands of national importance. Notable alterations to the Ramsar classification system included the addition of non-tidal freshwater forested wetlands (A12) and rock pools (B17). Inland karst systems were also added (B19), although the Ramsar classification system now includes karst systems under all categories.

B—Inland wetlands

1. Permanent rivers and streams; includes waterfalls
2. Seasonal and irregular rivers and streams
3. Inland deltas (permanent)
4. Riverine floodplains; includes river flats, flooded river basins, seasonally flooded grassland, savannah and palm savannah
5. Permanent freshwater lakes (> 8 ha); includes large oxbow lakes
6. Seasonal/intermittent freshwater lakes (> 8 ha), floodplain lakes
7. Permanent saline/brackish lakes
8. Seasonal/intermittent saline lakes
9. Permanent freshwater ponds (< 8 ha), marshes and swamps on inorganic soils; with emergent vegetation waterlogged for at least most of the growing season
10. Seasonal/intermittent freshwater ponds and marshes on inorganic soils; includes sloughs, potholes; seasonally flooded meadows, sedge marshes
11. Permanent saline/brackish marshes
12. Seasonal saline marshes
13. Shrub swamps; shrub-dominated freshwater marsh, shrub carr, alder thicket on inorganic soils
14. Freshwater swamp forest; seasonally flooded forest, wooded swamps; on inorganic soils
15. Peatlands; forest, shrub or open bogs
16. Alpine and tundra wetlands; includes alpine meadows, tundra pools, temporary waters from snow melt
17. Freshwater springs, oases and rock pools
18. Geothermal wetlands
19. Inland, subterranean karst wetlands

[Excerpt from the Directory of Important Wetlands, Environment Australia 2001]

Appendix 5:

EPBC Protected Matters Database Search – Mallee CMA Region

Australian Government
Department of the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

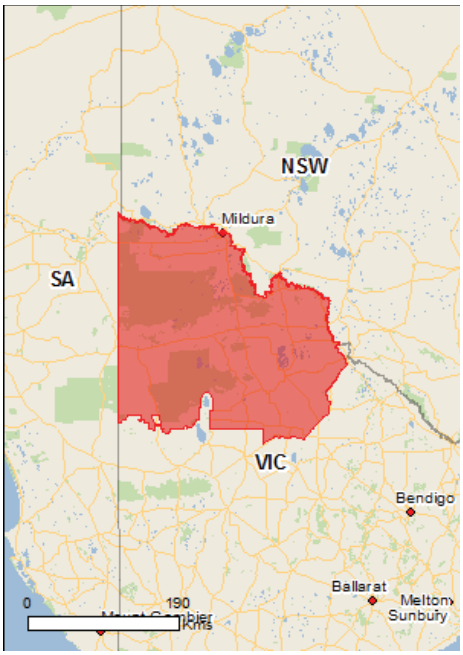
Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

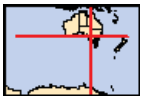
NRM MALLEE, VIC

Report created: 28/07/14 08:55:58

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements





Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International	5
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	6
Threatened Species:	42
Migratory Species:	17

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.

Commonwealth Lands:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	26
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

Place on the RNE:	61
State and Territory Reserves:	405
Regional Forest Agreements:	None
Invasive Species:	41
Nationally Important Wetlands:	17

Details

Matters of National Environmental Significance

Wetlands of International Significance (RAMSAR) [Resource Information]

Name	Proximity
Banrock station wetland complex	Upstream from Ramsar
Coorong and lakes alexandrina and albert	Upstream from Ramsar
Hattah-kulkyne lakes	Within Ramsar site
Lake albacutya	Within 10km of Ramsar
Riverland	Within 10km of Ramsar

Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community known to occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community likely to occur within area
River Murray and associated wetlands, floodplains and groundwater systems, from the junction with the Darling River to the sea	Approval Disallowed	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Threatened Species [Resource Information]

Name	Status	Type of Presence
BIRDS		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Manorina melanotis Black-eared Miner [449]	Endangered	Species or species habitat known to occur within area
Pachycephala rufogularis Red-lored Whistler [601]	Vulnerable	Species or species habitat likely to occur within area
Pedionomus torquatus Plains-wanderer [906]	Vulnerable	Species or species habitat likely to occur within area
Polytelis anthopeplus monarchoides Regent Parrot (eastern) [59612]	Vulnerable	Breeding likely to occur within area

Name	Status	Type of Presence
Psophodes nigrogularis leucogaster		
Western Whipbird (eastern), Mallee Western Whipbird [64448]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Stipiturus mallee		
Mallee Emu-wren [59459]	Endangered	Species or species habitat known to occur within area
FISH		
Bidyanus bidyanus		
Silver Perch, Bidyan [76155]	Critically Endangered	Species or species habitat likely to occur within area
Craterocephalus fluviatilis		
Murray Hardyhead [56791]	Endangered	Species or species habitat known to occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
FROGS		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur within area
INSECTS		
Synemon plana		
Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area
MAMMALS		
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
PLANTS		
Acacia glandulicarpa		
Hairy-pod Wattle [8838]	Vulnerable	Species or species habitat likely to occur within area
Acacia menzelii		
Menzel's Wattle [9218]	Vulnerable	Species or species habitat may occur within area
Austrostipa metatoris		
[66704]	Vulnerable	Species or species habitat likely to occur within area
Austrostipa wakoolica		
[66623]	Endangered	Species or species habitat likely to occur within area
Caladenia tensa		
Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat known to occur within area
Caladenia versicolor		
Candy Spider-orchid [24392]	Vulnerable	Species or species habitat may occur within area
Callitriche cyclocarpa		
Western Water-starwort [7477]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Eleocharis obicis a spike rush [15320]	Vulnerable	Species or species habitat likely to occur within area
Lepidium monoplocoides Winged Pepper-cress [9190]	Endangered	Species or species habitat likely to occur within area
Lepidium pseudopapillosum Erect Pepper-cress [11548]	Vulnerable	Species or species habitat likely to occur within area
Maireana cheelii Chariot Wheels [8008]	Vulnerable	Species or species habitat likely to occur within area
Myriophyllum porcatum Ridged Water-milfoil [19919]	Vulnerable	Species or species habitat likely to occur within area
Phebalium lowanense Lowan Phebalium [7144]	Vulnerable	Species or species habitat likely to occur within area
Pimelea spinescens subsp. pubiflora Wimmera Rice-flower [21979]	Critically Endangered	Species or species habitat likely to occur within area
Pterostylis arenicola Sandhill Greenhood Orchid [17919]	Vulnerable	Species or species habitat may occur within area
Pterostylis cheraphila Floodplain Rustyhood [56508]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis xerophila Desert Greenhood [7997]	Vulnerable	Species or species habitat likely to occur within area
Sclerolaena napiformis Turnip Copperbur [11742]	Endangered	Species or species habitat likely to occur within area
Solanum karsense Menindee Nightshade [7776]	Vulnerable	Species or species habitat likely to occur within area
Stackhousia annua Annual Stackhousia, Annual Candles [17773]	Vulnerable	Species or species habitat likely to occur within area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Swainsona pyrophila Yellow Swainson-pea [56344]	Vulnerable	Species or species habitat likely to occur within area
Tecticornia flabelliformis Bead Glasswort [82664]	Vulnerable	Species or species habitat known to occur within area
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat likely to occur within area
REPTILES		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area

Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Breeding known to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]		Roosting known to occur within area
Calidris ruficollis		
Red-necked Stint [860]		Roosting known to occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Species or species habitat known to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Limosa limosa		
Black-tailed Godwit [845]		Roosting known to occur within area
Numenius minutus		
Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa glareola		
Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Defence - KAIRIVU BARRACKS - MILDURA

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Lake Tyrell Area	VIC	Indicative Place
Lindsay Island and the Copi Plains	VIC	Indicative Place
Murray River Forest Area	VIC	Indicative Place
Pine Plains Area	VIC	Indicative Place
Sanders Road remnant vegetation	VIC	Indicative Place
Wallpolla Island	VIC	Indicative Place
Big Desert	VIC	Interim List
Annuello Flora and Fauna Reserve	VIC	Registered
Big Desert Wilderness Park	VIC	Registered
Bronzewing Flora and Fauna Reserve	VIC	Registered
Chowilla Area near Renmark	SA	Registered
Hattah Lakes System	VIC	Registered
Lake Albacutya Park	VIC	Registered
Mallanbool Flora and Fauna Reserve	VIC	Registered
Meringur Flora and Fauna Reserve	VIC	Registered
Mount Shaugh Conservation Park	SA	Registered
Murray Mallee - Big Desert / Wyperfeld Block	VIC	Registered
Murray Mallee - Bookmark Block	SA	Registered
Murray Mallee - Murray Sunset Country	VIC	Registered
Murray Mallee - Ngarkat Complex	SA	Registered
Ngarkat Conservation Park (1980)	SA	Registered
Paradise Flora and Fauna Reserve	VIC	Registered

Name	State	Status
Pink Lakes State Park (former)	VIC	Registered
Wandown Wildlife Reserve	VIC	Registered
Wathe State Wildlife Reserve	VIC	Registered
Wyperfeld National Park (1978 boundary)	VIC	Registered
Yarrara Flora and Fauna Reserve	VIC	Registered
Indigenous		
Manatunga Housing Settlement Site	VIC	Indicative Place
Southern Raak Plains Archaeological Complex	VIC	Indicative Place
Yelta Mission	VIC	Indicative Place
Bumbang Island	VIC	Registered
Horseshoe Bend Burial Site	VIC	Registered
Lake Wirrengren - Brambrambult Brothers Dreaming Trail	VIC	Registered
Lake Wonga - Brambrambult Brothers Dreaming Trail	VIC	Registered
Merbein Midden	VIC	Registered
Mount Gray Site	VIC	Registered
Nyah Forest Mounds Area	VIC	Registered
Pine Plains - Brambrambult Brothers Dreaming Trail	VIC	Registered
Robinvale Burial Site	VIC	Registered
Ross Spring Wells Area	VIC	Registered
Historic		
Patchewollock Railway Station Complex	VIC	Identified through State processes
Horticultural Research Station	VIC	Indicative Place
Lalbert Dog Fence	VIC	Indicative Place
Lock and Weir No 11	VIC	Indicative Place
Lock and Weir No 15	NSW	Indicative Place
Manangatang Railway Station	VIC	Indicative Place
Murrayville Railway Station	VIC	Indicative Place
Nyah Historic Pump House	VIC	Indicative Place
Old Coach Road	VIC	Indicative Place
Pine Tank Water Storage Facility (former)	VIC	Indicative Place
War Graves, Mildura Public Cemetery	VIC	Indicative Place
Billabong Pump Station	VIC	Registered
Cow Plains Homestead, outbuildings and surrounds	VIC	Registered
Glosters Garage	VIC	Registered
Hopetoun House	VIC	Registered
House	VIC	Registered
Lake Corrong Station Homestead	VIC	Registered
Lock Nine Pumphouse (former)	VIC	Registered
Nowingi Iron Clad Catchment	VIC	Registered
Psyche Bend Pumping Station (former)	VIC	Registered
Rio Vista	VIC	Registered

State and Territory Reserves

[Resource Information]

Name	State
14 Mile B.R.	VIC
Angels Rest F.R	VIC
Annuello B.R	VIC
Annuello F.F.R.	VIC
Annuello R.N.A.	VIC
Bailey Plain B.R.	VIC
Balmers Tank B.R	VIC
Bambill B.R	VIC
Bannerton F.F.R.	VIC
Banyan B.R.	VIC
Baring I112 B.R.	VIC
Baring I113 B.R.	VIC
Baring I252 B.R.	VIC
Baring I253 B.R.	VIC
Baring North I111 B.R	VIC
Beabush Tank B.R.	VIC
Beer Can Corner B.R.	VIC
Bell N.C.R.	VIC
Bellevue Tank B.R.	VIC
Benetook B.R.	VIC
Berriwillock B.R.	VIC
Berrook	VIC
Beulah B.R.	VIC

Name	State
Big Desert	VIC
Birdcage F.F.R.	VIC
Bitchigal B.R	VIC
Blue Mountain B.R.	VIC
Boigbeat I158 B.R	VIC
Boigbeat I292 B.R.	VIC
Boigbeat Tank B.R.	VIC
Boinka B.R	VIC
Boinka F.R.	VIC
Bolton B.R.	VIC
Bolton F.F.R	VIC
Boonoonar B.R.	VIC
Boorongie B.R.	VIC
Boulka I107 B.R	VIC
Boulka I96 B.R	VIC
Bourka I156 B.R	VIC
Bower Tank B.R.	VIC
Box Flat B.R.	VIC
Box Swamp B.R.	VIC
Bransons B.R.	VIC
Brimy Bill (5 Mile Lake) W.R.	VIC
Broken Bucket Tank B.R.	VIC
Bronzewing B.R.	VIC
Bronzewing F.F.R	VIC
Broombush	VIC
Bulgei B.R.	VIC
Bulls Swamp W.R	VIC
Bumbang I261 B.R.	VIC
Bumbang I262 B.R	VIC
Bumbang I264 B.R	VIC
Bumbang I38 B.R	VIC
Bumbang I39 B.R.	VIC
Burnell I35 B.R	VIC
Burnell I36 B.R	VIC
Burupga B.R	VIC
Byanga B.R	VIC
Cambacanya F.F.R	VIC
Carapugna B.R	VIC
Carapugna Tennis Court B.R.	VIC
Cardross N.C.R.	VIC
Carina B.R	VIC
Carori I174 B.R	VIC
Carori I175 B.R	VIC
Carters Tank B.R.	VIC
Carwarp B.R.	VIC
Carwarp B.R. 2	VIC
Carwarp West I12 B.R	VIC
Carwarp West I224 B.R	VIC
Carwarp West I9 B.R	VIC
Chalka Creek	VIC
Chillingollah B.R.	VIC
Chillingollah F.F.R	VIC
Chillingollah West B.R.	VIC
Chinaman Flat	VIC
Chinkapook F.F.R.	VIC
Chinkapook North B.R.	VIC
Chiprick I177 B.R.	VIC
Christmas Tank B.R.	VIC
Clarks Tank B.R.	VIC
Clear Tank B.R.	VIC
Cocamba B.R.	VIC
Cocamba F.F.R.	VIC
Cokam B.R.	VIC
Company Dam B.R.	VIC
Cookies Plain B.R.	VIC
Coonimur I56 B.R	VIC
Cowangie B.R.	VIC

Name	State
Cowangie Railway B.R.	VIC
Cowangie School B.R.	VIC
Culgoa N.F.R	VIC
Curyo I188 B.R.	VIC
Curyo I295 B.R.	VIC
Daalko B.R.	VIC
Danyo	VIC
Danyo I63 B.R	VIC
Danyo I64 B.R	VIC
Danyo I65 B.R	VIC
Dattuck	VIC
Dattuck B.R.	VIC
Daytrap B.R.	VIC
Degraves Tank F.R	VIC
Dennying Channel B.R.	VIC
Dering F.F.R.	VIC
Dering I254 B.R.	VIC
Double Yards B.R.	VIC
Drendles B.R.	VIC
Duddo B.R.	VIC
Duddo Wells B.R.	VIC
Dunstan B.R	VIC
Dunstans F.F.R.	VIC
Eureka B.R.	VIC
Eureka School B.R.	VIC
Eureka West B.R.	VIC
Frasers B.R.	VIC
Gadsen Bend Park	VIC
Galah B.R.	VIC
Galpunga	VIC
Gayfield B.R	VIC
Gerahmin B.R.	VIC
Gerahmin North B.R.	VIC
Ginquam I4 B.R	VIC
Ginquam I5 B.R	VIC
Gnarr F.R	VIC
Gnarr I237 B.R.	VIC
Gnarr I75 B.R	VIC
Goschen B.R.	VIC
Goyura B.R.	VIC
Grants B.R.	VIC
Gunners Tank B.R.	VIC
Gutcha B.R.	VIC
Harrisons Basin B.R.	VIC
Hattah - Kulkyne	VIC
Heggety Tank B.R.	VIC
Heywood Lake W.R.	VIC
Hopkins Tank B.R	VIC
Hopping Mouse Hill R.N.A	VIC
Hynams B.R.	VIC
Julians B.R.	VIC
Kangaroo Dam B.R.	VIC
Kangaroo Tank B.R.	VIC
Karadoc N.C.R.	VIC
Karawinna B.R	VIC
Karween B.R.	VIC
Karyrie I193 B.R.	VIC
Karyrie I194 B.R	VIC
Karyrie I296 B.R.	VIC
Karyrie I297 B.R.	VIC
Kattyoong B.R	VIC
Kattyoong F.R	VIC
Kemendok	NSW
Kia	VIC
Kia I242 B.R	VIC
Kia I242A B.R	VIC
Kia I31 B.R	VIC

Name	State
Kia I33 B.R	VIC
Kiamal B.R.	VIC
Kings Billabong Park	VIC
Kodoonong B.R.	VIC
Kookoombo West B.R.	VIC
Koonda F.R	VIC
Kulwin F.F.R.	VIC
Kulwin F.R.	VIC
Kulwin I50 B.R.	VIC
Kulwyne Swamp B.R.	VIC
Lackeys B.R.	VIC
Lads Tank B.R.	VIC
Lake Danaher B.R.	VIC
Lake Jerriwirrup	VIC
Lake Timboram F.F.R	VIC
Lake Tyrrell W.R.	VIC
Lake Wahpool West B.R.	VIC
Lake Walla Walla	VIC
Lakes Powell and Carpul W.R.	VIC
Lambert Island N.C.R.	VIC
Lang Plain B.R.	VIC
Larundel I131A B.R.	VIC
Larundel I267 B.R.	VIC
Larundel I268 B.R.	VIC
Leitpar B.R.	VIC
Lianiduck F.F.R.	VIC
Linga B.R.	VIC
Linga School South B.R.	VIC
Magpie Tank B.R.	VIC
Mallanbool F.F.R	VIC
Mamemgorook I236 B.R.	VIC
Mamengoroock I18 B.R	VIC
Mamengoroock I72 B.R.	VIC
Mamengoroock I73 B.R	VIC
Manangatang (Lulla) F.F.R	VIC
Manangatang B.R.	VIC
Manya B.R.	VIC
Manya F.R	VIC
Marlbed I191 B.R.	VIC
McBains B.R.	VIC
McLeans B.R.	VIC
Menzies N.C.R.	VIC
Merbein B.R.	VIC
Merbein South F.R.	VIC
Meringur F.R.	VIC
Merrinee B.R.	VIC
Mildura F.F.R	VIC
Mildura I13 B.R	VIC
Mildura I14 B.R	VIC
Mildura I15 B.R.	VIC
Mildura I220A B.R.	VIC
Mildura I221 B.R.	VIC
Mildura I222 B.R	VIC
Mildura I223 B.R	VIC
Millers Tank B.R.	VIC
Millewa	VIC
Millewa South	VIC
Minook	VIC
Miralie B.R.	VIC
Mittyack B.R.	VIC
Mittyack Blue Hills B.R.	VIC
Mittyack Prange Road B.R.	VIC
Mittyack West B.R.	VIC
Morkala B.R.	VIC
Morkalla	VIC
Morkalla - Red Cliffs Railway B.R.	VIC
Moss Tank F.F.R.	VIC

Name	State
Mossop B.R.	VIC
Mount Cowra	VIC
Mount Crozier	VIC
Murray - Kulkyne Park	VIC
Murray - Sunset	VIC
Murrayville B.R.	VIC
Murrayville F.R.	VIC
Myall B.R	VIC
Nandaly B.R	VIC
Narraport B.R.	VIC
Natya B.R.	VIC
Neds Corner Station	VIC
North Wyperfeld	VIC
Nowie B.R	VIC
Nowingi B.R.	VIC
Nulkwyne I22 B.R	VIC
Nulkwyne I25 B.R	VIC
Nulkwyne I26 B.R	VIC
Nulkwyne I29 B.R	VIC
Nulkwyne I30 B.R	VIC
Nullawill West B.R.	VIC
Nunga B.R.	VIC
Nurnurnemal B.R.	VIC
Nurnurnemal N.C.R.	VIC
Nyah B.R.	VIC
Nyah-Vinifera Park	VIC
Nyang I238 B.R	VIC
Nyang I239 B.R	VIC
O'Shannessy B.R.	VIC
O'Sullivans Lookout	VIC
Ouyen I244 B.R.	VIC
Ouyen I245 B.R	VIC
Ouyen I245A B.R.	VIC
Ouyen I34 B.R	VIC
Ouyen I82 B.R.	VIC
Ouyen I83 B.R.	VIC
Ouyen I85 B.R	VIC
Paignie B.R.	VIC
Paignie I23 B.R.	VIC
Pallarang B.R	VIC
Panitya B.R.	VIC
Paradise F.F.R.	VIC
Passage Camp N.C.R.	VIC
Patchewollock I117A B.R	VIC
Patchewollock North B.R.	VIC
Piambie B.R.	VIC
Piangil - Yungera Railway B.R.	VIC
Piangil B.R.	VIC
Piangil West B.R.	VIC
Pidgeon Tank B.R.	VIC
Pier Millan B.R.	VIC
Pira B.R.	VIC
Pirlta B.R.	VIC
Pirro B.R.	VIC
Plants B.R.	VIC
Polisbet B.R.	VIC
Pooks B.R.	VIC
Possum Flat B.R.	VIC
Prooinga School B.R.	VIC
Purnya	VIC
Purnya B.R.	VIC
Raak Plain	VIC
Red Bluff F.F.R	VIC
Red Cliffs (Ovens Av) N.F.R.	VIC
Red Cliffs (Richardson St) N.F.R.	VIC
Red Cliffs N.F.R	VIC
Red Cliffs S.R.	VIC

Name	State
Rileys Tank B.R	VIC
River Murray Reserve	VIC
River Murray Reserve (non-PV)	VIC
Robinsons Tank B.R.	VIC
Rocket Lake	VIC
Round Swamp B.R.	VIC
Rudds Rocks	VIC
Ryanby B.R.	VIC
Ryans B.R.	VIC
Settlement Road	VIC
Soaks B.R.	VIC
South Sunset R.N.A	VIC
South Wyperfeld	VIC
Sparas B.R.	VIC
Speed B.R.	VIC
Speed N.F.R.	VIC
Spindles B.R.	VIC
State Gully B.R.	VIC
Stony Plain B.R.	VIC
Sunset	VIC
Sunset	VIC
Symes B.R.	VIC
Tarpaulin Bend	VIC
Telopea Downs	VIC
Thalia B.R.	VIC
Tiega F.R	VIC
Tiega I24 B.R	VIC
Tiega I28 B.R	VIC
Tiega I80 B.R	VIC
Tiega I81 B.R	VIC
Timberoo F.F.R.	VIC
Timberoo I106 B.R	VIC
Timboram West Tank B.R.	VIC
Toltol F.F.R	VIC
Toltol I263 B.R.	VIC
Toltol I40 B.R.	VIC
Torneys Tank B.R.	VIC
Torrita F.F.R	VIC
Toupnein Creek	VIC
Towan B.R	VIC
Towan Plains F.F.R.	VIC
Towma (Lake Marlbed) F.F.R	VIC
Towma B.R	VIC
Turoar I142 B.R	VIC
Turoar I150 B.R	VIC
Turoar South B.R.	VIC
Turriff East School B.R.	VIC
Turriff F.F.R	VIC
Turriff West School B.R.	VIC
Tutye B.R.	VIC
Twin Dams B.R.	VIC
Tyrrell Creek SS.R.	VIC
Underbool B.R.	VIC
Underbool I61 B.R	VIC
Underbool I71 B.R	VIC
Underbool I87 B.R	VIC
Wagant I129A B.R	VIC
Wagant I37 B.R	VIC
Waitchie B.R	VIC
Waitchie F.F.R	VIC
Waitchie Tank B.R.	VIC
Walpeup F.F.R.	VIC
Walpeup I101 B.R	VIC
Walpeup I103 B.R	VIC
Walpeup I78 B.R	VIC
Walpeup N.F.R	VIC
Wandown F.F.R	VIC

Name	State
Wangie B.R.	VIC
Wangie F.F.R.	VIC
Wangie W.R.	VIC
Wargan-Mallee B.R.	VIC
Watchupga I185 B.R.	VIC
Watchupga I294 B.R	VIC
Wathe F.F.R	VIC
Watseys B.R.	VIC
Welshmans Plain F.F.R	VIC
Wemen F.F.R	VIC
Werrimull B.R.	VIC
Wewin B.R.	VIC
White Gate B.R.	VIC
Whitehorse B.R.	VIC
Wild Dogs Tank B.R.	VIC
Wilhelmina N.F.R	VIC
Wilkur B.R.	VIC
Wimmera River H.R.	VIC
Winnambool B.R.	VIC
Wood Wood F.F.R	VIC
Woomelang B.R.	VIC
Woorinen I284 B.R.	VIC
Woorinen South B.R.	VIC
Woornack I109 B.R	VIC
Woornack I110 B.R	VIC
Woornack I246 B.R.	VIC
Woornack I247 B.R	VIC
Woornack I97 B.R	VIC
Worooa B.R.	VIC
Wortongie B.R.	VIC
Wymlet I20 B.R	VIC
Wymlet I21 B.R	VIC
Wymlet I241 B.R	VIC
Wyperfeld	VIC
Yaapeet B.R.	VIC
Yaapeet I258 B.R.	VIC
Yarraby F.R.	VIC
Yarrara F.F.R.	VIC
Yarto B.R.	VIC
Yarto N.F.R.	VIC
Yatpool F.R.	VIC
Yatpool I10 B.R	VIC
Yatpool I6 B.R	VIC
Yatpool Tank B.R.	VIC
Yellimjip B.R.	VIC
Yetmans (Patchewollock) F.F.R	VIC
Yungera B.R.	VIC

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit,

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis		
Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Austrocylindropuntia spp. Prickly Pears [85132]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat may occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple,		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Silverleaf-nettle, Trompillo [12323]		
Tamarix aphylla		
Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Ulex europaeus		
Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Belsar Island	VIC
Bunguluke Wetlands, Tyrrell Creek & Lalbert Creek Floodplain	VIC
Cardross Lakes	VIC
Hattah Lakes	VIC
Heywoods Lake	VIC
Kings Billabong Wetlands	VIC
Lake Ranfurly	VIC
Lake Tyrrell	VIC
Lake Wallawalla	VIC
Lindsay Island	VIC
Major Mitchell Lagoon	VIC
Pink Lakes	VIC
Raak Plain	VIC
Riverland Wetland Complex	SA
Wallpolla Island	VIC
Wargan Basins (Meridian Lakes)	VIC
Wimmera River	VIC

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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