



Monitoring waterbird abundance in response to environmental watering at the Hattah Lakes Icon Site: 2016

Prepared for Mallee Catchment Management Authority

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1 Introduction

1.1 Project background

Biosis Pty. Ltd. was commissioned by the Mallee Catchment Management Authority to undertake monitoring of waterbird species at the Hattah Lakes Icon Site (DSE 2010). The monitoring program is designed to collect quantitative data on the diversity and abundance of waterbird species in response to manipulation of water levels in the Hattah Lakes floodplain. The nature of the surveys, in which point counts are made from a specific location on the edge of each waterbody, means that counts of birds provide relative measures of abundance but do not represent comprehensive total census numbers.

The report is presented in two sections. The first covers waterbird surveys undertaken during December 2015, March and May 2016, which is the third period of monitoring undertaken by Biosis. The second section provides a summary of the monitoring program from February 2014 – May 2016 and allows for comparison of waterbird diversity and abundance over a greater range of seasonal and water-level variance.

Over the three years of the study to-date, we have monitored waterbirds in months as stipulated by the Mallee CMA. With the exception of December 2015, monitoring has been undertaken during autumn and winter.

1.2 Objectives

The purpose of the project is to obtain data that can be used to measure the response of waterbird populations to changing water levels across the Hattah Lakes floodplain. The specific objectives of the project are as follows:

- Provide counts of waterbird species from replicate timed point-counts at eight lakes within the Hattah Lakes floodplain in specified months
- Highlight any rare or threatened species and breeding activity noted.

2 Methods

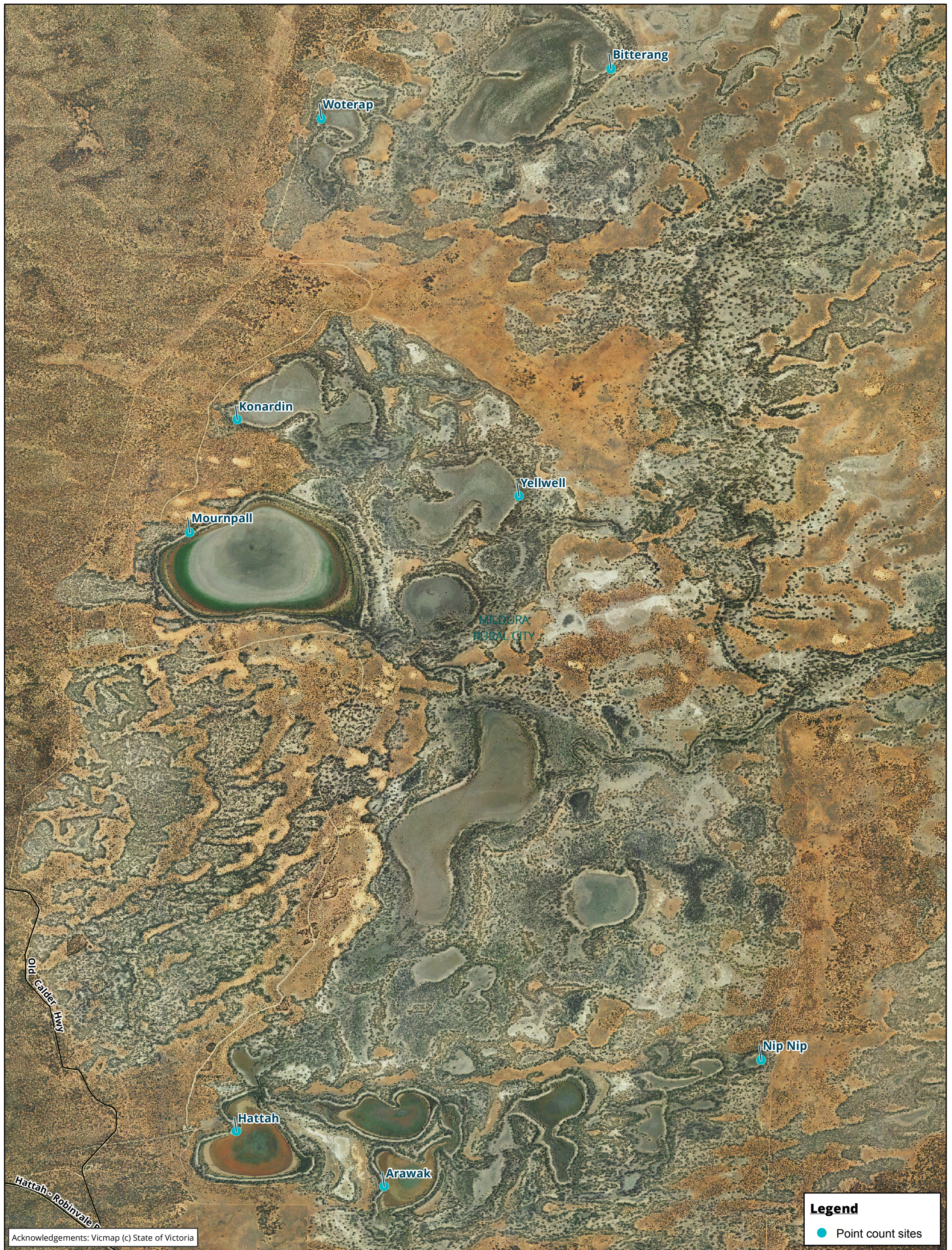
The following methods have been used for waterbird counts over the study from February 2014 to-date. Waterbird surveys were undertaken as timed point counts at eight lakes within the Hattah Lakes Icon Site: Bitterang, Woterap, Yellwell, Konardin, Mournpall, Hattah, Arawak and Nip Nip. The location of point counts is shown in Figure 1.

The months for waterbird surveys were stipulated by the Mallee CMA.

In each survey session, usually over two consecutive days, four replicate point counts were made at each of the eight lakes. Each point count consisted of an experienced observer recording the maximum number of every waterbird species visible on the wetland over a 30-minute period, in order to capture a 'snap-shot' of waterbird diversity and abundance for each count undertaken. Metadata collected includes time and date of the count and basic weather information at the time of the count.

Each survey session was undertaken by two experienced ornithologists working independently. Point counts were undertaken with the use of binoculars and spotting scopes.

For the purpose of the study a waterbird is defined as any species that habitually wades or swims in water, however we have also included in our results other species that forage almost exclusively within wetlands such as terns, gulls and the White-bellied Sea-Eagle.



Acknowledgements: Vicmap (c) State of Victoria

Legend

- Point count sites

Figure 1: Location of waterbird monitoring sites, Hattah Lakes icon site



Ballarat, Brisbane, Canberra, Melbourne, Sydney, Wangaratta & Wollongong

Acknowledgements:

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Metres
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Coordinate System: GDA 1994 MGA Zone 54



3 Results: December 2015 – May 2016

Survey sessions in this period were on the following dates:

- 21 and 22 December 2015
- 30 and 31 March 2016
- 12 and 13 May 2016

3.1 Site conditions

Weather conditions encountered during each point count are detailed in Appendix 2 (Tables A2.1-A2.3). Overall, weather conditions were stable and did not present any limitations for undertaking the surveys.

Over the period of the December 2015 to May 2016 waterbird monitoring, water levels were in decline following a small watering event in November 2015. Water levels in the March and May 2016 monitoring sessions were sequentially lower than had been experienced in any of the preceding surveys undertaken by Biosis (Figure 2).

In December 2015 the small, shallow Lake Nip Nip was reduced to a pool of water approximately 20 metres in diameter and at its deepest was less than 10 centimetres. Water levels of the remaining seven lakes were all lower than in previous monitoring sessions, but each contained open water.

In March 2016 Lake Nip Nip was completely dry, while all other monitored lakes still contained open water.

In May 2016 Lake Nip Nip remained dry and Lakes Yellwell and Konardin were almost dry and each contained only shallow puddles surrounded by damp mudflats in their deepest portions. Water levels of the remaining five lakes were lower still but contained open water.

3.2 Waterbird diversity & abundance

Detailed results for all counts for the three survey sessions are tabulated in Appendix 3 (Tables A3.1-A3.3).

Across the three survey sessions (December 2015 – May 2016), a greater diversity of species was present than in all but one previous monitoring session, with 33 species in December; 40 species in March and 31 species in May. Total species diversity in previous monitoring sessions between February 2014 and April 2015 was between 20 and 29, and was 32 in June 2015. It is likely that the higher diversity in the December 2015 – May 2016 surveys reflects the fact that while there was then still sufficient water in some lakes for some deep-water species, at the other extreme water in the shallower lakes was also low enough to provide habitat for shallow-water species. In fact the greatest diversity and abundance of shallow-water waders, including some migratory shorebirds, was recorded in March 2016, albeit that the species and numbers of waders were relatively small by comparison with those that routinely occur in some coastal habitats. The shorebirds recorded for the first time in this period include Marsh Sandpiper, Red-capped Plover, Red-kneed Dotterel, Red-necked Avocet and Red-necked Stint. Amongst the shorebirds recorded in March were migratory species (Marsh Sandpiper, Red-necked Stint and Sharp-tailed Sandpiper) that were no longer present in May.

In terms of abundance, the highest mean and maximum counts of a number of species were documented in these three sessions. These included Australian Wood Duck, Pacific Black Duck, Pink-eared Duck, Grey Teal, Hardhead, Black Swan, Black-fronted Dotterel, Black-winged Stilt, Red-necked Avocet, Red-necked Stint, Yellow-billed Spoonbill, Great Crested Grebe and Little Black Cormorant.

Mean and maximum numbers of some species were lower in these sessions than were recorded in previous monitoring. Most noticeable among these were Darter and Great Cormorant.

4 Results: 2014 – 2016

Between February 2014 and May 2016 a combined total of 96 counts were made at the eight lakes.

In that overall period, point count surveys were undertaken by Biosis on the following dates:

- 25 and 26 February 2014
- 15 and 16 May 2014
- 16, 17, 18 and 19 June 2014
- 24 and 25 March 2015
- 14 and 15 April 2015
- 3 and 4 June 2015
- 21 and 22 December 2015
- 30 and 31 March 2016
- 12 and 13 May 2016

4.1 Species conservation status

A number of species recorded during the monitoring program are listed as threatened in Victoria under the *Flora and Fauna Guarantee Act 1988* (FFG Act) and/or the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2013). Four species recorded are listed as migratory species and/or under the provisions for marine species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Changes to the EPBC Act list of migratory species has seen the White-bellied Sea-eagle removed from that list. A summary of the listed conservation status of species recorded across all monitoring sessions is provided in Table 1 below.

Table 1. Maximum numbers of listed waterbird species recorded and their conservation status

Common name	Conservation status			Feb 2014	May 2014	June 2014	Mar 2015	Apr 2015	June 2015	Dec 2015	Mar 2015	May 2015
	EPBC Act	Advisory list	FFG Act									
Australasian Shoveler		vulnerable				4	10	4	8	7	49	60
Hardhead		vulnerable		1	5	1	1	60	350	85	24	150
Blue-billed Duck		endangered	listed				10				7	
Musk Duck	marine	vulnerable						2	2	1	3	9
Pied Cormorant		near threatened		3	52	80	20	7	45	9	58	4
Eastern Great Egret	marine	vulnerable	listed			1	4	5	14	1	6	3
Intermediate Egret	marine	endangered	listed								1	
Little Egret	marine	endangered	listed					1	1	8	5	3
Nankeen Night Heron	marine	near threatened		2								
Pacific Gull	marine	near threatened									2	
Caspian Tern	migratory/marine	near threatened	listed		2	18	2		13			33
Gull-billed Tern	migratory/marine	endangered	listed	1								
White-bellied Sea-Eagle	marine	vulnerable	listed				1		1	1		
Marsh Sandpiper	migratory/marine	vulnerable									9	
Red-necked Stint	migratory/marine										64	
Sharp-tailed Sandpiper	migratory/marine										2	

4.2 Lake water levels

The monitoring sessions were undertaken to assess waterbird diversity and abundance relative to changing water levels within the Hattah Lakes system. Daily water levels for two of the lakes monitored in the project (Lake Hattah and Lake Mournpall) were provided by Mallee CMA for the period from July 2013 to May 2016. Figure 2 shows monthly water levels for Lake Hattah and the dates of waterbird monitoring sessions.

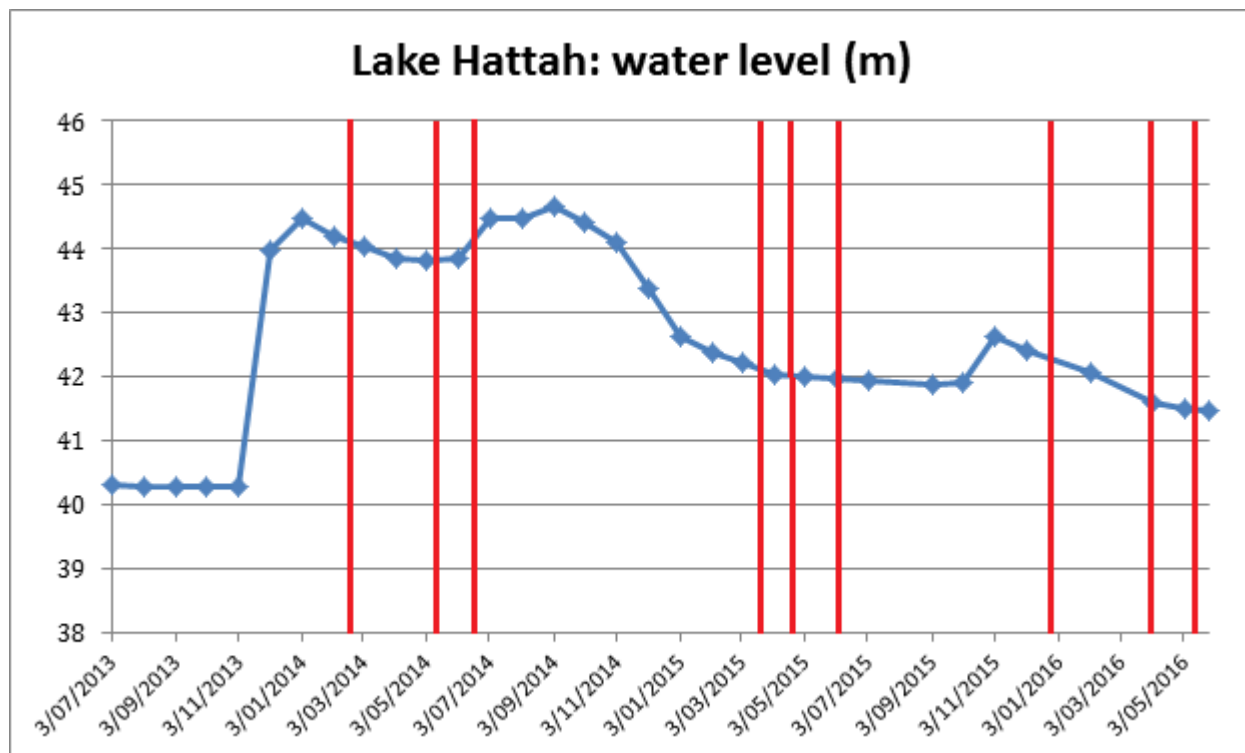


Figure 2. Water levels in Lake Hattah July 2013 – May 2016 (plotted from data courtesy Mallee CMA). Red lines denote dates of waterbird point counts. Note rapid rises in levels due to watering events in November 2013 & November 2015.

4.3 Waterbird diversity & abundance

Over the monitoring program since February 2014 a total of 50 waterbird species have been recorded across the eight lakes surveyed. The number of species and of individuals of particular species has varied between survey sessions.

A variety of factors undoubtedly influence abundance, species composition and breeding of waterbirds at Hattah Lakes. The majority of waterbird species that are year-round residents of the Australian continent are nomadic and can be expected to respond to favourable local conditions, but their presence at the lakes may also be affected by particularly favourable or unfavourable conditions elsewhere, such as flooding of the inland Channel Country. The majority of differences in presence, numbers and behaviours of waterbirds over the three years covered by the monitoring program appear to have been in species-specific response to changing water levels within the lakes.

The presence of international migratory birds at Hattah Lakes is also influenced by the seasonality of their migratory behaviours. The international migratory shorebird species detected are annually present during

the warmer months of the year but are substantially absent from Australia between mid-autumn and mid-spring.

Abundance and species diversity across the monitoring program to-date can be assessed by a variety of measures. Tables 2, 3 and 4 respectively show results for each species recorded by the following measures:

- Table 2: The maximum count of each species and the lake where that was recorded in each of the nine survey sessions. This indicates relative abundance for the species according to the different sessions and differential use of the lakes by particular species. The table also shows the combined total number of waterbird species recorded at the eight lakes during each session.
- Table 3: The mean number of birds of each species recorded at all sites where they were present during each survey session.
- Table 4: The number of counts in which each species was recorded during each survey session (from the total of 32 counts per survey session; and the number of lakes where each species was recorded during each survey session (out of the eight lakes surveyed).

Over the period of monitoring to-date, highest water levels occurred in 2014, following the November 2013 watering event. There appears to have been a response to this watering event by piscivorous species that are deeper divers. Surveys in that period recorded high counts of Darters. The number of Great Cormorants rose substantially after February 2014, and remained relatively high throughout the monitoring program except for March 2016 when their number was substantially lower. Nonetheless, overall species diversity was low in 2014 with 20 species recorded in February and May and 21 recorded in June. This may reflect that while deeper, open water is present it does not provide ideal conditions for 'dabbling' ducks, shallow diving piscivores and waders, although episodic deep watering events are still likely to play a vital role for such species by increasing productivity of the wetlands during subsequent periods of reducing water levels.

Lowest water levels occurred during the 2016 surveys and three of the eight lakes had substantially or wholly dried by May 2016. As discussed in Section 3, above, the presence of a number of wading shorebirds in the December 2015 to May 2016 surveys was the most notable response to shallow water as a number of the lakes dried.

Substantial trends in presence and abundance are not apparent for the great majority of species across the monitoring program to-date, particularly for the significant portion of species for which only small numbers were recorded.

The overall trend across the monitoring program has been of increasing species diversity since February 2014, with a peak of 40 species recorded in March 2016. However that peak was influenced by a number of species that were represented by very small numbers of individuals and, as mentioned previously, the reduction to 30 species in May 2016 was partly influenced by annual departure from Australia of a small number of migratory species that had been present in December 2015 and March 2016.

The most notable breeding by waterbirds during the monitoring to-date has been by Darters and cormorant species. Flooding events are known to be a major trigger for the commencement of breeding for Darter and Great Cormorant and a number of nests of both species were observed at Lakes Mournpall, Hattah, Arawak and Yellwell during 2014. The nature of the point count methods did not permit confirmation of the number of nests that were active. During the June 2014 monitoring session, rapidly increasing water levels were observed to be inundating a number of active cormorant nests.

By April 2015, very few active Darter or Great Cormorant nests were observed, however large numbers of non-breeding birds were still present at most of the lakes. In December 2015 four Darter nests were recorded at Lake Yellwell and one that could be observed from the observation location contained advanced chicks.

Also in December 2015, Little Pied Cormorants were recorded breeding at Lake Yellwell. Seven nests were recorded from the observation location and, of the maximum count of 42 birds there, approximately 10 appeared to be juveniles, indicating that successful breeding was recently completed by a number of pairs.

Table 2. Maximum count of each species and the lake where that was recorded in each survey session. A lake is not specified in a few instances where the same number of individuals was documented at multiple lakes. Also shown are total number of waterbird species recorded during each session.

Species	Maximum count of each species & lake where recorded for each survey session																	
	Feb 2014		May 2014		June 2014		Mar 2015		Apr 2015		June 2015		Dec 2015		Mar 2016		May 2016	
Australasian Grebe	4	Nip Nip	7	Nip Nip	7	Mournpall	25	Woterap	44	Hattah	74	Woterap	15	Yellwell	12	Hattah	34	Hattah
Australasian Shoveler					4	Hattah	10	Nip Nip	4	Nip Nip	8	Nip Nip	7	Yellwell	49	Woterap	60	Bitterang
Australian Pelican	8	Bitterang	42	Konardin	34	Yellwell	70	Konardin	25	Arawak	280	Bitterang	100	Yellwell	20	Mournpall	61	Bitterang
Australian Shelduck			2	Yellwell	2	Nip Nip			2	Yellwell	6	Konardin	7	Konardin	1	Yellwell	1	Bitterang
Australian White Ibis							3	Woterap	7	Woterap	3	Woterap	5	Yellwell	7	Konardin	2	Bitterang
Australian Wood Duck	28	Nip Nip	13	Woterap	20	Arawak	3	Nip Nip	7	Bitterang	60	Yellwell	200	Yellwell	6	Arawak	4	Arawak
Banded Lapwing													1	Bitterang				
Black Swan					1	Konardin	3	Hattah			2	Konardin	57	Yellwell	2	Arawak	92	Bitterang
Black-fronted Dotterel			3	Nip Nip	2	Nip Nip					1	Nip Nip			94	Konardin	47	Yellwell
Black-tailed Native-hen											6	Arawak						
Black-winged Stilt							1	Yellwell					8	Bitterang	38	Yellwell	15	Bitterang
Blue-billed Duck							10	Konardin							7	Mournpall		
Caspian Tern			2	Bitterang	18	Mournpall	2	Bitterang			13	Bitterang					33	Yellwell
Chestnut Teal	8	Arawak							1	Arawak			20	Yellwell	1	Arawak		
Darter	37	Arawak	65	Mournpall	124	Mournpall	24	Bitterang	12	Bitterang	10	Bitterang	26	Yellwell	22	Hattah	23	Hattah
Dusky Moorhen	1	Konardin					1	Mournpall			1	Konardin						
Eastern Great Egret					1	Yellwell	4	Yellwell	5	Yellwell	14	Bitterang	1	Yellwell	6	Mournpall	3	Mournpall
Eurasian Coot	9	Bitterang	5	Hattah	5	Woterap	20	Mournpall	26	Yellwell	300	Konardin	250	Yellwell	27	Mournpall	25	Bitterang
Great Cormorant	9	Yellwell	212	Konardin	245	Bitterang	550	Arawak	140	Arawak	350	Bitterang	82	Konardin	12	Mournpall	120	Arawak
Great Crested Grebe			5	Hattah	17	Hattah	20	Konardin	16	Konardin	8	Hattah	12	Hattah	68	Mournpall	37	Mournpall
Grey Teal	38	Nip Nip	32	Nip Nip	70	Yellwell	92	Nip Nip	58	Woterap	51	Woterap	960	Yellwell	1350	Yellwell	452	Bitterang
Gull-billed Tern	1	Woterap																
Hardhead	1	Hattah	5	Nip Nip	1	Nip Nip	1	Woterap	60	Konardin	350	Konardin	85	Yellwell	24	Mournpall	150	Bitterang
Hoary-headed Grebe	16	Hattah	5	Hattah	12	Arawak	9	Hattah	125	Hattah	650	Hattah	50	Konardin	65	Hattah	285	Hattah

Species	Maximum count of each species & lake where recorded for each survey session																	
	Feb 2014		May 2014		June 2014		Mar 2015		Apr 2015		June 2015		Dec 2015		Mar 2016		May 2016	
Intermediate Egret															1	Hattah		
Little Black Cormorant	3	Bitterang	52	Konardin	34	Bitterang	108	Yellwell	95	Arawak	55	Mournpall	47	Hattah	200	Mournpall	45	Mournpall
Little Egret									1	Hattah	1	Hattah	8	Hattah	5	Arawak	3	Arawak
Little Pied Cormorant	1	Hattah	10	Arawak	20	Arawak	50	Yellwell	150	Yellwell	105	Yellwell	42	Yellwell	59	Mournpall	48	Mournpall
Marsh Sandpiper															9	Konardin		
Mallard	2	Yellwell																
Masked Lapwing					2	Arawak	2	Yellwell	2	Hattah	3	Bitterang	3	Bitterang	10	Yellwell	2	Woterap
Musk Duck									2	Bitterang	2	Konardin	1	Bitterang	3	Konardin	9	Mournpall
Nankeen Night Heron	2	Hattah																
Pacific Black Duck	3	Hattah			2	Konardin	4	Woterap	14	Bitterang	8	Woterap	60	Yellwell	31	Bitterang	26	Bitterang
Pacific Gull															2	Konardin		
Pied Cormorant	3	Arawak	52	Yellwell	80	Yellwell	20	Yellwell	7	Yellwell	45	Bitterang	9	Yellwell	58	Mournpall	4	Hattah
Pink-eared Duck							33	Nip Nip	13	Nip Nip	5	Arawak	45	Konardin	447	Yellwell	104	Woterap
Red-capped Plover															9	Konardin		
Red-kneed Dotterel													2	Konardin	9	Bitterang		
Red-necked Avocet															490	Konardin	34	Bitterang
Red-necked Stint															64	Konardin		
Sacred Kingfisher							1	Arawak	1	Arawak								
Sharp-tailed Sandpiper															2	Konardin		
Silver Gull			3	Yellwell			2	Bitterang			6	Bitterang			5	Konardin		
Straw-necked Ibis													5	Yellwell				
White-bellied Sea-Eagle							1	Hattah			1	Konardin	1	Konardin	1			
White-faced Heron	2		1	Konardin			5	Yellwell	3	Konardin	4	Bitterang	2	Arawak	3	Konardin	2	Bitterang
White-necked Heron	2	Nip Nip	1	Konardin							1	Woterap	1	Nip Nip	1	Konardin	1	Bitterang
Yellow-billed Spoonbill			4	Bitterang			4	Nip Nip	12	Yellwell	25	Yellwell	4	Yellwell	15	Woterap	50	Bitterang
Total number of species	20		20		21		29		26		32		32		40		30	

Table 3. Mean number of birds of each species recorded at all sites. Blanks indicate species was not recorded during the relevant survey session

Species	Mean number of birds recorded at sites where species was present								
	Feb 2014	May 2014	June 2014	Mar 2015	Apr 2014	June 2015	Dec 2015	Mar 2016	May 2016
Australasian Grebe	3	4	2	11	16	15	8	4	8
Australasian Shoveler			4	7	3	5	5	19	9
Australian Pelican	3	12	10	14	9	38	19	10	15
Australian Shelduck		2	2		2	4	7	1	1
Australian White Ibis				2	2	2	2	4	2
Australian Wood Duck	9	4	5	2	5	12	46	4	3
Banded Lapwing							1		
Black Swan			1	3		1	17	1	17
Black-fronted Dotterel		3	2			1		39	18
Black-tailed Native-hen						3			
Black-winged Stilt				1			3	14	9
Blue-billed Duck				8				4	
Caspian Tern		2	4	2		3			11
Chestnut Teal	8				1		17	1	
Darter	7	22	33	11	4	4	6	12	8
Dusky Moorhen	1			1		1			
Eastern Great Egret			1	2	2	3	1	3	2
Eurasian Coot	5	2	2	7	7	47	76	7	8
Great Cormorant	3	55	77	104	47	76	40	6	35
Great Crested Grebe		3	6	9	7	3	6	56	11
Grey Teal	13	12	8	19	16	17	186	487	112
Gull-billed Tern	1								
Hardhead	1	3	1	1	26	98	31	23	58
Hoary-headed Grebe	6	2	4	4	34	112	14	24	66
Intermediate Egret								1	

Species	Mean number of birds recorded at sites where species was present								
	Feb 2014	May 2014	June 2014	Mar 2015	Apr 2014	June 2015	Dec 2015	Mar 2016	May 2016
Little Black Cormorant	2	9	22	24	19	16	11	59	16
Little Egret					1	1	8	5	3
Little Pied Cormorant	1	8	6	9	15	19	23	12	17
Marsh Sandpiper								6	
Mallard	2								
Masked Lapwing			2	2	2	2	2	3	1
Musk Duck					2	1	1	2	5
Nankeen Night Heron	2								
Pacific Black Duck	2		2	3	5	3	15	7	8
Pacific Gull								2	
Pied Cormorant	1	16	25	6	3	11	3	33	3
Pink-eared Duck				28	6	3	24	121	47
Red-capped Plover								5	
Red-kneed Dotterel							2	4	
Red-necked Avocet								315	14
Red-necked Stint								37	
Sacred Kingfisher				1	1				
Sharp-tailed Sandpiper								2	
Silver Gull		2		2		3		3	
Straw-necked Ibis							5		
White-bellied Sea-Eagle				1		1	1	1	
White-faced Heron	1	1	2	2	1	1	1	1	1
White-necked Heron	1	1				1	1	1	1
Yellow-billed Spoonbill		4		4	12	15	4	4	27

Table 4. Number of counts and of lakes in which each species was recorded during each survey session

Species	Number of counts (from total of 32) in which species recorded (left column of survey session) Number of lakes (from total of 8) at which species recorded (right column of survey session)																	
	Feb 2014		May 2014		June 2014		Mar 2015		Apr 2015		June 2015		Dec 2015		Mar 2016		May 2016	
Australasian Grebe	5	2	14	6	16	6	12	5	13	4	18	6	3	2	9	4	11	4
Australasian Shoveler					1	1	4	1	3	1	8	3	3	2	9	4	9	3
Australian Pelican	15	7	20	7	16	7	27	7	25	7	24	7	22	8	15	5	14	4
Australian Shelduck			2	2	3	1			2	2	10	3	1	1	4	1	1	1
Australian White Ibis							5	3	9	5	6	5	4	2	12	4	2	2
Australian Wood Duck	11	4	9	5	16	7	4	3	3	2	16	6	11	3	3	2	3	3
Banded Lapwing													1	1				
Black Swan					1	1	2	1			7	2	8	4	3	3	9	3
Black-fronted Dotterel			1	1	3	1					1	1			7	3	12	4
Black-tailed Native-hen											5	3						
Black-winged Stilt							1	1					5	2	11	3	8	2
Blue-billed Duck							2	1							2	2		
Caspian Tern			4	3	26	7	1	1			13	6					8	3
Chestnut Teal	1	1							1	1			3	2	1	1		
Darter	20	8	27	8	27	7	26	8	20	7	24	8	24	7	11	3	13	4
Dusky Moorhen	1	1					3	2			2	1						
Eastern Great Egret					1	1	5	3	10	4	9	5	4	2	4	2	3	2
Eurasian Coot	5	4	10	5	10	4	22	7	21	7	23	7	9	3	15	4	14	4
Great Cormorant	21	8	27	7	29	8	13	6	9	5	11	6	7	2	5	2	9	3
Great Crested Grebe			4	2	9	3	9	3	11	3	11	5	6	2	4	1	8	2
Grey Teal	10	5	5	4	15	8	27	8	21	7	23	7	16	7	26	7	18	5
Gull-billed Tern	1	1																
Hardhead	1	1	4	2	2	1	2	2	9	3	17	5	7	3	2	1	4	2
Hoary-headed Grebe	3	2	4	2	7	3	6	2	12	5	22	6	4	3	8	5	10	4
Intermediate Egret													0		3	2		

Species	Number of counts (from total of 32) in which species recorded (left column of survey session) Number of lakes (from total of 8) at which species recorded (right column of survey session)																	
	Feb 2014		May 2014		June 2014		Mar 2015		Apr 2015		June 2015		Dec 2015		Mar 2016		May 2016	
Little Black Cormorant	2	2	9	5	6	2	13	7	16	5	18	7	7	4	10	3	5	2
Little Egret									1	1	3	1	1	1	1	1	2	2
Little Pied Cormorant	2	2	3	2	9	5	16	7	20	6			5	2	11	4	14	4
Marsh Sandpiper															4	1		
Mallard	1	1																
Masked Lapwing					1	1	4	3	3	2	3	3	4	2	13	5	9	4
Musk Duck									8	4	5	3	2	2	8	4	7	2
Nankeen Night Heron	1	1																
Pacific Black Duck	5	3			3	3	7	5	13	5	9	4	7	3	6	4	9	4
Pacific Gull															1	1		
Pied Cormorant	10	7	13	6	14	5	9	5	7	4	8	4	8	5	2	2	3	1
Pink-eared Duck							4	1	4	1	3	3	2	1	17	5	11	4
Red-capped Plover															5	2		
Red-kneed Dotterel													3	2	4	2		
Red-necked Avocet															6	2		2
Red-necked Stint															4	1		
Sacred Kingfisher							1	1	1	1					0			
Sharp-tailed Sandpiper															2	1		
Silver Gull			3	1			1	1			4	2			8	3		
Straw-necked Ibis													1	1				
White-bellied Sea-Eagle							1	1			2	1	1	1	3	3		
White-faced Heron	11	7	5	3	7	6	19	8	17	8	22	8	3	2	19	6	7	4
White-necked Heron	4	2	1	1							1	1	2	2	1	1	3	1
Yellow-billed Spoonbill			1	1			1	1	2	1	4	2	2	1	8	5	4	1

5 References

DSE 2010. *Hattah-Kulkyne Lakes Ramsar Site Ecological Character Description*. Department of Sustainability and Environment, Melbourne.

DSE 2013. *Advisory List of Threatened Vertebrate Fauna in Victoria – 2013*. Victorian Government Department of Environment & Primary Industries, Melbourne.

Appendices

Appendix 1: 2016 monitoring metadata

Table A1.1. Waterbird monitoring metadata for counts completed in December 2015

Lake	Count site co-ordinates	Count start time & date	Temperature	% Cloud cover	Precipitation	Wind speed	Wind direction	Condition of lake
Bitterang	54H 626660E 6163410S	13:13 hrs 21/12/2015	21	70-100	0	20	SE	Open water
		17:25 hrs 21/12/2015	20	70-100	0	10	ESE	
		08:25 hrs 22/12/2015	15	<10	0	0		
		11:44 hrs 22/12/2015	25	<10	0	17	SE	
Woterap	54H 623860E 6162930S	12:32 hrs 21/12/2015	20	70-100	0	20	SE	Open water
		16:40 hrs 21/12/2015	20	70-100	0	10	ESE	
		09:05 hrs 22/12/2015	16	<10	0	0		
		11:54 hrs 22/12/2015	27	<10	0	20	SE	
Yellwell	54H 625770E 6159280S	11:50 hrs 21/12/2015	20	70-100	0	20	SE	Open water
		16:00 hrs 21/12/2015	20	70-100	0	10	ESE	
		09:47 hrs 22/12/2015	20	<10	0	0		
		12:40 hrs 22/12/2015	28	<10	0	16	SE	
Konardin	54H 623050E 6160020S	11:03 hrs 21/12/2015	19	70-100	0	19	SSE	Open water
		15:15 hrs 21/12/2015	22	70-100	0	15	ESE	
		10:30 hrs 22/12/2015	24	<10	0	0		
		13:21 hrs 22/12/2015	29	<10	0	15	SE	
Mournpall	54H 622590E 6158930S	14:40 hrs 21/12/2015	22	70-100	0	15	ESE	Open water
		17:20 hrs 21/12/2015	24	70-100	0	13	ESE	
		10:25 hrs 22/12/2015	23	<10	0	17	SE	
		14:10 hrs 22/12/2015	30	<10	0	10		
Hattah	54H 623040E 6153140S	11:00 hrs 21/12/2015	15	70-100	0	20	ENE	Open water
		14:51 hrs 21/12/2015	24	70-100	0	15	SE	
		11:45 hrs 22/12/2015	19	<10	0	17	SE	
		09:40 hrs 22/12/2015	25	<10	0	0		
Arawak	54H 624470E 6152610S	12:00 hrs 21/12/2015	19	70-100	0	15	ENE	Open water
		15:32 hrs 21/12/2015	24	70-100	0	17	SE	
		09:00 hrs 22/12/2015	18	<10	0	17	SE	
		12:30 hrs 22/12/2015	25	<10	0	0		
Nip Nip	54H 628110E 6153830S	12:55 hrs 21/12/2015	22	70-100	0	20	ESE	Reduced to shallow pool approx 20 m diameter only
		16:25 hrs 21/12/2015	24	70-100	0	15	SE	
		08:10 hrs 22/12/2015	19	<10	0	11	ESE	
		13:15 hrs 22/12/2015	29	<10	0	0		

Table A1.2. Waterbird monitoring metadata for counts completed in March 2016

Lake	Count site co-ordinates	Count start time & date	Temperature	% Cloud cover	Precipitation	Wind speed (km/h)	Wind direction	Condition of lake
Bitterang	54H 626660E 6163410S	12:45 hrs 30/03/2016	20	<10%	0	5	SW	Open water
		16:40 hrs 30/03/2016	25	<10%	0	2	SW	
		08:45 hrs 31/03/2016	12	<10%	0	0		
		11:15 hrs 31/03/2016	23	<10%	0	3	SE	
Woterap	54H 623860E 6162930S	11:56 hrs 30/03/2016	18	<10%	0	18	W	Open water
		15:50 hrs 30/03/2016	26	<10%	0	2	SW	
		09:25 hrs 31/03/2016	17	<10%	0	0		
		12:05 hrs 31/03/2016	26	<10%	0	0		
Yellwell	54H 625770E 6159280S	11:15 hrs 30/03/2016	18	<10%	0	8	S	Open water
		15:00 hrs 30/03/2016	25	<10%	0	3	SW	
		10:05 hrs 31/03/2016	17	<10%	0	0		
		12:45 hrs 31/03/2016	24	<10%	0	4	SE	
Konardin	54H 623050E 6160020S	10:05 hrs 30/03/2016	21	10-30%	0	5	S	Open water
		14:00 hrs 30/03/2016	25	<10%	0	5	SW	
		10:45 hrs 31/03/2016	19	<10%	0	2	N	
		13:30 hrs 31/03/2016	27	<10%	0	5	SE	
Mournpall	54H 622590E 6158930S	10:10 hrs 30/03/2016	16	<10%	0	7.9	SE	Open water
		13:55 hrs 30/03/2016	21	<10%	0	6	SSE	
		08:40 hrs 31/03/2016	14	<10%	0	2	S	
		13:30 hrs 31/03/2016	25	<10%	0	5	N	
Hattah	54H 623040E 6153140S	11:00 hrs 30/03/2016	22	<10%	0	3	SE	Open water
		15:00 hrs 30/03/2016	20	<10%	0	14	SW	
		09:30 hrs 31/03/2016	20	<10%	0	0		
		12:50 hrs 31/03/2016	22	<10%	0	0		
Arawak	54H 624470E 6152610S	11:45 hrs 30/03/2016	21	<10%	0	2.2	SE	Open water
		15:55 hrs 30/03/2016	21	<10%	0	5	S	
		10:10 hrs 31/03/2016	21	<10%	0	0		
		12:10 hrs 31/03/2016	20	<10%	0	0		
Nip Nip	54H 628110E 6153830S	12:30 hrs 30/03/2016	21	<10%	0	4	SW	Lake has no surface water
		16:44 hrs 30/03/2016	22	<10%	0	5	S	
		08:25 hrs 31/03/2016	10	<10%	0	0		
		13:50 hrs 31/03/2016	26	<10%	0	0		

Table A1.3. Waterbird monitoring metadata for counts completed in May 2016

Lake	Count site co-ordinates	Count start time & date	Temperature C°	% Cloud cover	Precipitation	Wind speed (km/h)	Wind direction	Condition of lake
Bitterang	54H 626660E 6163410S	11:12 hrs 12/05/2016	8	70-100%	0	10	SW	Open water
		15:25 hrs 12/05/2016	22	10-30%	0	3	SW	
		09:10 hrs 13/05/2016	14	<10%	0	3	W	
		12:13 hrs 13/05/2016	22	<10%	0	5	NW	
Waterap	54H 623860E 6162930S	10:29 hrs 12/05/2016	17	70-100%	drizzle	10	W	Open water
		14:40 hrs 12/05/2016	22	30-70%	0	4	SW	
		10:00 hrs 13/05/2016	18	<10%	0	2	W	
		13:09 hrs 13/05/2016	22	<10%	0	6	NW	
Yellwell	54H 625770E 6159280S	09:45 hrs 12/05/2016	16	70-100%	0	10	NW	Lake almost dry with series of shallow puddles & damp mudflats in middle
		13:55 hrs 12/05/2016	20	70-100%	0	8	SW	
		10:50 hrs 13/05/2016	20	<10%	0	1	W	
		13:55 hrs 13/05/2016	21	<10%	0	6	NW	
Konardin	54H 623050E 6160020S	09:00 hrs 12/05/2016	17	70-100%	0	5	NW	Lake almost dry with small shallow puddle & damp mudflats in middle
		13:15 hrs 12/05/2016	22	70-100%	0	6	SW	
		11:35 hrs 13/05/2016	24	<10%	0	2	W	
		14:40 hrs 13/05/2016	21	<10%	0	8	NW	
Mournpall	54H 622590E 6158930S	09:00 hrs 12/05/2016	19	70-100%	0	4	NW	Open water
		13:10 hrs 12/05/2016	19	70-100%	0	8	SW	
		11:19 hrs 13/05/2016	20	<10%	0	3	W	
		15:10 hrs 13/05/2016	24	<10%	0	4	NW	
Hattah	54H 623040E 6153140S	10:55 hrs 12/05/2016	20	70-100%	0	6	NW	Open water
		15:10 hrs 12/05/2016	21	10-30%	0	7	SW	
		10:27 hrs 13/05/2016	17	<10%	0	3	W	
		14:10 hrs 13/05/2016	25	<10%	0	1	NW	
Arawak	54H 624470E 6152610S	10:08 hrs 12/05/2016	21	70-100%	0	1	NW	Open water
		14:25 hrs 12/05/2016	21	30-70%	0	6	SW	
		09:27 hrs 13/05/2016	14	<10%	0	0		
		13:20 hrs 13/05/2016	24	<10%	0	3	NW	
Nip Nip	54H 628110E 6153830S	11:35 hrs 12/05/2016	20	70-100%	0	7	SW	Lake has no surface water
		16:05 hrs 12/05/2016	23	<10%	0	8	SW	
		08:30 hrs 13/05/2016	12	<10%	0	0		
		12:25 hrs 13/05/2016	23	<10%	0	0		

Appendix 2: 2016 waterbird abundance results

Table A2.1. Waterbird abundance results: species and numbers counted in December 2015

Lake	Bitterang				Woterap				Yellwell				Konardin				Mournpall				Hattah				Arawak				Nip Nip						
Count start time & date	13:13 hrs 21/12/2015	17:25 hrs 21/12/2015	08:25 hrs 22/12/2015	11:44 hrs 22/12/2015	12:32 hrs 21/12/2015	16:40 hrs 21/12/2015	09:05 hrs 22/12/2015	11:54 hrs 22/12/2015	11:50 hrs 21/12/2015	16:00 hrs 21/12/2015	09:47 hrs 22/12/2015	12:40 hrs 22/12/2015	11:03 hrs 21/12/2015	15:15 hrs 21/12/2015	10:30 hrs 22/12/2015	13:21 hrs 22/12/2015	14:40 hrs 21/12/2015	17:20 hrs 21/12/2015	10:25 hrs 22/12/2015	14:10 hrs 22/12/2015	11:00 hrs 21/12/2015	14:51 hrs 21/12/2015	09:40 hrs 22/12/2015	11:45 hrs 22/12/2015	12:00 hrs 21/12/2015	15:32 hrs 21/12/2015	09:00 hrs 22/12/2015	12:30 hrs 22/12/2015	12:55 hrs 21/12/2015	16:25 hrs 21/12/2015	08:10 hrs 22/12/2015	13:15 hrs 22/12/2015			
Australasian Grebe			4							6		15																							
Australasian Shoveler									5			7		2																					
Australian Pelican				3			12	7	100	30	62		50	91	9	2	1	8	1	8	3	12	12		2	1	3	3				1			
Australian Shelduck													7																						
Australian Wood Duck					57	8	18		200	10	48	75																	9	38	35	12			
Australian White Ibis										5	1		2	1																					
Banded Lapwing			1																																
Black Swan					7			7	9	21	57	30				6							2												
Black-fronted Dotterel																																			
Black-winged Stilt	2	2	8									2	3																						
Blue-billed Duck																																			
Caspian Tern																																			
Chestnut Teal											20	15		15																					
Darter	9	2	2	2	3	2	1		13	11	9	26	1		1	2	16	2	3	3		4	1		9	7	6	1							
Eastern Great Egret																																			
Eurasian Coot									250	135	245	50						1	2	2		1	2												
Great Cormorant									23	75	29		60	82	9	2																			
Great Crested Grebe																					7	12	9		3		2	4							
Great Egret											1	1									1			1											

Lake	Bitterang				Woterap				Yellwell				Konardin				Mournpall				Hattah				Arawak				Nip Nip					
Count start time & date	13:13 hrs 21/12/2015	17:25 hrs 21/12/2015	08:25 hrs 22/12/2015	11:44 hrs 22/12/2015	12:32 hrs 21/12/2015	16:40 hrs 21/12/2015	09:05 hrs 22/12/2015	11:54 hrs 22/12/2015	11:50 hrs 21/12/2015	16:00 hrs 21/12/2015	09:47 hrs 22/12/2015	12:40 hrs 22/12/2015	11:03 hrs 21/12/2015	15:15 hrs 21/12/2015	10:30 hrs 22/12/2015	13:21 hrs 22/12/2015	14:40 hrs 21/12/2015	17:20 hrs 21/12/2015	10:25 hrs 22/12/2015	14:10 hrs 22/12/2015	11:00 hrs 21/12/2015	14:51 hrs 21/12/2015	09:40 hrs 22/12/2015	11:45 hrs 22/12/2015	12:00 hrs 21/12/2015	15:32 hrs 21/12/2015	09:00 hrs 22/12/2015	12:30 hrs 22/12/2015	12:55 hrs 21/12/2015	16:25 hrs 21/12/2015	08:10 hrs 22/12/2015	13:15 hrs 22/12/2015		
Grey Teal	2	11	1		6				500	960	780	400	85	60	140	14	2	2												4			2	
Hardhead							1		47	4	28	85	30			22																		
Hoary-headed Grebe		1		1																														
Intermediate Egret																																		
Little Egret																						8												
Little Black Cormorant					7					1		3		7		4					7			47										
Little Pied Cormorant								24	34	14	42																				1			
Marsh Sandpiper																																		
Masked Lapwing	1	3							1			2																						
Musk Duck	1																				1													
Pacific Black Duck					1				60	4	4	30														1	2							
Pacific Gull																																		
Pied Cormorant								9					2	1	4	3		1				5					1							
Pink-eared Duck													45	3																				
Red-capped Plover																																		
Red-kneed Dotterel		1												2	2																			
Red-necked Avocet																																		
Red-necked Stint																																		
Sharp-tailed Sandpiper																																		
Silver Gull																																		
Straw-necked Ibis												5																						
Yellow-billed Spoonbill											4	4																						
White-bellied Sea-Eagle																																1		
White-faced Heron													1													2	1							
White-necked Heron												1																			1			

Table A2.2. Waterbird abundance results: species and numbers counted in March 2016

Lake	Bitterang				Woterap				Yellwell				Konardin				Mournpall				Hattah				Arawak				Nip Nip						
Count start time & date	12:45 hrs 30/03/2016	16:40 hrs 30/03/2016	08:45 hrs 31/03/2016	11:15 hrs 31/03/2016	11:56 hrs 30/03/2016	15:50 hrs 30/03/2016	09:25 hrs 31/03/2016	12:05 hrs 31/03/2016	11:15 hrs 30/03/2016	15:00 hrs 30/03/2016	10:05 hrs 31/03/2016	12:45 hrs 31/03/2016	10:05 hrs 30/03/2016	14:00 hrs 30/03/2016	10:45 hrs 31/03/2016	13:30 hrs 31/03/2016	10:10 hrs 30/03/2016	13:55 hrs 30/03/0216	08:40 hrs 31/03/2016	13:30 hrs 31/03/2016	11:00 hrs 30/03/2016	15:00 hrs 30/03/2016	09:30 hrs 31/03/2016	12:50 hrs 31/03/2016	11:45 hrs 30/03/2016	15:55 hrs 30/03/2016	10:10 hrs 31/03/2016	12:10 hrs 31/03/2016	12:30 hrs 30/03/2016	16:44 hrs 30/03/2016	08:25 hrs 31/03/2016	08:25 hrs 31/03/2016			
Australasian Grebe		2	2		1		2														9		3	12			5		3						
Australasian Shoveler	25			8	39	49	42	2		2		4		4																					
Australian Pelican	6	10	16			3	8									3		9	20		14	13	10	12			2	15	5						
Australian Shelduck									1	1	1	1																							
Australian Wood Duck																						2					6		3						
Australian White Ibis		1		2	1		2		7	4	1	5	7	3	4	6																			
Banded Lapwing																																			
Black Swan				1														1											2						
Black-fronted Dotterel				4			1				1		94	47	78	47																			
Black-winged Stilt		2	2	3					3	2	38	7	28	25	7	34																			
Blue-billed Duck				1															7																
Caspian Tern																																			
Chestnut Teal																																			1
Darter																	3	19	3	9	11	20	22	18	6			10	6						
Eastern Great Egret																									1		3	2							
Eurasian Coot		1	12	3													2	27	6	3	2	5	9	9	2	8	2	7							
Great Cormorant																	12		1	12					2	2									
Great Crested Grebe																	47	40	68	67															
Great Egret																																			
Grey Teal	256	927	850	434	347	317	363	291	940	1223	1350	1290	870	1118	1300	686	2	1	3		16		33	11	6	6	5	9							
Hardhead																	24			22															
Hoary-headed Grebe	14						2										3				54	53	65		2	1									
Intermediate Egret																					1			1			1								
Little Egret																												5							

Lake	Bitterang				Woterap				Yellwell				Konardin				Mournpall				Hattah				Arawak				Nip Nip			
Count start time & date	12:45 hrs 30/03/2016	16:40 hrs 30/03/2016	08:45 hrs 31/03/2016	11:15 hrs 31/03/2016	11:56 hrs 30/03/2016	15:50 hrs 30/03/2016	09:25 hrs 31/03/2016	12:05 hrs 31/03/2016	11:15 hrs 30/03/2016	15:00 hrs 30/03/2016	10:05 hrs 31/03/2016	12:45 hrs 31/03/2016	10:05 hrs 30/03/2016	14:00 hrs 30/03/2016	10:45 hrs 31/03/2016	13:30 hrs 31/03/2016	10:10 hrs 30/03/2016	13:55 hrs 30/03/0216	08:40 hrs 31/03/2016	13:30 hrs 31/03/2016	11:00 hrs 30/03/2016	15:00 hrs 30/03/2016	09:30 hrs 31/03/2016	12:50 hrs 31/03/2016	11:45 hrs 30/03/2016	15:55 hrs 30/03/2016	10:10 hrs 31/03/2016	12:10 hrs 31/03/2016	12:30 hrs 30/03/2016	16:44 hrs 30/03/2016	08:25 hrs 31/03/2016	08:25 hrs 31/03/2016
Little Black Cormorant																200	44	26	94	7			9	70	54	32	51					
Little Pied Cormorant		1														34	59	10				1	3	3	6	5	4	11				
Marsh Sandpiper													7	9	5	2																
Masked Lapwing	1						1	2	2	10	8	3	4	2	2	2							2	1								
Musk Duck						1											3			2	1		2	2	1	1						
Pacific Black Duck			31											2							2		2	1					1			
Pacific Gull																																
Pied Cormorant																	58															
Pink-eared Duck	68	41	28	88	62	31	57	64	447	365	320	132	140	91	77	43										1						
Red-capped Plover												1	7	5	4	9																
Red-kneed Dotterel	9	2		3											1																	
Red-necked Avocet											1	1	463	476	490	456																
Red-necked Stint													13	30	64	40																
Sharp-tailed Sandpiper														2	2																	
Silver Gull													4	5	2	2	3	3	5				3									
Straw-necked Ibis																																
Yellow-billed Spoonbill		5					15					2	1												3	3	2	2				
White-bellied Sea-Eagle										1							1						1									
White-faced Heron	1	1	1	1	1	2	2	2		1	2	3		3	1	2	1			1	1	1		1								
White-necked Heron														1																		

Table A2.3. Waterbird abundance results: species and numbers counted in May 2016

Lake	Bitterang				Woterap				Yellwell				Konardin				Mournpall				Hattah				Arawak				Nip Nip			
Count start time & date	11:12 hrs 12/05/2016	15:25 hrs 12/05/2016	09:10 hrs 13/05/2016	12:13 hrs 13/05/2016	10:29 hrs 12/05/2016	14:40 hrs 12/05/2016	10:00 hrs 13/05/2016	13:09 hrs 13/05/2016	09:45 hrs 12/05/2016	13:55 hrs 12/05/2016	10:50 hrs 13/05/2016	13:55 hrs 13/05/2016	09:00 hrs 12/05/2016	13:15 hrs 12/05/2016	11:35 hrs 13/05/2016	14:40 hrs 13/05/2016	9:00 hrs 12/05/2016	13:10 hrs 12/05/2016	11:19 hrs 13/05/2016	15:10 hrs 13/05/2016	10:55 hrs 12/05/2016	15:10 hrs 12/05/2016	10:27 hrs 13/05/2016	14:10 hrs 13/05/2016	10:08 hrs 12/05/2016	14:25 hrs 12/05/2016	09:27 hrs 13/05/2016	13:20 hrs 13/05/2016	11:35 hrs 12/05/2016	16:05 hrs 12/05/2016	08:30 hrs 13/05/2016	12:25 hrs 13/05/2016
Australasian Grebe	5	2	1																2	1	5	3	34	20		11	6					
Australasian Shoveler	4	7	3	60	1		2	2											1									3				
Australian Pelican	61	37		42														8	5	4	3	7	6	11	5	6	5	13				
Australian Shelduck	1																															
Australian Wood Duck				2																			2			4						
Australian White Ibis				2																								1				
Banded Lapwing																																
Black Swan	4	36	12	92													3								2	2	2	3				
Black-fronted Dotterel	10	4	23			4	1	2	40	34	47	45			4	1																
Black-winged Stilt	15	8	6	15	8	9	5	8																								
Blue-billed Duck																																
Caspian Tern									12	13	23	33					1		1								1	2				
Chestnut Teal																																
Darter		3															1	15	9	1	10	10	23	12	6	5	6	2				
Eastern Great Egret																	1	3											2			
Eurasian Coot	2	3		25													3	2	2	2		5	5	7	15	15	16	11				
Great Cormorant																		30	56		76		5	1	120	11	1	19				
Great Crested Grebe																	37	8	15	23	2	2	1	1								
Great Egret																																
Grey Teal	55	452	157	300	240	253	236	268											3	2	1	8	3	11	1	15	5	6				
Hardhead	80			150															1	1												
Hoary-headed Grebe			1	40															16	17	137	85	285	73		2	4					
Intermediate Egret																																

Lake	Bitterang				Woterap				Yellwell				Konardin				Mournpall				Hattah				Arawak				Nip Nip					
Count start time & date	11:12 hrs 12/05/2016	15:25 hrs 12/05/2016	09:10 hrs 13/05/2016	12:13 hrs 13/05/2016	10:29 hrs 12/05/2016	14:40 hrs 12/05/2016	10:00 hrs 13/05/2016	13:09 hrs 13/05/2016	09:45 hrs 12/05/2016	13:55 hrs 12/05/2016	10:50 hrs 13/05/2016	13:55 hrs 13/05/2016	09:00 hrs 12/05/2016	13:15 hrs 12/05/2016	11:35 hrs 13/05/2016	14:40 hrs 13/05/2016	9:00 hrs 12/05/2016	13:10 hrs 12/05/2016	11:19 hrs 13/05/2016	15:10 hrs 13/05/2016	10:55 hrs 12/05/2016	15:10 hrs 12/05/2016	10:27 hrs 13/05/2016	14:10 hrs 13/05/2016	10:08 hrs 12/05/2016	14:25 hrs 12/05/2016	09:27 hrs 13/05/2016	13:20 hrs 13/05/2016	11:35 hrs 12/05/2016	16:05 hrs 12/05/2016	08:30 hrs 13/05/2016	12:25 hrs 13/05/2016		
Little Egret																2									3									
Little Black Cormorant																	1	15	45	17								4						
Little Pied Cormorant	2	2		2												36	48	36			5	4	3	5	14	27	34	15						
Marsh Sandpiper																																		
Masked Lapwing		2		2	1	2	1															1		1		1		1						
Musk Duck																	6	4	9	1		2	3	7										
Pacific Black Duck	20			26														2	2	6		2	2	10				2						
Pacific Gull																																		
Pied Cormorant																					2	4	3											
Pink-eared Duck	4	95	22	10	80	100	104	95								1			2								1							
Red-capped Plover																																		
Red-kneed Dotterel																																		
Red-necked Avocet	8		34	20	3	3																												
Red-necked Stint																																		
Sharp-tailed Sandpiper																																		
Silver Gull																																		
Straw-necked Ibis																																		
Yellow-billed Spoonbill	50	4	9	43																														
White-bellied Sea-Eagle																																		
White-faced Heron		2	1	2				1				2															1	1						
White-necked Heron	1		1	1																														