Victorian Duck Season Priority Waterbird Count, 2024

K. Stamation, D. Rogers and A. Muir

June 2024

Arthur Rylah Institute for Environmental Research Published Report

Arthur Rylah Institute for environmental research

VICTORIA State Government | Energy, Environment and Climate Action

Arthur Rylah Institute for Environmental Research
Department of Energy, Environment and Climate Action
PO Box 137, Heidelberg, Victoria 3084
Phone (03) 9450 8600
Website: www.ari.vic.gov.au

Citation: Stamation, K. Rogers, D., and Muir, A. (2024). Victorian Duck Season Priority Waterbird Count, 2024. Arthur Rylah Institute for Environmental Research Published Report for the Wildlife Policy Section, Department of Energy, Environment and Climate Action and the Game Management Authority. Department of Energy, Environment and Climate Action, Heidelberg, Victoria.

Front cover photo: Curlew Sandpiper at the Western Treatment Plant (Danny Rogers).

ISBN 978-1-76136-818-9 (pdf/online/MS word)

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

DEECA is committed to genuinely partnering with Victorian Traditional Owners and Victoria's Aboriginal community to progress their aspirations.

Accessibility

To receive this document in an alternative format, phone the Customer Service Centre on 136 186, email customer.service@delwp.vic.gov.au, or contact National Relay Service on 133 677. Available at DEECA website (www.deeca.vic.gov.au).

Victorian Duck Season Priority Waterbird Count, 2024

Kasey Stamation, Danny Rogers and Annette Muir

Arthur Rylah Institute for Environmental Research
Department of Energy, Environment and Climate Action
123 Brown Street, Heidelberg, Victoria 3084

Arthur Rylah Institute for Environmental Research
Published Report for: Wildlife Policy Section, Department of Energy, Environment and Climate Action and the Game Management Authority.

Acknowledgements

Funding for the preparation of this report was provided by the Regulatory Wildlife Policy section, Biodiversity Division, of the Department of Energy, Environment and Climate Action (DEECA) – we thank Louise Thompson and Vural Yazgin for their support.

Special thanks are due to the regional coordinators and regional staff who collected the data that form the basis of this report. In 2024 this task was shared equally between DEECA and the Game Management Authority (GMA). In particular we thank Heath Dunstan (GMA) and Lachlan Clarke (DEECA) for reviewing the list of priority wetlands and co-ordinating the on-ground effort.

A draft of this report was improved by comments from Lindy Lumsden and Nyil Khwaja (ARI), Louise Thompson (DEECA Regulatory Wildlife Policy) and Simon Toop (GMA).

Contents

Acknowledgements ii

Summary 2

1 Introduction 3

2 Methods 4

2.1 Count organisation 4
2.2 Timing of the count relative to season opening 4
2.3 Wetlands surveyed 4
2.4 Field methods 4
2.5 Species counted and analysed 5

3 Results 7

3.1 Number of wetlands counted 7
3.2 Game species 9
3.3 Threatened waterbirds considered sensitive to disturbance 9
3.3.1 Blue-billed Duck 9
3.3.2 Freckled Duck 9
3.3.3 Musk Duck 9
3.3.4 Brolga 9
3.3.5 Great Egret 9
3.3.6 Plumed Egret 10
3.3.7 Little Egret 10
3.3.8 Latham's Snipe 10
3.3.9 Curlew Sandpiper 10
3.3.10 Australasian Bittern 10
3.4 Breeding and moulting 10
3.5 Further regulation of hunting activity 10

4 Discussion 13

4.1 Limitations and constraints 13
4.2 The future 13

References 15

Appendix 1: List of priority wetlands and assessment status 18

Appendix 2: Other wetlands surveyed 21

Tables

Table 1. The priority species for the 2024 Duck Season Priority Waterbird Count 5
Table 2. Waterbird species that may breed colonially at wetlands open to hunting in Victoria. 6
Table 3. Coverage of priority wetlands in the 2024 Duck Season Priority Waterbird Count by DEECA region 7
Table 4. Summary of Summer Waterbird Counts and Duck Season Priority Waterbird Counts conducted in Victoria from 1987 to 2024 7
Table 5. Wetlands that received further regulation of hunting based on the information collected during the 2024 Duck Season Priority Waterbird Count. 11
Table 6. Wetlands that were closed ahead of the 2024 duck hunting season for other reasons including surveys outside of the DSPWC period. 12

Summary

Context:
The Victorian Duck Season Priority Waterbird Count is a state-wide survey of game ducks and other selected waterbird species on popular duck hunting wetlands. It is conducted each year in the lead up to the Victorian duck hunting season.

The count should occur as close as possible to opening week while still allowing adequate time for management decisions to be made and authorised in time for season opening, hence the start date of the hunting season sets the timetable for conducting the priority waterbird count.

In 2024, the Victorian duck hunting season took place between 10 April and 5 June, which meant that this year's Duck Season Priority Waterbird Count took place between 27 February and 14 March 2024.

Each year the Game Management Authority (GMA) and the Department of Energy, Environment and Climate Action (DEECA) review the list of priority wetlands to be surveyed. In 2024 a list of 134 priority wetlands were identified.

Aims:
The Duck Season Priority Waterbird Count (DSPWC) gathers numerical, locational, and breeding data about game ducks and threatened waterbirds to inform management decisions regarding the forthcoming duck hunting season. Specifically, the aims are to:

1. Identify wetlands that are open to hunting and are holding large numbers of significant, non-game waterbirds (to inform consideration of further regulation of hunting, including closure of individual wetlands to hunting).
2. Identify cases of local breeding by waterbirds, particularly colony-breeding species (for consideration of further regulation, including closure to hunting).
3. Provide details on the distribution and numbers of game and priority non-game species of waterbirds on wetlands open to hunting.
4. Collect data to inform the Interim Harvest Model which is used to inform decisions about duck hunting arrangements in subsequent years.

Methods:
A total of 134 priority wetlands were identified across Victoria for assessment in 2024. Of these, standardised surveys of targeted waterbird species were made at 101 priority wetlands, 32 priority wetlands were identified as dry (<5% capacity, so not surveyed) and one priority wetland was not assessed. An additional eight non-priority wetlands were also surveyed over a two-week period between 27 February and 14 March 2024.

Results:
In 2024 the total count of ducks belonging to the eight game species was 71% of the long-term mean and 85% of the mean since the DSPWC began in 2015 (excluding pandemic-affected counts in 2020 and 2021), up from 28% of the long-term mean in 2023.

There were more dry wetlands (i.e. those holding less than 5% water) than last year with 31% of wetlands categorised as dry compared to 6% in 2023.

Record numbers of Brolga were recorded during the 2024 DSPWC with one very large aggregation of 149 at Lake Muirhead (Grampians).

Curlew Sandpiper were also recorded in record numbers, with 2610 observed at Lake Martin/Cundare Pool (Barwon South West).

Conclusions and Implications:
The 2024 Duck Season Priority Waterbird Count was efficiently conducted within the time frames stipulated by the season opening date.

Based on data collected during the count, 32 wetlands were identified as warranting extra management attention during the 2024 duck hunting season. Most closures were the result of Australasian Shoveler and Brolga counts meeting or exceeding trigger levels for closure consideration (as specified in Menkhorst and Thompson 2022).

1 Introduction

Annual counts of waterbirds in the lead-up to the opening of duck hunting season have been conducted at wetlands across Victoria since 1987. The counts were instigated following a recommendation from a review of the management of duck hunting within the state (Loyn 1989, 1991). Between 1987 and 2014, the purpose of the counts (then referred to as the Summer Waterbird Count) was to count waterbirds at as many wetlands as possible across Victoria, regardless of hunting status, but with an emphasis on eight duck species designated as game species (Wildlife (Game) Interrim Regulations 2023 schedule 11). This information was used to inform management decisions about further regulation of hunting on specific wetlands during the forthcoming duck hunting season.

In 2015, a new approach was introduced that directed limited survey capacity to wetlands that have been: 1) historically important duck hunting sites; 2) are on public land or are open to hunting; and 3) have a history of supporting threatened waterbird species. There has also been an increasing emphasis on broadening the focus of the surveys to include all threatened waterbirds, including species not often recorded during earlier counts. This change reflects a concern that duck hunting could have more nuanced impacts on waterbirds than simply direct mortality (Menkhorst 2019, Menkhorst and Thompson 2022). This changed approach is reflected in the list of target species, as well as the change of name of the count to Duck Season Priority Waterbird Count (DSPWC) and adjusting the layout of the field data sheet accordingly.

Data collected during the pre-duck season counts have also proven to be valuable for other purposes, including informing the development of management plans for Ramsar sites and other individual wetlands, providing critical data for the Interim Harvest Model used to recommend daily bag sizes (e.g., Klaassen & Kingsford 2021) and monitoring population trends of individual species (e.g., Pacioni et al. 2017).

All count data obtained during these surveys are stored in departmental databases held at the Arthur Rylah Institute for Environmental Research (ARI) and submitted to the Victorian Biodiversity Atlas. The results of these annual counts have been published in various reports (Martindale 1988; Hewish 1988; Peter 1989–1992; Purdey and Loyn 2008–2011, 2013; Purdey and Menkhorst 2014–2015) or are available as unpublished reports (Price 1993; O'Brien 1994; Pert 1995; Norman 1996–2006; Norman and Purdey 2007; Menkhorst and Purdey 2016; Menkhorst et al. 2017–2023; Menkhorst and Stamation 2021–2022) and since 2014 have been made available on the website of the Game Management Authority, Victoria (https://www.gma.vic.gov.au/research/duck-research).

The objectives of the 2024 DSPWC were to:

1. Identify wetlands that are open to hunting and currently support large numbers of significant, non-game waterbirds (to inform consideration of further regulation, including possible closure of individual wetlands to hunting).
2. Identify cases of local breeding by waterbirds, particularly colony-breeding species (for consideration of further regulation, including closure to hunting).
3. Provide details on the distribution and numbers of game and non-game species of waterbirds on wetlands open to hunting.
4. Collect data to inform the Interim Harvest Model which is used to inform decisions about duck hunting arrangements in subsequent years.

2 Methods

2.1 Count organisation

In 2024, the field component of the counts was shared equally by the Department of Energy, Environment and Climate Action (DEECA) and the Game Management Authority (GMA). Within DEECA, five regional coordinators were assigned the task of arranging on-ground logistics and ensuring data sheets were submitted within the timelines. The GMA nominated one staff member to coordinate their surveys and data submission.

Each regional coordinator was responsible for liaising locally with DEECA and GMA officers in their region, distributing instructions and count forms, and ensuring adequate coverage of regional wetlands without duplication. The coordinators acted as a conduit for problems encountered during surveys and were expected to review completed forms before forwarding them to the authors at ARI by a specified date.

Regional coordinators were also required to inform the authors immediately if any of the priority species were detected or significant breeding events by, for example, colony-breeding waterbirds, were found during counts. In cases where a wetland was counted by persons other than government agency staff and significant waterbird values were reported, a government agency staff member was sent to the site to verify the report.

Completed forms, once processed locally, were scanned and emailed to the authors as soon as possible. This allowed preliminary data to be examined for records of rare or threatened non-game species, or any evidence of breeding birds that might require special protection. At ARI, the authors checked all data sheets for accuracy and completeness, queried coordinators or individual observers on unusual or deficient records and entered data into a Microsoft Access© database.

2.2 Timing of the count relative to season opening

Dates for the counts are set so that enough time is available to recommend further regulation of duck hunting and for management action to be legally enacted prior to the opening of the hunting season. The period of the count has been reduced to 14 days with the end date being as close as possible to opening day of the duck season while also allowing sufficient time for a review of the data followed by consultation with stakeholders and implementation of the necessary legal mechanisms to allow management actions to be implemented before the season opens. This timing helps to minimise error due to waterbird movements between the count and opening day of the hunting season. Even so, the period between the count and opening day, which is necessitated by requirements to implement legal mechanisms under the Victorian *Wildlife Act 1975*, is roughly three weeks in any given year, an ample period for flocks of waterbirds to change location. This time lag remains a shortcoming in the decision-making process as it is currently structured. To minimise the chance of errors due to waterbird movements, wetlands at which significant values (numbers of a threatened species exceeding the threshold, or significant breeding activity) are identified during the count are monitored by GMA or DEECA staff prior to management decisions being finalised to ensure that the issue still exists at the site. Further targeted monitoring by GMA or DEECA staff may take place throughout the duck hunting season to assess the need for further management intervention, such as further closures or re-openings.

2.3 Wetlands surveyed

The schedule of priority wetlands for surveying is reviewed each year to account for any foreseeable accessibility challenges (e.g. through private land), and to match staffing capacity. The 134 priority wetlands for 2024 are listed in Appendix 1.

2.4 Field methods

Counts were made of targeted waterbird species (see below) on a wetland (or a defined part of a large wetland), using binoculars or tripod-mounted spotting scopes. Observers were asked to record the wetland name, location (using Australian Map Grid reference or nearest town as a guide), date, time, priority species present and number of individuals of each priority species. At each wetland, an estimate of water level was taken (as a percentage of its full supply level) and, if the entire wetland could not be surveyed, an estimate was sought of the proportion of the wetland that was surveyed. Observations of breeding by any waterbird species were also recorded, including numbers of broods or nests (and nest contents where appropriate).

Wetlands that were found to be dry, or almost so, were generally not formally surveyed but were simply noted to be not supporting waterbirds.

2.5 Species counted and analysed

Species targeted for counting are the eight game duck species (i.e. native duck species that may be hunted in Victoria in a normal year, including the Australasian Shoveler and Hardhead which were prohibited from being hunted in the 2024 season) plus 12 rare or threatened non-game species that have been identified as being at risk of being shot mistakenly by hunters due to their resemblance or association with game species (e.g., Freckled Duck) or are particularly susceptible to the sorts of disturbance associated with duck hunting (Menkhorst 2019, Menkhorst and Thompson 2022) (Table 1). Other waterbird species are also counted as time permits. This is a significant change from the previous Summer Waterbird Count (1987-2014) which targeted the eight game species plus eight specified non-game species, including some abundant species such as Black Swan and Hoary-headed Grebe.

Particular attention is also given to identifying active waterbird breeding colonies where adverse impacts of disturbance by hunters may be amplified by the numbers of birds present in a relatively small area. Waterbird species that may breed colonially at Victorian wetlands open to hunting are listed in Table 2.

Table 1. The priority species for the 2024 Duck Season Priority Waterbird Count

*Note that two game species, the Australasian Shoveler and the Hardhead, were prohibited from being hunted during the 2024 season.

	English name	Scientific name
Game species	Australian Shelduck	*Tadorna tadornoides*
	Australian Wood Duck	*Chenonetta jubata*
	Australasian Shoveler*	*Spatula rhynchotis*
	Chestnut Teal	*Anas castanea*
	Grey Teal	*Anas gracilis*
	Hardhead*	*Aythya australis*
	Pacific Black Duck	*Anas superciliosa*
	Pink-eared Duck	*Malacorhynchus membranaceus*
Non-game priority species	Australian Painted-snipe	*Rostratula australis*
	Australasian Bittern	*Botaurus poiciloptilus*
	Blue-billed Duck	*Oxyura australis*
	Brolga	*Antigone rubicunda*
	Curlew Sandpiper	*Calidris ferruginea*
	Freckled Duck	*Stictonetta naevosa*
	Great Egret	*Ardea alba*
	Plumed (Intermediate) Egret	*Ardea (intermedia) plumifera*
	Latham's Snipe	*Gallinago hardwickii*
	Little Egret	*Egretta garzetta*
	Magpie Goose	*Anseranas semipalmata*
	Musk Duck	*Biziura lobata*

Table 2. Waterbird species that may breed colonially at wetlands open to hunting in Victoria.

English name	Scientific name
Australasian Darter	*Anhinga novaehollandiae*
Australian Painted-snipe	*Rostratula australis*
Australian Pelican	*Pelecanus conspicillatus*
Australian White Ibis	*Threskiornis moluccus*
Caspian Tern	*Hydroprogne caspia*
Eastern Cattle Egret	*Bubulcus coromandus*
Fairy Tern	*Sternula nereis*
Glossy Ibis	*Plegadis falcinellus*
Great Cormorant	*Phalacrocorax carbo*
Great Egret	*Ardea alba*
Gull-billed Tern	*Gelochelidon nilotica*
Plumed (Intermediate) Egret	*Ardea (intermedia) plumifera*
Little Black Cormorant	*Phalacrocorax sulcirostris*
Little Egret	*Egretta garzetta*
Little Pied Cormorant	*Microcarbo melanoleucos*
Little Tern	*Sternula albifrons*
Magpie Goose	*Anseranas semipalmata*
Nankeen Night-Heron	*Nycticorax caledonicus*
Pied Cormorant	*Phalacrocorax varius*
Pied Stilt	*Himantopus leucocephalus*
Red-necked Avocet	*Recurvirostra novaehollandiae*
Royal Spoonbill	*Platalea regia*
Silver Gull	*Chroicocephalus novaehollandiae*
Straw-necked Ibis	*Threskiornis spinicollis*
Whiskered Tern	*Chlidonias hybrida*
Yellow-billed Spoonbill	*Platalea flavipes*

3 Results

3.1 Number of wetlands counted

The 2024 DSPWC contributes to a dataset now spanning the 37 years from 1987. In 2024, counts were made at 101 priority wetlands that held water. A further 32 priority wetlands were dry and were not counted (see Appendix 1) giving a total of 133 priority wetlands assessed (99%). Waterbirds at a further eight non-priority wetlands were also counted (Appendix 2), while two additional wetlands were surveyed for Brolga only.

The numbers of priority wetlands in each DEECA region and the number that were surveyed or not surveyed in 2024 are shown in Table 3. Table 4 shows the annual effort since counts began in 1987 and the numbers of game and non-game birds counted.

Table 3. Coverage of priority wetlands in the 2024 Duck Season Priority Waterbird Count by DEECA region

Dry wetlands were not surveyed but are considered to have been 'assessed'.

DEECA region	Number of priority wetlands	Number of priority wetlands holding water and surveyed	Number of priority wetlands that were dry	Number of priority wetlands not assessed
Barwon South West	29	24	5	0
Gippsland	15	11	2	1
Grampians	35	24	11	0
Hume	15	8	7	0
Loddon Mallee	40	34	6	0
All	**134**	**101 (75%)**	**32 (25%)**	**1 (1%)**

Table 4. Summary of Summer Waterbird Counts and Duck Season Priority Waterbird Counts conducted in Victoria from 1987 to 2024

SWC = Summer Waterfowl Count; DSPWC = Duck Season Priority Waterbird Count

Program	Year	Count Period	Number of wetlands surveyed	Total Count of game species	Total count of non-game species
SWC	1987	17 – 25 January	332	205,000	177,000
	1988	6 – 14 February	472	294,108	185,821
	1989	4 – 12 February	626	292,598	170,375
	1990	18 – 26 February	668	385,148	225,230
	1991	16 – 24 February	786	414,417	264,610
	1992	22 February – 1 March	659	408,004	219,411
	1993	20 – 28 February	534	218,562	107,650
	1994	26 February – 6 March	284	292,899	173,887
	1995	25 February – 5 March	367	196,955	141,609
	1996	24 February – 3 March	234	200,861	197,916

Program	Year	Count Period	Number of wetlands surveyed	Total Count of game species	Total count of non-game species
	1997	22 February – 2 March	223	124,914	92,003
	1998	21 February – 1 March	309	216,476	152,348
	1999	27 February – 7 March	312	206,839	128,969
	2000	26 February – 5 March	298	128,021	78,675
	2001	24 February – 4 March	336	240,671	102,926
	2002	23 February – 3 March	225	231,235	106,191
	2003	22 February – 2 March	175	155,623	93,972
	2004	21 – 29 February	249	187,139	85,468
	2005	19–27 February	272	155,069	81,950
	2006	25 February – 5 March	268	182,487	85,887
	2007	24 February – 4 March	176	91,210	46,770
	2008	23 February – 2 March	191	58,628	41,454
	2009	21 February – 1 March	161	78,723	38,283
	2010	20–28 February	153	77,649	35,485
	2011	19 February – 6 March	201	104,903	16,768
	2012	11 February – 4 March	136	212,865	81,848
	2013	9 February – 2 March	133	185,507	103,467
	2014	10 – 23 February	166	267,055	113,717
DSPWC	2015	16 – 28 February	126	159,666	74,290
	2016	15 – 26 February	131	92,168	74,452
	2017	13 – 24 February	127	283,430	114,463
	2018	12 – 23 February	144	262,397	130,762
	2019	11 – 22 February	135	225,733	85,889
	2020*	30 March – 12 April & 22 – 30 April	62	3,250	10,093
	2021*	19 April – 4 May	84	45,730	20,532
	2022	7 – 20 February	139	40,202	10,791
	2023	7 – 20 February & 16 - 28 March	127	52,129	24,140
	2024	27 February – 14 March	133	132,246	55,385
	Mean		**267**	**187,119**	**103,960**

*Count severely affected by COVID-19 pandemic travel restrictions.

3.2 Game species

In 2024, the total count of ducks belonging to the eight game species was 132,246, 71% of the long-term mean and 85% of the mean since the DSPWC began in 2015 (excluding pandemic-affected counts in 2020 and 2021 (Table 4) which is considerably higher than the previous 4 years where high rainfall events caused flooding across north-eastern New South Wales and south-eastern Queensland, likely attracting many waterbirds from Victoria (Loyn et al. 2014, Clarke et al. 2015, Bino et al. 2020, Papas et al. 2021, Menkhorst et al. 2023).

One species, the Grey Teal, made up 42% of the total game duck count, with the Australian Shelduck contributing a further 16%, Chestnut Teal 13% and Pacific Black Duck 12%, meaning these four species made up 84% of all game ducks counted. Pink-eared Duck and Australian Wood Duck accounted for 7% and 6% of all game ducks counted respectively and the remaining game species (Australasian Shoveler and Hardhead) made a negligible contribution.

3.3 Threatened waterbirds considered sensitive to disturbance

Sightings were made of 10 of the 12 threatened, non-game waterbird species targeted for attention during the 2024 DSPWC (see Table 1). These sightings are briefly summarised below.

3.3.1 Blue-billed Duck

The Blue-billed Duck is a non-game species that is of particular concern because it is listed as Vulnerable under the *Flora and Fauna Guarantee Act 1988.* During the 2024 DSPWC, the Blue-billed Duck was recorded at 21 wetlands with the largest group being 420 at Lake Tutchewop. On 27 March, outside the DSPWC period, 811 Blue-billed Duck were counted at Pine Lake by ARI staff undertaking fieldwork for a separate research program (N. Khwaja, pers. comm.); 79 Blue-billed Duck had been counted at this wetland during the DSPWC on 4 March 2024.

3.3.2 Freckled Duck

The Freckled Duck is a non-game species that is of particular concern because it is listed as Endangered under the *Flora and Fauna Guarantee Act 1988*. Freckled Ducks are at risk of being shot during duck hunting season because they can be difficult to distinguish from Pacific Black Duck when flying or fly in mixed flocks with game ducks. During the 2024 DSPWC, the Freckled Duck was recorded at 6 wetlands. The largest aggregation was 46 at Lake Goldsmith (Loddon Mallee) on 29 March 2024. The total number of Freckled Duck observed during the DSPWC was 101, below the 2023 count of 246 and well below the highest total of 1626 observed in 2018.

3.3.3 Musk Duck

The Musk Duck is a non-game species that is of particular concern because it is listed as Vulnerable under the *Flora and Fauna Guarantee Act 1988.* It was recorded at 32 wetlands during the 2024 count, but there were only 8 wetlands where numbers exceeded 10. There was one large aggregation of 200 at Lake Bolac (Grampians) on March 13.

3.3.4 Brolga

The Brolga is a non-game species that is of particular concern because it is listed as Endangered under the *Flora and Fauna Guarantee Act 1988.* An aggregation of 149 Brolgas were present at Lake Muirhead (Grampians) on 13 March as well as 20 Brolga at Bulrush Swamp (Barwon South West), 20 at Cundare Pool (Barwon South West) and 20 at Lake Linlithgow (Grampians). On the 13 and 14 March 2024, 38-49 Brolga were consistently observed by ARI staff at Lake Stewart (a private wetland where hunting is generally permitted by the landowner). Brolgas were also present in small numbers (up to 10) at eleven other wetlands during the count period.

3.3.5 Great Egret

The Great Egret is listed as Vulnerable under the *Flora and Fauna Guarantee Act 1988.* This species was present at 36 of the monitored wetlands with the largest aggregation at Big Reedy Lagoon (Hume), where 45 individuals were present on 28 February.

3.3.6 Plumed Egret

The Plumed Egret is listed as Critically Endangered under the *Flora and Fauna Guarantee Act 1988.* In total 150 were counted across 12 wetlands and numbers were greater than 10 at 4 wetlands. The largest group was 50 observed at Moodie Swamp on 13 March 2024. These are the largest numbers of Plumed Egret recorded since the DSPWC began in 2015.

3.3.7 Little Egret

The Little Egret is listed as Endangered in Victoria. Breeding in Victoria appears to be confined to several tiny colonies near Geelong, Queenscliff and at Mud Islands. Former breeding colonies at Gunbower Island on the Murray River have been inactive for several decades. Little Egrets were reported at 6 wetlands during the 2024 DSPWC, including 15 at Victoria Lagoon (Gippsland) on 27 February.

3.3.8 Latham's Snipe

Although not formally listed as threatened in Victoria, there is concern that Latham's Snipe is declining. It has recently been listed as Vulnerable under the *EPBC Act 1999*. Just two birds were observed in the 2024 DSPWC, at Lake Colac (Barwon South West) on 4 March.

3.3.9 Curlew Sandpiper

The Curlew Sandpiper is listed as Critically Endangered under the *Flora and Fauna Guarantee Act 1988*. Curlew Sandpiper were recorded at 2 wetlands during the 2024 DSPWC. There was a count of 6 at Lake Colac (Barwon South West) and an extraordinary count of 2610 at Lake Martin/Cundare Pool (Barwon South West) on the 6 March.

3.3.10 Australasian Bittern

The Australasian Bittern is listed as Critically Endangered under the Flora and Fauna Guarantee Act 1988. On 13 March 2024 ARI staff observed 2 Australasian Bitterns at Hird Swamp during surveys for the Wetland Monitoring and Assessment Program for Environmental Water (a separate survey program). This site had been surveyed by DEECA staff on 6 March as part of the DSPWC: no Australasian Bittern were observed in that survey, but the survey team noted very poor visibility of the wetland due to dense vegetation growth. On 13 March the ARI team waded through the vegetation and flushed the Australasian Bittern.

3.4 Breeding and moulting

The Victorian duck hunting season is timed to occur after the main waterbird breeding period (July–January in Victoria) and after game species have completed their post-breeding moult. The survey results indicate that breeding by waterfowl was largely finished statewide at the time of the 2024 DSPWC. Only a few broods of ducklings were observed: 1 brood of Australian Wood Duck ducklings at Dowdle Swamp (Hume); 2 broods of Grey Teal and 4 broods of Great Crested Grebe at Lake Meran (Loddon Mallee); and 1 brood of Pacific Black Duck ducklings at Wooroonook Lake [Church] (Loddon Mallee).

There was one instance of colonial nesting observed in the south-central portion of Dowds Morass State Game Reserve (Gippsland) on 1 March 2024, with an estimate of 400 individual Pied Cormorants, including immatures on nests and an estimate of 250 individual Royal Spoonbills with immatures on the nests.

3.5 Further regulation of hunting activity

In 2024, information collected during the DSPWC contributed to decisions to further regulate hunting activity. This included the complete closure of 23 wetlands due to the count of at least one threatened waterbird meeting trigger levels (see Menkhorst and Thompson, 2022) or the presence of colonial breeding, ahead of the commencement of the 2024 duck season; 2 of these wetlands were reopened during the season as the trigger was no longer met (see Table 5). A further nine wetlands were closed prior to the 2024 duck season

for reasons outside of the DSPWC and 3 wetlands were closed during the season following agency verification of third-party reports of significant numbers of threatened species (Table 6).

Table 5. Wetlands that received further regulation of hunting based on the information collected during the 2024 Duck Season Priority Waterbird Count.

Wetland name	Action trigger	Management action
Big Reedy Lagoon	Great Egret	Closed to hunting
Bullrush Swamp	Brolga	Closed to hunting
Clydebank Morass*	Australasian Shoveler	Closed to hunting
Cundare Pool	Brolga	Closed to hunting
Dowd Morass**	Colonial breeding waterbirds	Partial closure
Greens Lake	Brolga	Closed to hunting
Hird Swamp	Australasian Bittern	Closed to hunting
Koorangie State Game Reserve (First Marsh)	Freckled Duck, breeding waterbirds	Closed to hunting
Lake Bolac	Musk Duck	Closed to hunting
Lake Buloke (incl. Little Lake Buloke)	Australasian Shoveler	Closed to hunting
Lake Buninjon	Australasian Shoveler and Blue-billed Duck	Closed to hunting
Lake Colongulac	Australasian Shoveler	Closed to hunting
Lake Cullen	Australasian Shoveler	Closed to hunting
Lake Goldsmith	Australasian Shoveler and Freckled Duck	Closed to hunting
Lake Martin	Curlew Sandpiper	Closed to hunting
Lake Muirhead	Brolga	Closed to hunting
Lake Murdeduke	Blue-billed Duck	Closed to hunting
Lake Natimuk	Australasian Shoveler	Closed to hunting
Lake Stewart (private wetland)	Brolga	Closed to hunting
Lake Wat Wat	Australasian Shoveler	Closed to hunting
Pine Lake	Australasian Shoveler and Blue-billed Duck	Closed to hunting
Green Swamp	Brolga	Closed to hunting
Tower Hill	Australasian Shoveler	Closed to hunting

*reopened during the season as Australasian Shovelers were no longer present at the site

**reopened during the season when breeding had ceased.

Table 6. Wetlands that were closed ahead of the 2024 duck hunting season for other reasons including surveys outside of the DSPWC period.

Wetland name	Action trigger	Management action
Kow Swamp	Reaffirm Wildlife Sanctuary status	Closed to hunting
Reedy Lakes (near Kerang)	Reaffirm Wildlife Sanctuary status	Closed to hunting
Richardson River (near Lake Buloke)	Blue-billed Duck (observed after priority waterbird count)	Closed to hunting
Anderson Inlet	Known habitat for Orange-bellied Parrots	Closed to hunting
Lake Connewarre	Significant number of Orange-bellied Parrot	Closed to hunting
Lake Linlithgow	Blue-billed Duck (observed after priority waterbird count)	Closed to hunting
Lake Boort*	Grey-headed Flying Foxes	Closed to hunting
Lake Wongan	Australasian Shoveler (observed after priority waterbird count)	Closed to hunting
Lake Tutchewop	Blue-billed Duck (observed after priority waterbird count)	Closed to hunting
Lake Lonsdale**	Freckled Duck	Closed to hunting
Lake Modewarre**	Australasian Shoveler	Closed to hunting
Moodie Swamp**	Brolga	Closed to hunting

*re-opened during the season once flying foxes were no longer roosting at the site

**closed during the season following agency verification of third-party reports of significant numbers of threatened species.

4 Discussion

The total count of game ducks in the 2024 DSPWC was 85% of the mean for the past eleven years (excluding pandemic-affected counts in 2020 and 2021) up from 28% in 2023 and suggests a considerable increase in game duck species across Victoria since numbers dropped during La Nina event years from 2020-2023. This is despite more dry wetlands (i.e. those holding less than 5% water) with 25% of wetlands categorised as dry in 2024 compared to 6% in 2023. A marked increase in game duck species was also seen in the latest statewide abundance estimates for game ducks, where aerial and ground surveys are conducted in spring each year (Ramsey and Fanson et al. 2024). It is assumed that numbers of game ducks declined in Victoria in 2022 and early 2023 due to improved conditions across north-eastern New South Wales and south-eastern Queensland (Menkhorst et al. 2023) and that the subsequent increase in game species abundance has likely been driven by an increase in breeding activity during these favourable conditions (Ramsey and Fanson et al. 2024).

4.1 Limitations and constraints

The limitations and constraints of the DSPWC need to be appreciated when considering the results. While it is the only long-term, land-based survey of the State's waterbirds, with annual counts since 1987, the number of wetlands surveyed has declined from a peak of 786 wetlands in 1991, to 121–150 in recent years. Regional organisers are now encouraged to focus survey effort on those wetlands that are on public land, are open to hunting and which consistently hold large numbers of game species. This biases the data towards waterbird species that prefer large and more permanent wetlands (such as Hardhead, Blue-billed Duck, Eurasian Coot and Hoary-headed Grebe), and against those species that prefer shallower, ephemeral and more highly vegetated wetlands (such as teal, Australasian Shoveler, Pink-eared Duck and bitterns). Australasian Bittern is a target species that can be easily overlooked and so additional effort (e.g. wading through vegetation) may be required at wetlands that have supported bitterns in the past and/or are identified as having suitable habitat. Furthermore, as survey coverage decreases, the chances of the survey failing to record aggregations of significant species increases, which compromises the value of the counts as a tool for minimising the impact of duck hunting on wetland values.

4.2 The future

The original Summer Waterfowl Count was designed to achieve two main objectives (Loyn 1989, 1991):

1. to locate flocks of threatened waterfowl or breeding aggregations of waterbirds that may warrant additional management during the coming duck hunting season.
2. to obtain data on numbers of waterbirds in Victoria for long-term monitoring.

Management of game species requires long-term tracking of changes in species abundance across the state and the continent. The inherent variability of the Australian climate has profound effects on the availability of habitat for waterbirds, and breeding opportunities are typically provided by flood events in disparate parts of the continent (e.g., Frith 1982; Kingsford and Norman 2002).

Long-term datasets are essential to tease out the relative importance of these climatic influences, compared to immediate human impacts, such as hunting and the provision of environmental water. Such datasets are rare in Australia, and many have been discontinued. In Victoria, only Western Port has been monitored long-term for waterbirds, since 1973 (Loyn et al. 1994; Hansen et al. 2015), and the Western Treatment Plant has been intensively monitored since 2000 (Loyn et al. 2014). On a much broader scale, the Eastern Australian Aerial Waterbird Survey (EAAWS), which began in 1983, has provided annual abundance indices of waterbirds and wetland habitats across a standard series of aerial transect lines from Queensland to Victoria and into South Australia (see https://www.ecosystem.unsw.edu.au/content/rivers-and-wetlands/waterbirds/eastern-australian-waterbird-survey). However, the aerial transect lines used in the EAAWS are widely spaced (2 degrees of latitude or approximately 168 km in Victoria) and thus many important Victorian wetlands are not covered.

The DSPWC adds a broad perspective to our understanding of waterbird numbers and distribution within Victoria, with data having been collected from many wetlands (121+ annually, and approximately 1,500 altogether) since 1987. The data summarised here add to the series that is used to assist decision making about duck hunting and wetland management in the state, as envisaged by Loyn (1991). Only a sample of the State's wetlands is surveyed each year, and it should be stressed that most of these counts do not

provide data on absolute numbers of waterbirds or total species diversity. While the primary aim is to identify wetlands that warrant consideration for further regulation of hunting (objective 1) and that emphasis has been exaggerated as survey resources have decreased, it still has value as an index of abundance for comparisons between years (objective 2), with appropriate recognition of the data limitations as described above. Examples of appropriate use of the DSPWC data include Murray et al. (2012) and Klaassen and Kingsford (2021). DSPWC data have also proved helpful in other projects including assessing species population trends (e.g., Pacioni et al. 2017), BirdLife Australia's Australian Waterbird Index project (Clemens et al, 2019) and assessing the success of management to maintain Ramsar values.

References

Bino, G.,Brandis, K., Kingsford, R.T. and Porter, J. (2020). Waterbird synchrony across Australia's highly variable dryland rivers - Risks and opportunities for conservation. *Biological Conservation* **243**, article id. 108497.

Emison, W.B., Beardsell, C.M., Norman, F.I., Loyn, R.H. and Bennett, S.C. (1987). Atlas of Victorian Birds. Department of Conservation, Forests and Lands, Royal Australasian Ornithologists Union, Melbourne.

Clarke, R.H., Herrod, A., Loyn, R.H., Carter, M.J., Silcocks, A., Menkhorst, P. and Johnstone, C. (2015). Waterbird fluctuations at coastal wetland refugia in response to Murray-Darling Basin streamflow and rainfall. Monash University, Victoria.

Clemens, R., Driessen, J. and Ehmke, G. (2019). Australian Bird Index Phase 2 – Developing Waterbird Indices for National Reporting. Unpublished report for the Department of the Environment. BirdLife Australia, Melbourne.

Frith, H.J. (1982). *Waterfowl in Australia*. Angus & Robertson, Sydney.

Hansen, B.D., Menkhorst, P., Maloney, P. and Loyn, R.H. (2015). Long-term declines in multiple waterbird species in a tidal embayment, south-east Australia. *Austral Ecology* **40**, 515–527.

Hewish, M. (1988). Waterfowl count in Victoria, February 1988. *RAOU Report* No. 52.

Kingsford, R.T. and Norman, F.I. (2002). Australian waterbirds – products of the nation's ecology. *Emu* **102**, 29–46.

Klaassen, M. and Kingsford, R. (2021). Using duck proxies and surface water to inform hunting arrangements. Unpublished report to the Victorian Game Management Authority available at https://www.gma.vic.gov.au/__data/assets/pdf_file/0008/828494/Using-duck-proxies-and-surface-water-to-inform-hunting-arrangements.pdf

Loyn, R.H. (1989). *The management of duck hunting in Victoria – a review*. Arthur Rylah Institute of Environmental Research Technical Series No. 70. Department of Conservation, Forests and Lands, Melbourne.

Loyn, R.H. (1991). Assessing and managing the impact of duck hunting in Victoria – a new approach. *Wildfowl* **42**, 155–61.

Loyn, R.H., Dann, P. and Bingham, P. (1994). Ten years of waterbird counts in Western Port, Victoria, 1973–83. I. Waterfowl and large wading birds. *Australian Bird Watcher* **15**, 333–350.

Loyn, R.H., Rogers, D.I, Swindley, R.J., Stamation, K., Macak, P. and Menkhorst, P. (2014). Waterbird monitoring at the Western Treatment Plant, 2000–12: the effects of climate and sewage treatment processes on waterbird populations. Arthur Rylah Institute for Environmental Research Technical Report Series No. 256. Department of Environment and Primary Industries, Heidelberg.

Marchant, S. and Higgins, P. J. (eds) (1990). *Handbook of Australian, New Zealand and Antarctic Birds, Volume 1 (B)*. *Ardea intermedia* Intermediate Egret. Pp 978-986. Oxford University Press, Melbourne.

Martindale, J. (1988). Waterfowl count in Victoria, January 1987. *RAOU Report* No. 37.

Menkhorst, P.W. (2019). Waterbird susceptibility to disturbance from duck hunting in Victoria. *Arthur Rylah Institute for Environmental Research Technical Report Series* Number 305.

Menkhorst, P.W. and Thompson, L. (2022). Waterbird susceptibility to disturbance from duck hunting in Victoria (2020 update). *Arthur Rylah Institute for Environmental Research Technical Report Series* Number 338.

Menkhorst, P. and Purdey, D. (2016). Victorian Summer Waterbird Count 2016. Arthur Rylah Institute for Environmental Research. Unpublished Client Report. Department of Environment, Land, Water & Planning, Heidelberg, Victoria.

Menkhorst, P. and Stamation, K. (2021). Victorian Duck Season Priority Waterbird Count, 2021. Unpublished report to Regulatory Strategy and Design Branch, Department of Environment, Land, Water and Planning, Arthur Rylah Institute for Environmental Research, Heidelberg.

Menkhorst, P. and Stamation, K. (2022). Victorian Duck Season Priority Waterbird Count, 2022. Unpublished report to Regulatory Strategy and Design Branch, Department of Environment, Land, Water and Planning, Arthur Rylah Institute for Environmental Research, Heidelberg.

Menkhorst, P., Brown, G. and Stamation, K. (2023). Victorian Duck Season Priority Waterbird Count, 2023. Unpublished Client report for the Wildlife Policy Section, Department of Energy, Environment and Climate Action and the Game Management Authority. Arthur Rylah Institute for Environmental Research, Department of Energy, Environment and Climate Action, Heidelberg, Victoria.

Menkhorst, P., Brown, G. and Stamation, K. (2017). Victorian Summer Waterbird Count 2017. Arthur Rylah Institute for Environmental Research. Unpublished Client Report. Department of Environment, Land, Water & Planning, Heidelberg, Victoria.

Menkhorst, P., Brown, G. and Stamation, K. (2018). Victorian Summer Waterbird Count 2018. Arthur Rylah Institute for Environmental Research. Unpublished Client Report. Department of Environment, Land, Water & Planning, Heidelberg, Victoria.

Menkhorst, P., Stamation, K. and Brown, G. 2019. Victorian Summer Waterbird Count 2019. Unpublished report to Regulatory Strategy and Design Branch, Department of Environment, Land, Water and Planning, Arthur Rylah Institute for Environmental Research, Heidelberg.

Menkhorst, P., Stamation, K. and Eketone, T.A.M. (2020). Victorian Duck Season Priority Waterbird Count, 2020. Arthur Rylah Institute for Environmental Research, Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

Menkhorst, P., Brown, G. and Stamation, K. (2023). Victorian Duck Season Priority Waterbird Count, 2023. Unpublished Client report for the Wildlife Policy Section, Department of Energy, Environment and Climate Action and the Game Management Authority. Arthur Rylah Institute for Environmental Research, Department of Energy, Environment and Climate Action, Heidelberg, Victoria.

Morley, C. and Alcorn, R. 2018. Geelong Bird Report 2013-2016. Geelong Field Naturalists Club, Geelong. Available at https://www.dropbox.com/s/qy13k9srany042v/Geelong%20Bird%20Report%202013-2016%20P.pdf?dl=0

Murray, C.G., Loyn, R.H., Kasel, S., Hepworth, G., Stamation, K. and Hamilton, A.J. (2012). What can a database compiled over 22 years tell us about the use of different types of wetlands by waterfowl in southeastern Australian summers? *Emu* **112**, 209–217.

Norman, F.I. (1996). *A report on some results of the 1996 Summer Waterfowl Count in Victoria*. Unpublished Report, Parks, Flora and Fauna Branch.

Norman, F.I. (1997). *A report on some results of the 1997 Summer Waterfowl Count in Victoria*. Unpublished Report, Parks, Flora and Fauna Branch.

Norman, F.I. (1998). *A report on some results of the 1998 Summer Waterfowl Count in Victoria*. Unpublished Report, Parks, Flora and Fauna Branch.

Norman, F.I. (1999). *A report on some results of the 1999 Summer Waterfowl Count in Victoria*. Unpublished Report, Parks, Flora and Fauna Branch.

Norman, F.I. (2000). *A report on some results of the 2000 Summer Waterfowl Count in Victoria*. Unpublished Report, Parks, Flora and Fauna Branch.

Norman, F.I. (2001). *A report on some results of the 2001 Summer Waterfowl Count in Victoria*. Unpublished Report, Parks, Flora and Fauna Branch.

Norman, F.I. (2002). *A report on some results of the 2002 Summer Waterfowl Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch.

Norman, F.I. (2003). *A report on some results of the 2003 Summer Waterfowl Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch.

Norman, F.I. (2004). *A report on some results of the 2004 Summer Waterfowl Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch.

Norman, F.I. (2005). *A report on some results of the 2005 Summer Waterfowl Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch.

Norman, F.I. (2006). *A report on some results of the 2006 Summer Waterfowl Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch.

Norman, F.I. and Purdey, D.C. (2007). *The 2007 Summer Waterbird Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch.

O'Brien, M. (1994). *Summer Waterfowl Count 1994*. Unpublished Report, Arthur Rylah Institute for Environmental Research, Department of Conservation and Natural Resources, Melbourne.

Papas, P., Hale, R., Amtstaetter, F., Clunie, P., Rogers, D., Brown, G, Brooks, J., Cornell, G., Stamation, K., Downe, J., Vivian, L., Sparrow, A., Frood, D., Sim, L., West, M., Purdey, D., Bayes, E., Caffrey, L., Clarke-Wood, B. and Plenderleith, L. (2021). Wetland Monitoring and Assessment Program for environmental water: Stage 3 Final Report (PDF, 6.6 MB). Arthur Rylah Institute for Environmental Research Technical Report Series No. 322. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

Pacioni, C., Ramsay, D.S.L. and Menkhorst, P. (2017). Assessment of the status of the Australasian (blue-winged) shoveler (*Anas rhynchotis*) in south-eastern Australia. Unpublished report to Game Management Authority, Arthur Rylah Institute for Environmental Research, Heidelberg.

Pert, P. (1995). *Results of the 1995 Summer Waterfowl Count in Victoria.* Unpublished Report, Arthur Rylah Institute for Environmental Research, Department of Conservation and Natural Resources, Melbourne.

Peter, J. (1989). Waterfowl count in Victoria, February 1989. *RAOU Report* No. 57. RAOU, Moonee Ponds, Victoria.

Peter, J. (1990). Waterfowl count in Victoria, February 1990. *RAOU Report* No. 72. RAOU, Moonee Ponds, Victoria.

Peter, J. (1991). Waterfowl count in Victoria, February 1991. *RAOU Report* No. 79. RAOU, Moonee Ponds, Victoria.

Peter, J. (1992). Waterfowl count in Victoria, February 1992. *RAOU Report* No. 85. RAOU, Moonee Ponds, Victoria.

Price, R. (1993). 1993 *Summer Waterfowl Count*. Unpublished Report, Arthur Rylah Institute for Environmental Research, Department of Conservation and Natural Resources, Melbourne.

Purdey, D.C. and Loyn, R.H. (2008). *A report on some results of the 2008 Summer Waterfowl Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch, Department of Sustainability and Environment, Heidelberg, Victoria.

Purdey, D.C. and Loyn, R.H. (2009). *The 2009 Summer Waterbird Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch, Department of Sustainability and Environment, Heidelberg, Victoria.

Purdey, D.C. and Loyn, R.H. (2010). *The 2010 Summer Waterbird Count in Victoria*. Unpublished Report, Biodiversity and Natural Resources Branch, Department of Sustainability and Environment, Heidelberg, Victoria.

Purdey, D. and Loyn, R. (2011). *The 2011 Summer Waterbird Count in Victoria*. Arthur Rylah Institute for Environmental Research Technical Report Series No. 231. Department of Sustainability and Environment, Heidelberg, Victoria.

Purdey, D. and Loyn, R. (2013). *The 2012 Summer Waterbird Count in Victoria*. Arthur Rylah Institute for Environmental Research Technical Report Series No. 242. Department of Sustainability and Environment, Heidelberg, Victoria.

Purdey, D. and Menkhorst, P. (2014). *The 2013 Summer Waterbird Count in Victoria*. Unpublished Report to Game Victoria. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Heidelberg, Victoria.

Purdey, D. and Menkhorst, P. (2015). *Victorian Summer Waterbird Counts: 2014 and 2015*. Unpublished Report to the Ecological Policy Branch, Department of Environment, Land, Water and Planning. Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria.

Ramsey, D.S.L., and Fanson, B. (2024). Abundance estimates for game ducks in Victoria: Results from the 2023 aerial and ground surveys. Arthur Rylah Institute for Environmental Research Technical Report Series No. 376. Department of Energy, Environment and Climate Action, Heidelberg, Victoria.

Appendix 1: List of priority wetlands and assessment status

DEECA Region	Wetland Name	Latitude	Longitude	Dry	Assessed
Barwon South West	Brown Swamp	-38.27	144.13	N	✓
Barwon South West	Bryans Swamp	-37.56	142.27	Y	✓
Barwon South West	Bullrush Swamp	-37.77	142.23	N	✓
Barwon South West	Carter Swamp	-38.24	143.30	Y	✓
Barwon South West	Cundare Pool	-38.09	143.59	N	✓
Barwon South West	Deep Lake (Derrinallum)	-37.93	143.17	N	✓
Barwon South West	Deep Lake (Nerrin Nerrin)	-37.79	143.04	N	✓
Barwon South West	Eurack Swamp	-38.13	143.70	Y	✓
Barwon South West	Hospital Swamp	-38.23	144.41	N	✓
Barwon South West	Lake Balkil Narra	-38.12	143.37	Y	✓
Barwon South West	Lake Bookar	-38.13	143.12	N	✓
Barwon South West	Lake Colac	-38.30	143.59	N	✓
Barwon South West	Lake Colongulac	-38.17	143.16	N	✓
Barwon South West	Lake Connewarre	-38.23	144.45	N	✓
Barwon South West	Lake Coradgill	-38.11	143.36	N	✓
Barwon South West	Lake Elingamite	-38.35	143.01	N	✓
Barwon South West	Lake Fyans	-37.14	142.63	N	✓
Barwon South West	Lake Gherang	-38.25	144.06	N	✓
Barwon South West	Lake Kariah	-38.17	143.21	N	✓
Barwon South West	Lake Koreetnung	-38.18	143.24	N	✓
Barwon South West	Lake Lonsdale	-37.03	142.63	N	✓
Barwon South West	Lake Martin	-38.07	143.58	N	✓
Barwon South West	Lake Muirhead	-37.49	142.61	N	✓
Barwon South West	Lake Murdeduke	-38.17	143.89	N	✓
Barwon South West	Lake Punpundal	-38.13	143.37	N	✓
Barwon South West	Lake Round	-38.13	143.21	N	✓
Barwon South West	Lake Struan	-38.01	143.42	N	✓
Barwon South West	Lake Terang Goodwich	-38.12	143.37	Y	✓
Barwon South West	Lake Weering	-38.08	143.68	N	✓
Barwon South West	Lough Calvert	-38.18	143.69	Y	✓
Barwon South West	Reedy Lake (Geelong)	-38.21	144.42	N	✓
Barwon South West	Tower Hill	-38.32	142.35	N	✓
Gippsland	Blond Bay SGR	-38.01	147.52	N	✓
Gippsland	Clydebank Morass	-38.04	147.22	N	✓
Gippsland	Dowds Morass SGR	-38.14	147.23	N	✓
Gippsland	Freshwater Swamp SGR	-38.56	146.96	Y	✓
Gippsland	Heart Morass	-38.12	147.20	N	✓
Gippsland	Hollands Landing (Lagoon)	-38.06	147.45	N	✓
Gippsland	Jack Smith SGR	-38.50	147.00	Y	✓
Gippsland	Lake Coleman	-38.16	147.33	N	✓
Gippsland	Lake Corringle	-37.78	148.49	N	☒
Gippsland	Lake Curlip	-37.75	148.57	N	✓
Gippsland	Lake Kakydra	-38.07	147.20	N	✓

DEECA Region	Wetland Name	Latitude	Longitude	Dry	Assessed
Gippsland	Lake Wat Wat	-37.76	148.52	N	✓
Gippsland	Macleods Morass	-37.84	147.63	N	✓
Gippsland	Morleys Swamp	-38.09	147.44	N	✓
Gippsland	Victoria Lagoon	-38.04	147.45	N	✓
Grampians	Black Swamp (Balmoral)	-37.50	143.60	Y	✓
Grampians	Booroopki Swamp	-36.73	141.22	Y	✓
Grampians	Bradys Swamp	-37.59	142.45	N	✓
Grampians	Dock Lake	-36.77	142.30	N	✓
Grampians	Greens Swamp Wildlife Reserve	-37.00	141.78	N	✓
Grampians	Jacka Lake	-36.80	141.81	N	✓
Grampians	Lake Albacutya	-35.75	141.97	Y	✓
Grampians	Lake Batyo Catyo	-36.52	142.94	Y	✓
Grampians	Lake Bolac	-37.72	142.88	N	✓
Grampians	Lake Buninjon	-37.48	142.78	N	✓
Grampians	Lake Burrumbeet	-37.50	143.64	N	✓
Grampians	Lake Carpolac	-36.85	141.32	N	✓
Grampians	Lake Clarke	-36.87	141.86	Y	✓
Grampians	Lake Coorong	-35.73	142.40	N	✓
Grampians	Lake Goldsmith	-37.54	143.36	N	✓
Grampians	Lake Hancock	-36.55	142.92	Y	✓
Grampians	Lake Hindmarsh	-36.04	141.91	N	✓
Grampians	Lake Karnak	-36.83	141.51	Y	✓
Grampians	Lake Kennedy	-37.77	142.18	N	✓
Grampians	Lake Koynock	-36.82	141.51	Y	✓
Grampians	Lake Linlithgow	-37.75	142.22	N	✓
Grampians	Lake Natimuk	-36.70	141.94	N	✓
Grampians	Lake Turangmoroke	-37.73	142.89	N	✓
Grampians	Lake Wongan	-37.61	143.15	N	✓
Grampians	McGlashins Swamp	-37.09	141.76	N	✓
Grampians	Merin Merin Swamp	-37.23	143.80	Y	✓
Grampians	Pine Lake	-36.79	142.35	N	✓
Grampians	Toolondo Reservoir	-37.02	141.95	N	✓
Grampians	Walkers Swamp	-37.57	142.48	N	✓
Grampians	Wally Allans Swamp	-36.77	141.48	Y	✓
Grampians	Winter Lake	-36.88	141.27	Y	✓
Grampians	Yarrackigarra Swamp	-36.72	141.24	N	✓
Hume	Black Swamp (Nine Mile Creek)	-36.14	145.45	N	✓
Hume	Buffalo Dam	-36.71	146.66	N	✓
Hume	Doctors Swamp	-36.62	145.18	Y	✓
Hume	Dowdle Swamp	-36.10	146.03	Y	✓
Hume	Gaynors Swamp	-36.52	144.83	N	✓
Hume	Green Lake (north of Lake Cooper)	-36.44	144.84	N	✓
Hume	Jubilee Swamp	-36.57	145.76	Y	✓
Hume	Lake Cooper	-36.50	144.81	N	✓
Hume	Lake Moodemere	-36.05	146.39	N	✓
Hume	Lehmann Swamp	-36.56	145.61	Y	✓
Hume	Loch Garry	-36.23	145.31	N	✓
Hume	McBurney Swamp	-36.58	145.56	Y	✓

DEECA Region	Wetland Name	Latitude	Longitude	Dry	Assessed
Hume	Moodie Swamp	-36.23	145.79	N	✓
Hume	Morphett Swamp	-36.54	145.78	Y	✓
Hume	Reedy Lake (Nagambie)	-36.72	145.10	N	✓
Hume	Rowan Swamp	-36.29	145.98	Y	✓
Hume	Tungamah Swamp	-36.15	145.92	N	✓
Hume	Big Reedy Lagoon	-35.98	145.92	N	✓
Loddon Mallee	First Marsh	-35.67	143.74	N	✓
Loddon Mallee	Heywoods Lake	-34.79	143.21	N	✓
Loddon Mallee	Hird Swamp	-35.86	144.09	N	✓
Loddon Mallee	Horseshoe Bend Billabong	-34.14	142.06	N	✓
Loddon Mallee	Johnson's Swamp	-35.82	144.07	N	✓
Loddon Mallee	Lake Bael Bael	-35.69	143.74	N	✓
Loddon Mallee	Lake Boort	-36.13	143.74	N	✓
Loddon Mallee	Lake Buloke	-36.27	142.96	Y	✓
Loddon Mallee	Lake Cope Cope (Brown's Lake)	-36.46	143.03	N	✓
Loddon Mallee	Lake Cullen	-35.64	143.77	N	✓
Loddon Mallee	Lake Elizabeth	-35.70	143.82	N	✓
Loddon Mallee	Lake Gil Gil	-36.33	143.04	N	✓
Loddon Mallee	Lake Grassy (NW corner -public land component)	-36.46	143.06	Y	✓
Loddon Mallee	Lake Leaghur	-35.98	143.80	N	✓
Loddon Mallee	Lake Lyndger	-36.11	143.75	N	✓
Loddon Mallee	Lake Meran	-35.88	143.81	N	✓
Loddon Mallee	Lake Murphy	-35.81	143.87	N	✓
Loddon Mallee	Lake Nurrumbeet	-36.47	143.06	N	✓
Loddon Mallee	Lake Tutchewop	-35.51	143.75	N	✓
Loddon Mallee	Lake Wallenjoe	-36.48	144.88	N	✓
Loddon Mallee	Lake Wandella	-35.74	143.88	N	✓
Loddon Mallee	Lake Yando	-36.04	143.78	N	✓
Loddon Mallee	Little Lake Buloke	-36.32	142.95	N	✓
Loddon Mallee	Little Lake Meran	-35.85	143.81	N	✓
Loddon Mallee	Mansfield Swamp	-36.44	144.88	Y	✓
Loddon Mallee	McDonalds Swamp	-35.70	144.07	Y	✓
Loddon Mallee	Meridian Basin	-34.26	141.98	Y	✓
Loddon Mallee	Racecourse Lake	-35.61	143.79	N	✓
Loddon Mallee	Richardsons Lagoon	-36.03	144.57	N	✓
Loddon Mallee	Round Lake 1 (west of Lake Boga)	-35.47	143.61	N	✓
Loddon Mallee	Round Lake 2 (n. of Lake Meran)	-36.45	143.07	N	✓
Loddon Mallee	Second Marsh	-35.62	143.74	N	✓
Loddon Mallee	Third Marsh	-35.60	143.73	Y	✓
Loddon Mallee	Tobacco Lake	-35.86	143.80	N	✓
Loddon Mallee	Woolshed Swamp	-36.17	143.72	N	✓
Loddon Mallee	Wooroonook Lake (Church)	-36.27	143.21	N	✓
Loddon Mallee	Wooroonook Lake (Middle)	-36.27	143.20	N	✓

Appendix 2: Other wetlands surveyed

DEECA Region	Wetland Name
Barwon South West	Lake Modewarre Lake Terangpom
Grampians	Green Swamp (Near Dunkeld) – surveyed for Brolga only Kanagulk Lake
Gippsland	Nil
Hume	Lake Stewart – surveyed for Brolga only
Loddon Mallee	Lake Lookout Lake Gilmour Little Lake Bael Bael Round Lake (Cope Cope) Sandhill Lake

www.deeca.vic.gov.au

www.ari.vic.gov.au