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Studies of ibises in Victoria, II: Comparison of records of breeding between the period 1955–1956 to 1979–1980 and the period 1980–1981 to 2023–2024

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Abstract. Waterbirds across Australia are in significant decline. Aerial surveys have been used to estimate waterbird abundance, but their efficacy for estimating breeding is unclear. I collated records of ibis breeding to complement aerial survey data. These data from across Victoria between 1980–1981 and 2023–2024 are from birdwatchers, BirdLife Australia's Birdata, eBird and the Australian Waterbird Surveys databases and from the literature. Ibis were recorded breeding at 79 sites across Victoria, including 53 sites where the only ibis species to breed was Australian White Ibis *Threskiornis moluccus*, six sites where only Straw-necked Ibis *T. spinicollis* bred, and 20 sites where both these species bred. There were no breeding records for Glossy Ibis *Plegadis falcinellus* in the period 1980–1981 to 2023–2024. Records are compared with data collected >40 years ago between 1955–1956 and 1979–1980. Of the 66 sites reported previously, 50 sites had no breeding records since 1979–1980. Breeding was recorded at 63 sites not reported previously. There were 22 new sites in urban areas around Victoria, mainly used by Australian White Ibis and reflecting the expansion of breeding locations seen in other parts of Australia. The number of breeding sites compared with previously is 38% larger for Australian White Ibis and 26% fewer for Straw-necked Ibis. Because of the difficulties with counting nests, estimating the current total breeding population of ibises in Victoria is tentative but appears now to be much lower than previously reported. Straw-necked Ibis nest numbers remain approximately the same but are more concentrated in fewer colonies, especially in coastal Victoria. Australian White Ibis nest numbers appear to be significantly lower now. Both species may now be more susceptible to negative events at breeding sites, so protection of these sites and ongoing regular monitoring are increasingly important to maintain the Victorian population.

Introduction

Waterbirds are highly reliant on wetlands that are being lost at increasing rates because of floodplain development, water abstraction, pollution and climate change (Davidson 2014). Based on counts using aerial surveys (Bino *et al*. 2015, 2021), waterbirds in Australia have declined significantly since European colonisation. Although aerial surveys have been shown to be cost-effective for estimating waterbird abundance (Kingsford 1999; Kingsford & Porter 2009), their efficacy for identifying and estimating the number of waterbird breeding events is less clear (Rodgers *et al*. 2005), particularly for small sites with small numbers of nests. Other approaches to documenting waterbird breeding events remain of value, including on-ground observations by land managers, volunteers and scientists and telemetry data, and these data can complement the broader-scale data from aerial surveys.

Over 40 years ago, Cowling & Lowe (1981) collected records from field observers of ibis breeding in Victoria that showed an extension of breeding range over the period 1955–1956 to 1979–1980 for Australian White Ibis *Threskiornis moluccus* (henceforth White Ibis) and Straw-necked Ibis *T. spinicollis* and no evidence of great change in population size. Glossy Ibis *Plegadis falcinellus* breeding was rare, with only two recorded breeding attempts in that period. New ibis colonies, mostly in rural natural areas, had established as replacements for former traditional sites that were no longer suitable for breeding, most likely because of altered water regimes. This demonstrated the ability of the White Ibis in particular to opportunistically colonise new areas and adapt its nesting behaviour so that natural or human-induced water regimes and food supplies were exploited. This species also established new breeding sites in a few urban and human-dominated landscapes such as at Healesville Sanctuary and in dryland sites in exotic vegetation far from wetlands, whereas Straw-necked Ibis and Glossy Ibis showed no such expansion (Cowling & Lowe 1981). More recently, the expansion of White Ibis range and breeding into coastal and urban areas has been documented in New South Wales (NSW) and Queensland (Martin *et al*. 2007).

Ibis breeding events and locations have been relatively well studied in the Murray–Darling Basin and are the focus of significant management effort (Brandis *et al*. 2011, 2018, 2020, 2024; Bino *et al.* 2014). Recently McGinness *et al.* (2024a,b,c) have provided detailed information on the movements and habitat use of Straw-necked Ibis and White Ibis from Murray–Darling Basin breeding sites, to improve strategic management of these species. However, there is a paucity of collated information in Victoria on recent breeding events, locations and breeding numbers, with Leslie (2001) being one of the few exceptions. This paper attempts to fill this gap in knowledge.

Methods

Records of breeding by ibises in Victoria since those reported by Cowling & Lowe (1981) were obtained from the Birdata (BirdLife Australia 2024), eBird (2024) and Australian Waterbird Surveys (UNSW 2025) databases, from online literature (Google, Google Scholar, ResearchGate) searches, and targeted approaches to field observers. Location, coordinates, date, and number of nests of each species of ibis were collated for each

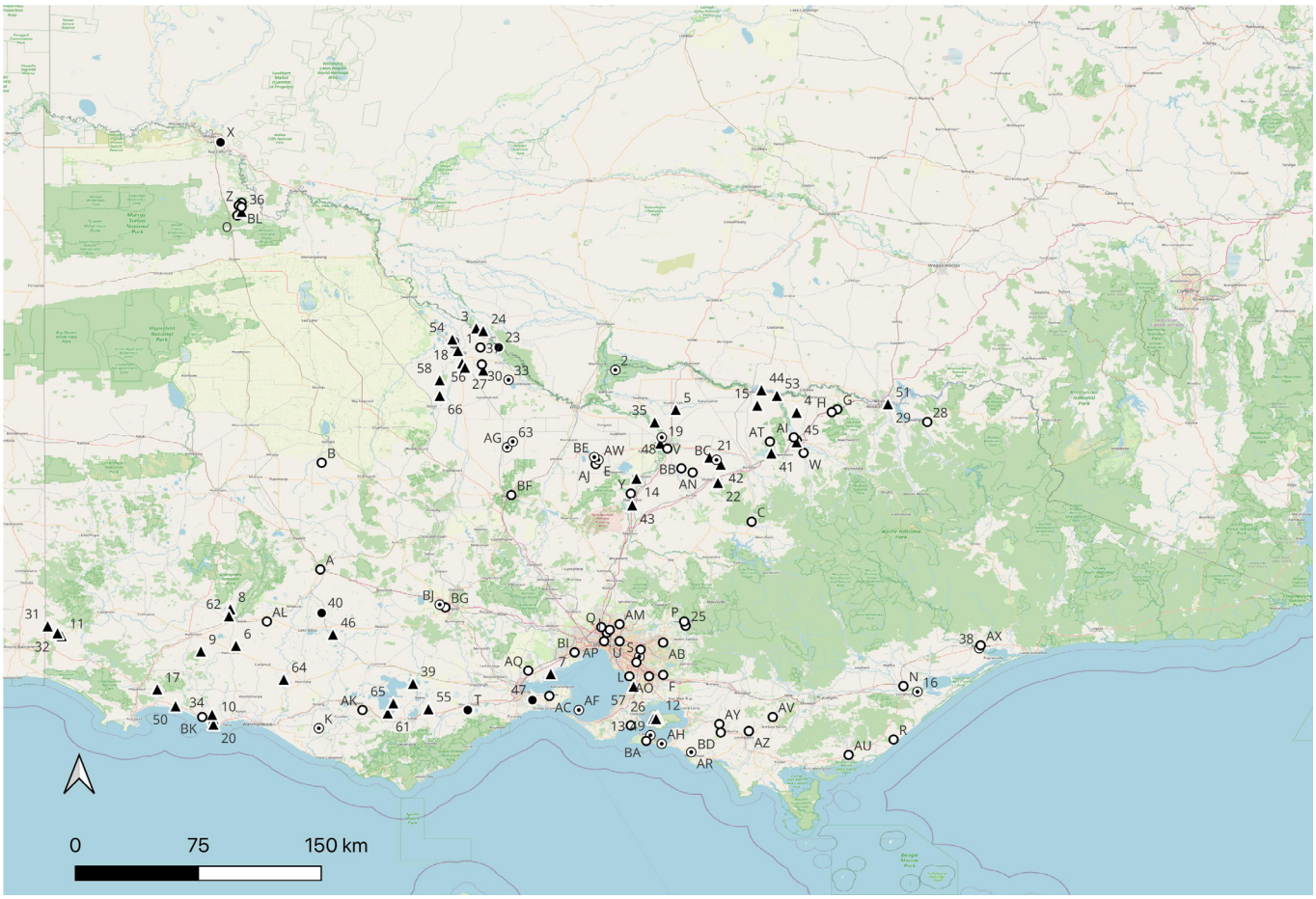

Figure 1. Location of ibis breeding sites in Victoria during the periods 1955–1956 to 1979–1980 and 1980–1981 to 2023–2024. ○ Australian White Ibis, ● Straw-necked Ibis, ⊙ both species, ▲none in 1980–1981 to 2023–2024. Site labels refer to Table 1.

breeding record. Breeding records from different parts of the same wetland or natural feature were considered to be from the same site. Breeding events were allocated to a financial year e.g. 1980–1981. These were compared with records collated by Cowling & Lowe (1981) for the period 1955–1956 to 1979–1980. Only records that had direct observation of adult birds sitting on nests were used. Records that listed only sightings of fledglings (i.e. which may include mobile chicks or juveniles) were not used as it was unclear if the birds had been raised at the site or had moved there since leaving the nest. Records of suspected (unconfirmed) breeding were also excluded. Wherever possible, nesting attempts were checked with the original observer to verify the records, including location, number of nests and dates of nesting. Land tenure of breeding sites was ascertained from land-zoning information held in VicPlan (DTP 2024). The distribution of ibises away from the breeding sites was examined using all available Birdata reports to see how this interacts with selection of breeding sites.

Results

Ibises were recorded breeding at 79 sites across Victoria since 1979–1980: 53 sites where only White Ibis bred, six sites where only Straw-necked Ibis bred, and 20 sites where both species bred (Figure 1, Table 1, Appendix 1). There was no record of breeding by Glossy Ibis during this period. Records for seven sites were provided by land-agency staff or contractors, for 49 sites by volunteer observers and for 23 sites through the Australian Waterbird Surveys program.

Of the 66 sites where breeding had been reported between 1955–1956 and 1979–1980, 50 sites have had no breeding records since 1979–1980. Known causes of this are deliberate management to discourage breeding of ibis (Healesville Fauna Park: Ross Williamson pers. comm. 2024), destruction of breeding habitat by fire (Gemmill Swamp: Don Roberts pers. comm. 2024) and redevelopment of a site for housing (Keith Turnbull Research Institute). Other causes are unknown.

At some former breeding sites, I found no published records of breeding in 1980–1981 to 2023–2024, and breeding might have ceased in the last 15 years, such as at Hird Swamp (no breeding since 2012–2013: Damien Cook pers. comm. 2024), Heifer Swamp and Clump Lagoon (no breeding since 2009–2010: Gemma Hocking pers. comm. 2024), and Vaughan Island and Wool Wool Rocks (no breeding since 2014–2015: Morley 2018).

In the period 1980–1981 to 2023–2024, breeding was recorded at 63 sites not reported previously. Only White Ibis bred at 49 of these sites, only Straw-necked Ibis at three, and both species bred at 11 sites.

There were 15 new sites in urban areas around the Melbourne region, such as Coburg Lake, Jells Park, Jack Roper Reserve and Williams Landing – almost exclusively used by White Ibis, with both species breeding at only

Table 1. Sites of ibis breeding in Victoria, between 1955 and 2024, shown in Figures 1–2. See Appendix 2 for further details of site (Site ID).

Site ID	*Site name*	*Site ID*	*Site name*	*Site ID*	*Site name*
A	Alexandra Gardens Park, Ararat	R	Jack Smith Lake	47	Reedy Swamp, Geelong
1	Back Swamp, Kerang	29	Jacob Swamp	48	Reedy Swamp, Shepparton
2	Barmah–Millewa Forest	S	Jells Park Lake	49	Rhyll Swamp
B	Batyo Catyo, Lake	30	Johnson Swamp	AN	Riggs Creek Swamp
C	Bennetts Farm Dam, Barjarg	31	Kaladbro Swamp	AO	Rivergum Creek Reserve
3	Benwell Forest, Koondrook	T	Karngun Bridges Swamp	50	Roberts property
D	Bitterang, Lake, Hattah	32	Kerr Swamp	AP	Royal Melbourne Zoo
4	Black Swamp, Boorhaman	U	Kew Golf Club Billabong	51	Ryan Island
5	Black Swamp, Shepparton	V	Kialla Lakes Shepparton	AQ	Serendip Sanctuary
6	Blackwood	W	King River Floodplain	53	Shanks Lagoon
7	Borrie, Lake	X	Kings Billabong	AR	Skip Road, Wonthaggi
8	Bryan Swamp	Y	Kirwans Bridge	AS	Springvale Botanical Cemetery
9	Buckleys Swamp	Z	Konardin Lake, Hattah	AT	Taminick
10	Burris property	AA	Koomba Park	AU	Tarra River Lagoon
E	Carag Carag	33	Kow Swamp	AV	Thorpdale
F	Cardinia Creek Parklands North	AB	Kuranga Native Nursery	55	Thurrambong, Lake
G	Chiltern	34	Leskes Duck Holes	56	Tragowel Swamp
H	Chiltern–Mt Pilot National Park	35	Loch Garry	57	Turnbull Research Institute
11	Church Swamp	36	Lockie, Lake	58	Twelve Mile Creek
12	Clump Lagoon	AC	Lorne, Lake	59	Two Mile Swamp
J	Coburg Lake Reserve	38	MacLeod Morass	AW	Two Tree Swamp
13	Coolart Lagoon	39	Martin, Lake	60	Undrained swamp
14	Doctors Swamp, Murchison	37	McDonald Swamp	AX	Unnamed wetland, Bairnsdale
16	Dowd Morass	AD	Merriwa Park, Wangaratta	AY	Unnamed wetland, Jeetho
15	Dowdle Swamp	40	Mininera, Lake	AZ	Unnamed wetland, Leongatha
K	Ecklin South Swamp	41	Mokoan, Lake (Winton Wetlands)	BA	Unnamed wetland, Phillip Island
L	Edithvale–Seaford Wetlands	42	Morphetts Swamp, Violet Town	BB	Unnamed wetland, Tamleugh
M	Edwardes Lake	AE	Mt Evelyn Garden Centre	BC	Unnamed wetland, Upotipotpon
17	Ettrick Swamp	AF	Mud Islands	BD	Unnamed wetland, Whitelaw
19	Gemmill Swamp, Shepparton	43	Muller Swamp, Nagambie	61	Vaughan Island
20	Goose Lagoon	44	Mulwala, Lake	BE	Wallenjoe Swamp
21	Gowangardie	AG	Myers Creek Swamp	62	Wannon River
22	Greens property	46	Nerrin Nerrin	BF	Weeroona, Lake, Bendigo
23	Gunbower Forest	AH	Newhaven Swamp	BG	Wendouree, Lake, Ballarat
N	Guthridge, Lake, Sale	45	Nine Mile Creek, Wangaratta	BH	Wilkur Creek Lagoon
24	Gutteram Swamp	AI	One Mile Creek Path, Wangaratta	BI	Williams Landing
O	Hattah, Lake	AJ	One Tree Swamp	63	Winghee Swamp
25	Healesville Fauna Park	AK	Purrumbete, Lake	BJ	Winter Swamp
P	Healesville Hotel	AL	Railway Dam, Glenthompson	65	Wool Wool Rocks
26	Heifer Swamp	AM	Redleap Reserve	64	Woolongoon, Mortlake
27	Hird Swamp	18	Reedy (First) Lake, Kerang	BK	Yambuk
28	Hume Reservoir, Mitta Mitta Arm	52	Reedy (Middle) Lake, Kerang	66	Yando Lake
Q	Jack Roper Reserve	54	Reedy (Third) Lake, Kerang	BL	Yelwell Lake, Hattah

two sites and with few Straw-necked Ibis nests. New breeding sites were established by White Ibis in urban areas in several regional cities, including Ararat, Ballarat, Bendigo, Sale, Wangaratta (three sites) and Shepparton. Most nesting sites were on islands or in wetland vegetation surrounded by water but unusually were also sometimes away from water, in eucalypts (Karngun Bridges) and pine trees (Yambuk).

New sites were sometimes within 50 km of sites where breeding was no longer recorded. Examples include at Mud Islands (breeding) and Heifer Swamp and Clump Lagoon (no more breeding); and Lake Purrumbete and Ecklin South Swamp (breeding) and Vaughan Island and Wool Wool Rocks (no more breeding).

The distribution of breeding sites across Victoria was similar between the two periods. In both cases there were large areas of Victoria where breeding was not recorded (Figures 1–2), including in the north and west of the state away from the Murray River and associated wetlands, and the elevated and forested country in the east. The land with breeding sites in this study was managed by the State Government (48%), was private land (33%) or was managed by Local Government (19%). In the previous study (Cowling & Lowe 1981), it was managed by State Government (86%), was private land (14%) or was managed by Local Government (0%).

Breeding at each site was usually irregular and not recorded in all years – ranging from one to 36 sites per year (Table 2). Between 1980–1981 and 2017–2018, there were <10 records in any year. From 2018–2019 the numbers of records per year varied from 12 to 36 records.

Overall, considering year × site combinations, there were 263 records of breeding by at least one ibis species in 1980–1981 to 2023–2024 (Appendix 2). When breeding occurred, there were more breeding records of White Ibis (235 records at 83 sites) than Straw-necked Ibis (75 records at 27 sites). There were 59 records, from 20 sites, where both species bred. Only Straw-necked Ibis bred on 15 occasions, at 10 sites, and only White Ibis on 177 occasions, at 75 sites.

The sites with the most records of breeding were Coolart Lagoon (41), Rhyll Swamp (20), Reedy (First) Lake (13) and Reedy (Middle) Lake (Kerang) (11). Since 2017–2018 (when the most records occurred), some sites had breeding in most years: it was recorded in six of 6 years at Coburg Lake, Jack Roper Reserve (Broadmeadows) and Reedy (First) Lake (Kerang); five of 6 years at Coolart Lagoon, Jells Park, Reedy Swamp (Geelong), Skip Road (Wonthaggi) and Rhyll Swamp; and four of 6 years at Barmah–Millewa, Kew Golf Club, MacLeod Morass and Reedy (Middle) Lake (Kerang).

The largest number of nests recorded in this study was at Mud Islands (56,166 Straw-necked Ibis), Reedy (Middle) Lake (Kerang) (26,600 of each species), Mud Islands (7616 White Ibis), Reedy (Middle) Lake (Kerang) (6400 Straw-necked Ibis), Lake Mininera (6000 Straw-necked Ibis) and MacLeod Morass (5000 Straw-necked Ibis) (Appendix 2).

Numbers nesting at some sites were lower in this study period than they were in 1955–1956 to 1979–1980, e.g. Rhyll Swamp, Coolart Lagoon, Reedy Swamp (Geelong), Reedy Swamp (Shepparton) and Dowd Morass. These had new sites nearby such as Newhaven Swamp, Skip Road (Wonthaggi), Mud Islands, and Lake Guthridge. By contrast, nesting numbers were higher at Reedy (Middle) Lake (Kerang), Barmah–Millewa, MacLeod Morass and Lake Mininera than previously.

The only breeding of Straw-necked Ibis recorded in the Melbourne metropolitan region was at Jells Park in 2021–2022 (two nests) and in 2022–2023 (one nest).

Discussion

The development of digital technology since the previous study (Cowling & Lowe 1981) has made the accessibility of field observations much more efficient than previous methods, such as letters and telephone calls, that were used by Cowling & Lowe (1981). The use by citizen scientists of online databases and mobile applications has greatly enhanced the knowledge base of biological information. The records for ibis breeding in this period are only those available through the sources described in the methods section.

The total number of breeding sites recorded in Victoria between 1955–1956 and 2023–2024 is 129. The number used by White Ibis is now 38% larger (73 vs 53) than reported in 1981 (Cowling & Lowe 1981) and by Straw-necked Ibis is 26% fewer (26 vs 35). Numbers of nests were lower at some sites than previously recorded but higher at nearby sites, suggesting a local movement of breeding. The most notable change is the new breeding site at Mud Islands, which is now the biggest colony in Victoria (Menkhorst 2010), whereas the previously reported largest site at Hird Swamp had no nesting in the past 12 years (and nesting is alternating between Reedy Lake sites and Kow Swamp in the same region: Damien Cook pers. comm. 2024) albeit with lower numbers of nests than in 1979–1980. Another prominent change is White Ibis establishing many new sites in urban areas in Melbourne (Figure 2) and regional cities, which is equivalent to the increase in number of their sites.

The distribution of ibis breeding across Victoria is broadly similar in both studies, with most breeding sites along the Murray River and on the Southern Volcanic Plain and Southern Coastal Plain (DCCEEW 2025). However, there is a noticeable retraction of breeding colonies into fewer sites in each region. The exception is the proliferation of sites around Melbourne and regional centres.

There was a concentration of sites no longer used for breeding in the south-west (18 out of 25) and north-central (23 of 49) regions of Victoria. In the south-west, this has resulted in a large decrease in nests of both Straw-necked Ibis and White Ibis, with no known local replacement sites. Consideration should be given to environmental watering for ibis in this region along the lines suggested by McGinness *et al.* (2024b). In the north-central region, the loss of breeding is associated with concentration of breeding by both species at fewer sites around Kerang and Barmah–Millewa, perhaps associated with concentration of environmental watering at a few sites. Further comment on this is provided below.

Large areas continue not to be used for breeding, such as in the Wimmera, in the Mallee away from the Murray River and associated wetlands, and in the elevated and forested

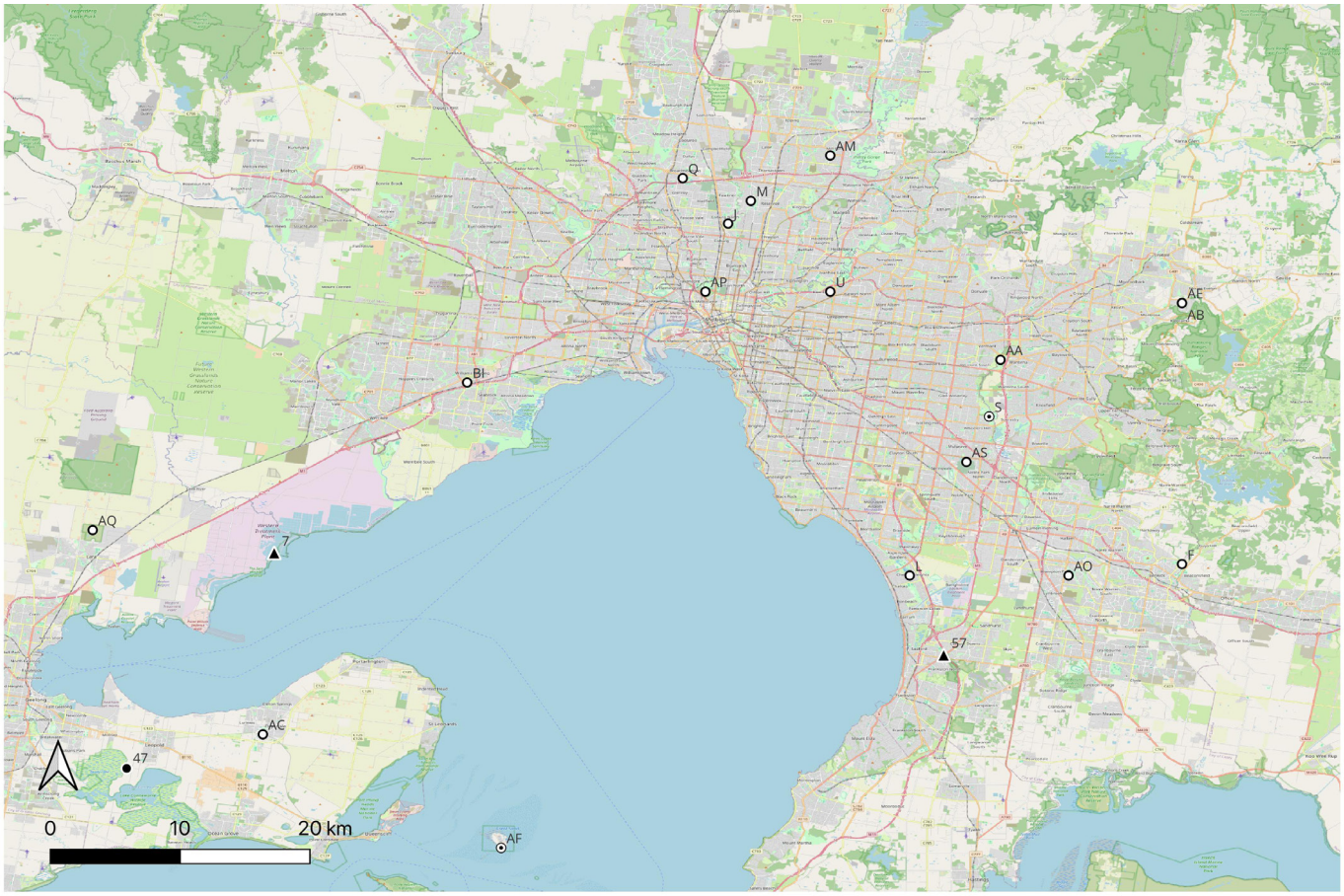

Figure 2. Location of ibis breeding sites in the Melbourne region during the periods 1955–1956 to 1979–1980 and 1980–1981 to 2023–2024. ○ Australian White Ibis, ● Straw-necked Ibis, ⊙ both species, ▲ none in 1980–1981 to 2023–2024. Site labels refer to Table 1.

country in the east (Figure 1). These regions also had fewer ibis observed than in the rest of the state, with reporting rates of White Ibis in natural resource management regions during the study of 0.5–2% in the Wimmera, and 2.5–10% in East Gippsland, compared with 12–30% in Port Phillip and Westernport and 8–20% in West Gippsland (BirdLife Australia 2024). Common movement routes revealed by satellite tracking of Straw-necked Ibis show that these non-breeding regions are rarely used by White Ibis and Straw-necked Ibis compared with areas between the common breeding sites (McGinness *et al.* 2024a,b,c). These areas are being avoided for breeding, feeding and transit.

The results of this study show that 76% of the sites reported in 1981 were not used for breeding during the current study period. Reasons for this include population control of birds and destruction of breeding habitat from a variety of causes, including destruction by fire, saline intrusion and its effects on nesting vegetation (Boon *et al.* 2008), land redevelopment and lack of water (Brandis *et al.* 2018).

The period between studies includes the Millennium Drought (1997–2009), during which many of the breeding sites had no or little water and so were unsuitable for nesting because of their accessibility to ground predators and poor feeding conditions. Some of these sites might have remained unsuitable after the drought ended because of low water flows and saline intrusion, and their effects on nesting vegetation, such as at Dowd Morass, Heifer Swamp, and Black Swamp (Boorhaman).

Counts of White Ibis at Coolart Lagoon have been made every year from 1961 to the present (Brian Thomas pers. comm. 2024). Between 1987–1988 and 2017–2018, they illustrate the impact of this drought on ibis breeding. Number of nests up to 1996–1997 was stable at a mean of ~450, followed by no breeding in eight of the 14 years up to 2010–2011, and a mean of ~40 nests between 2011–2012 and 2023–2024 (Brian Thomas pers. comm. 2024). This suggests that the population there perished or moved away or both during the drought. The period after 2010–2011 broadly coincides with the first records of White Ibis breeding at new sites from 2016–2017, especially around Melbourne. It is impossible to know whether birds at the new colonies were mature or juvenile birds that had moved from elsewhere. This pattern might have been repeated at other sites. Tracking White Ibis in Victoria with radio-transmitters would be a way to better understand these patterns.

The establishment of breeding at Mud Islands in the early 1990s (Menkhorst 2010) and subsequent increase in the numbers of nests up to the current numbers indicate a possible shift of the population from other sites such as Coolart, Reedy Swamp (Geelong), Heifer Swamp and Clump Lagoon. Counts of Straw-necked Ibis in Westernport away from breeding sites showed a large increase in the population from 1999 to 2003 (Loyn *et al.* 2018), indicating possible movement of birds from a wider region and suggesting that the area was a drought refuge. This could coincide with the cessation of breeding by Straw-necked Ibis at former large colonies at Wool Wool Rocks and in northern Victoria.

Table 2. The number of sites where White Ibis and/or Straw-necked Ibis were recorded breeding in each year of this study.

Year	*Total sites*	*Year*	*Total sites*
1980–1981	0	2002–2003	2
1981–1982	2	2003–2004	3
1982–1983	3	2004–2005	4
1983–1984	2	2005–2006	2
1984–1985	2	2006–2007	5
1985–1986	3	2007–2008	2
1986–1987	3	2008–2009	4
1987–1988	1	2009–2010	3
1988–1989	5	2010–2011	5
1989–1990	8	2011–2012	5
1990–1991	2	2012–2013	8
1991–1992	2	2013–2014	6
1992–1993	4	2014–2015	5
1993–1994	7	2015–2016	2
1994–1995	5	2016–2017	9
1995–1996	2	2017–2018	8
1996–1097	2	2018–2019	12
1997–1998	2	2019–2020	14
1998–1999	1	2020–2021	17
1999–2000	2	2021–2022	23
2000–2001	3	2022–2023	36
2001–2002	2	2023–2024	19

The sites that have persisted were on major irrigation systems [e.g. the Reedy Lakes (Kerang) and Kow Swamp], were near the coast (Rhyll Swamp and Coolart Lagoon) with more reliable rainfall, were associated with high-flow rivers south of the Great Dividing Range [e.g. Dowd Morass, MacLeod Morass, Reedy Swamp (Geelong)], or in urban areas fed by run-off from housing. These sites also had regular breeding.

There were 14 new sites in urban areas around the Melbourne region and eight new sites in regional cities, reflecting the expansion of breeding locations seen in other parts of Australia, including Sydney, NSW, and Brisbane, Queensland (Martin *et al*. 2007, 2010). These are relatively small colonies with up to ~200 nests in any year and are almost exclusively of White Ibis. This is also presumably a post-drought phenomenon using more reliable conditions for feeding and breeding. Establishment of these sites might not have occurred until 2016–2017 when breeding was first reported at Jells Park, Springvale Cemetery and Taminick, and then at Jack Roper Reserve in 2018–2019 and Cardinia Creek Reserve in 2020–2021. This apparent plasticity in the behaviour of the White Ibis is also seen in its use of other novel breeding habitats such as in *Eucalyptus* and pine trees. Counts of the maximum number of White Ibis nests in the same year at sites in the Melbourne region provide an estimate of the total breeding population there. The maximum number was 1515 nests in 2022–2023. By comparison, the maximum number of nests at breeding sites around Sydney was 1265 in 2008–2009 (Martin *et al.* 2010).

There is now a greater proportion of breeding sites on land managed by Local Government and private land and a lower proportion on land managed by the State Government than in the previous study (Cowling & Lowe 1981). Local Government and privately managed land has a broader range of uses than does State Government land, and so there may be a higher risk that breeding success can be compromised by conflicting demands. This has resulted in attempted or proposed population-reduction measures at Coburg Lake (Merri-bek City Council 2024), Redleap Reserve (Whittlesea Council 2024) and Springvale Botanical Cemetery (Helen Tuton pers. comm. 2024) because of the perceived pest status of the birds. There is little recognition that these are probably replacement sites for the former rural 'natural' sites affected by the drought and are maintaining the reduced post-drought population.

Environmental watering has become more widespread since the study of Cowling & Lowe (1981), and evidence shows that it is supporting waterbird numbers and diversity and providing habitat and breeding opportunities to protect waterbirds and help them recover (DELWP 2021). The results of watering in wetlands along the Murray River show a high diversity and abundance of waterbirds moving into watered sites, increasing habitat and breeding (DELWP 2021). However, although ibis breeding has been recorded in response to environmental watering at sites such as Hattah Lakes and Barmah–Millewa, other sites such as Johnson Swamp, Hird Swamp, McDonald Swamp and Gunbower Forest show little evidence of ibis breeding so far (Cook & Brown 2023). Many other factors influence breeding, e.g. some species need specific vegetation and water conditions in the breeding site together with large nearby foraging areas in good condition to encourage them to nest, and this is difficult to improve when only a limited area can be watered (DELWP 2021; McGinness *et al.* 2024a,b).

Numbers of nests were often not reported in the citizen-science databases and descriptors such as 'a few', 'many', and 'huge numbers' were used. Accurate numbers of nests at some other sites could not be determined because of difficulty of observers accessing and viewing the breeding sites because of site restrictions, which makes the records there less accurate and probably underestimates. Very few records were provided by the responsible land managers, with nearly all coming from volunteer observers, and are therefore also subject to this issue of accuracy because sites cannot be accessed.

Because of difficulties counting nests at most sites, even when access is available, estimating the current total breeding population of ibises in Victoria must be treated as approximate and tentative. The maximum number of nests recorded in any year was 7716 White Ibis and 56,166 Straw-necked Ibis in 2009–2010; 6800 White Ibis and 56,500 Straw-necked Ibis in 2016–2017; 27,075 White Ibis and 26,600 Straw-necked Ibis in 2010–2011; and 5320 White Ibis and 12,096 Straw-necked Ibis in 2021–2022. This compares with totals in 1979–1980 of 33,000 White Ibis and 76,000 Straw-necked Ibis nests.

Despite observations that White Ibis populations have significantly increased along the eastern Australian

seaboard and that they are now urban pests or are less likely to be affected by reduced flooding of rivers with regulation (Martin *et al*. 2007; Brandis *et al.* 2011), the breeding population in Victoria of White Ibis is much lower than previously reported and caution should be adopted in mounting population-control programs in urban areas. Straw-necked Ibis numbers approximate previous numbers but the birds are more concentrated in fewer colonies, especially in coastal Victoria, which means that Straw-necked Ibis may now be more susceptible to one-off negative events at breeding sites. Protection of these few sites and ongoing regular monitoring are more important than ever for the Victorian population.

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Appendix 1. Sites where ibis were recorded breeding in Victoria in the periods 1955–1956 to 1979–1980 and 1980–1981 to 2023–2024. Site ID refers to Figure 1; letters refer to new sites (1980–1981 to 2023–2024), numbers refer to sites recorded in previous study (1955–1956 to 1979–1980: Cowling & Lowe 1981). Tenure refers to land ownership (L = Local Government, P = private land, S = State Government). AWI = Australian White Ibis, SNI = Straw-necked Ibis.

Site ID	*Site name*	*Latitude*	*Longitude*	*1955–1956 to 1979–1980*	*1980–1981 to 2023–2024*	*Tenure*
A	Alexandra Gardens Park, Ararat	–37.28	142.93		AWI	P
1	Back Swamp, Kerang	–35.72	143.91	Ibis species		S
2	Barmah–Millewa Forest	–35.86	145.03	Both	Both	S
B	Batyo Catyo, Lake	–36.52	142.94		AWI	S
C	Bennetts Farm Dam, Barjarg	–36.94	146.00		AWI	L
3	Benwell Forest, Koondrook	–35.56	144.04	AWI		S
D	Bitterang, Lake, Hattah	–34.67	142.37		AWI	P
4	Black Swamp, Boorhaman	–36.16	146.32	Both		S
5	Black Swamp, Shepparton	–36.14	145.46	AWI		S
6	Blackwood	–37.82	142.33	AWI		P
7	Borrie, Lake	–38.02	144.57	Both		S
8	Bryan Swamp	–37.56	142.29	Both		S
9	Buckleys Swamp	–37.86	142.08	AWI		S
10	Burris property	–38.34	142.17	AWI		P
E	Carag Carag	–36.49	144.90		SNI	P
F	Cardinia Creek Parklands North	–38.03	145.37		AWI	L
G	Chiltern	–36.14	146.61		AWI	P
H	Chiltern–Mt Pilot National Park	–36.16	146.57		AWI	S
11	Church Swamp	–37.75	141.09	Ibis species		S
12	Clump Lagoon	–38.33	145.33	Both		S
J	Coburg Lake Reserve	–37.73	144.97		AWI	L
13	Coolart Lagoon	–38.39	145.14	AWI	AWI	S
14	Doctors Swamp, Murchison	–36.63	145.18	AWI		S
16	Dowd Morass	–38.15	147.18	Both	Both	S
15	Dowdle Swamp	–36.11	146.04	Both		S
K	Ecklin South Swamp	–38.41	142.92		Both	S
L	Edithvale–Seaford Wetlands	–38.04	145.13		AWI	L
M	Edwardes Lake	–37.71	144.99		AWI	L
17	Ettrick Swamp	–38.13	141.77	Both		S
19	Gemmill Swamp, Shepparton	–36.38	145.35	Both		S
20	Goose Lagoon	–38.38	142.17	Both		S
21	Gowangardie	–36.48	145.70	AWI		P
22	Greens property	–36.66	145.76	AWI		P
23	Gunbower Forest	–35.70	144.20	Both	SNI	S
N	Guthridge, Lake, Sale	–38.11	147.08		AWI	L
24	Gutteram Swamp	–35.58	144.09	AWI		S
O	Hattah, Lake	–34.76	142.34		AWI	S
25	Healesville Fauna Park	–37.68	145.53	AWI	AWI	S
P	Healesville Hotel	–37.65	145.52		AWI	P
26	Heifer Swamp	–38.34	145.30	Both		S
27	Hird Swamp	–35.86	144.09	3 species		S
28	Hume Reservoir, Mitta Mitta Arm	–36.23	147.25	Both	AWI	S
Q	Jack Roper Reserve	–37.69	144.93		AWI	L

Appendix 1 continued

Site ID	*Site name*	*Latitude*	*Longitude*	*1955–1956 to 1979–1980*	*1980–1981 to 2023–2024*	*Tenure*
R	Jack Smith Lake	–38.49	147.01		AWI	S
29	Jacob Swamp	–36.10	146.97	Both		S
S	Jells Park Lake	–37.90	145.20		Both	S
30	Johnson Swamp	–35.82	144.08	Ibis species	AWI	S
31	Kaladbro Swamp	–37.68	140.99	Both		S
T	Karngun Bridges Swamp	–38.28	143.98		SNI	L
32	Kerr Swamp	–37.73	141.06	Ibis species		S
U	Kew Golf Club Billabong	–37.79	145.06		AWI	P
V	Kialla Lakes Shepparton	–36.42	145.40		AWI	P
W	King River Floodplain	–36.45	146.37		AWI	P
X	Kings Billabong	–34.24	142.22		SNI	S
Y	Kirwans Bridge	–36.74	145.14		AWI	S
Z	Konardin Lake, Hattah	–34.69	142.35		AWI	S
AA	Koomba Park	–37.85	145.21		AWI	S
33	Kow Swamp	-35.93	144.27	Both	Both	S
AB	Kuranga Native Nursery	–37.80	145.37		AWI	P
34	Leskes Duck Holes	–38.31	142.16	Ibis species		P
35	Loch Garry	–36.23	145.31	Both		S
36	Lockie, Lake	–34.73	142.37	AWI		S
AC	Lorne, Lake	–38.18	144.56		AWI	L
38	MacLeod Morass	–37.84	147.62	Both	Both	S
39	Martin, Lake	–38.09	143.59	Both		S
37	McDonald Swamp	–35.70	144.07	Ibis species	AWI	S
AD	Merriwa Park, Wangaratta	–36.36	146.32		AWI	L
40	Mininera, Lake	–37.59	142.94	Both	SNI	P
41	Mokoan, Lake (Winton Wetlands)	–36.45	146.14	Both		S
42	Morphetts Swamp, Violet Town	–36.53	145.78	Both		S
AE	Mt Evelyn Garden Centre	–37.80	145.37		AWI	P
AF	Mud Islands	–38.28	144.77		Both	S
43	Muller Swamp, Nagambie	–36.82	145.15	AWI		S
44	Mulwala, Lake	–36.00	146.07	Both		S
AG	Myers Creek Swamp	–36.41	144.26		Both	S
46	Nerrin Nerrin	–37.74	143.02	Both		S
AH	Newhaven Swamp	–38.52	145.36		Both	S
45	Nine Mile Creek, Wangaratta	–36.37	146.32	AWI		S
AI	One Mile Creek Path, Wangaratta	–36.34	146.30		AWI	L
AJ	One Tree Swamp	–36.53	144.89		AWI	S
AK	Purrumbete, Lake	–38.28	143.23		AWI	S
AL	Railway Dam, Glenthompson	–37.65	142.55		AWI	P
AM	Redleap Reserve	–37.67	145.06		AWI	L
18	Reedy (First) Lake, Kerang	–35.67	143.88	Both	Both	S
52	Reedy (Middle) Lake, Kerang	–35.66	143.88	Both	Both	S
54	Reedy (Third) Lake, Kerang	–35.64	143.87	AWI		S
47	Reedy Swamp, Geelong	–38.21	144.44	Both	SNI	S

Appendix 1 continued

Site ID	*Site name*	*Latitude*	*Longitude*	*1955–1956 to 1979–1980*	*1980–1981 to 2023–2024*	*Tenure*
48	Reedy Swamp, Shepparton	–36.34	145.36	AWI	Both	S
49	Rhyll Swamp	–38.46	145.28	Both	Both	S
AN	Riggs Creek Swamp	–36.59	145.58		AWI	P
AO	Rivergum Creek Reserve	–38.04	145.27		AWI	L
50	Roberts property	–38.25	141.90	AWI		P
AP	Royal Melbourne Zoo	–37.79	144.95		AWI	S
51	Ryan Island	–36.10	146.97	Both		S
AQ	Serendip Sanctuary	–38.0	144.41		AWI	S
53	Shanks Lagoon	–36.04	146.18	Both		S
AR	Skip Road, Wonthaggi	–38.58	145.57		Both	P
AS	Springvale Botanical Cemetery	–37.94	145.18		AWI	S
AT	Taminick	–36.37	146.I3		AWI	P
AU	Tarra River Lagoon	–38.60	146.69		AWI	S
AV	Thorpdale	–38.33	146.15		AWI	P
55	Thurrambong, Lake	–38.27	143.70	SNI		S
56	Tragowel Swamp	–35.81	143.94	3 species		S
57	Turnbull Research Institute	–38.11	145.16	AWI		S
58	Twelve Mile Creek	–35.93	143.78	Ibis species		S
59	Two Mile Swamp	–35.84	143.96	Ibis species		S
AW	Two Tree Swamp	–36.50	144.91		Both	S
60	Undrained swamp	–38.34	145.32	AWI		S
AX	Unnamed wetland, Bairnsdale	–37.82	147.63		AWI	P
AY	Unnamed wetland, Jeetho	–38.38	145.77		AWI	P
AZ	Unnamed wetland, Leongatha	–38.43	145.98		Both	P
BA	Unnamed wetland, Phillip Island	–38.50	145.25		AWI	P
BB	Unnamed wetland, Tamleugh	–36.56	145.50		AWI	P
BC	Unnamed wetland, Upotipotpon	–36.50	145.75		Both	P
BD	Unnamed wetland, Whitelaw	–38.44	145.78		AWI	P
61	Vaughan Island	–38.30	143.41	Both		S
BE	Wallenjoe Swamp	–36.48	144.88		Both	S
62	Wannon River	–37.61	142.28	SNI		S
BF	Weeroona, Lake, Bendigo	–36.75	144.29		AWI	L
BG	Wendouree, Lake, Ballarat	–37.55	143.82		AWI	L
BH	Wilkur Creek Lagoon	–38.43	145.98		AWI	P
BI	Williams Landing	–37.87	144.74		AWI	P
63	Winghee Swamp	–36.37	144.30	SNI	Both	S
BJ	Winter Swamp	–37.53	143.78		Both	S
65	Wool Wool Rocks	–38.23	143.45	Both		S
64	Woolongoon, Mortlake	–38.06	142.67	SNI		P
BK	Yambuk	–38.33	142.09		AWI	P
66	Yando Lake	–36.04	143.78	SNI		S
BL	Yelwell Lake, Hattah	–34.70	142.37		AWI	S

Appendix 2. Detailed records of annual breeding for ibises in Victoria in the period 1980–1981 to 2023–2024. Year of record and maximum number of nests – blank refers to no records. Rd = Road. AWI = Australian White Ibis, SNI= Straw-necked Ibis.

Site name	*Year of record*	*Maximum no. nests AWI*	*Maximum no. nests SNI*	*Source*	*Personal communications and location details*
Alexandra Gardens Park, Ararat	2022–2023	26	0	eBird (2024)	
Alexandra Gardens Park. Ararat	2023–2024	40	0	eBird (2024)	
Back Swamp, Kerang					
Balyang Sanctuary	2006–3007	Some		eBird (2024)	
Barmah–Millewa Forest	2012–2013	222	778	UNSW (2025)	
Barmah–Millewa Forest	2014–2015	220		UNSW (2025)	
Barmah–Millewa Forest	2016–2017	150	50	UNSW (2025)	
Barmah–Millewa Forest	2018–2019	30		GB CMA (2023)	
Barmah–Millewa Forest	2020–2021	325	~100	GB CMA (2023)	
Barmah–Millewa Forest	2021–2022	569	324	GB CMA (2023)	
Barmah–Millewa Forest	2022–2023	3000. Both species		GB CMA (2023)	
Batyo Catyo, Lake	1994–1995	20		UNSW (2025)	
Bennetts Farm Dam, Barjarg	2020–2021	27		eBird (2024)	
Benwell Forest, Koondrook					
Bitterang, Lake Hattah	2022–2023	9	0	GHD (2023)	
Black Swamp, Boorhaman		0	0	Dan Pendavingh	No breeding both species last 15 years. Pers. comm. 2024
Black Swamp, Shepparton					
Blackwood					
Borrie, Lake					
Bryan Swamp					
Buckley's Swamp					
Burris property					
Carag Carag	2022–2023	0	1	eBird (2024)	Grinter Rd
Cardinia Creek Parklands North	2020–2021	3	0	eBird (2024)	
Cardinia Creek Parklands North	2023–2024	3	0	eBird (2024)	
Chiltern	2022–2023	2	0	BirdLife Australia (2024)	Dooley Property, Chiltern–Howlong Rd
Chiltern-Mt Pilot National Park	1988–1989	40		eBird (2024)	
Chiltern-Mt Pilot National Park	2015–2016	20		eBird (2024)	
Church Swamp					
Clump Lagoon		0	0	Gemma Hocking	No breeding both species last 15 years. Pers. comm. 2024
Coburg Lake Reserve	2018–2019	50		eBird (2024)	
Coburg Lake Reserve	2019–2020	30		eBird (2024)	
Coburg Lake Reserve	2020–2021	150		eBird (2024)	

Appendix 2 continued

Site name	*Year of record*	*Maximum no. nests AWI*	*Maximum no. nests SNI*	*Source*	*Personal communications and location details*
Coburg Lake Reserve	2021–2022	200		eBird (2024)	
Coburg Lake Reserve	2022–2023	150		eBird (2024)	
Coburg Lake Reserve	2023–2024	300		eBird (2024)	
Coolart Lagoon	1982–1983	70	0	BirdLife Australia (2024)	
Coolart Lagoon	1983–1984	0	0	BirdLife Australia (2024)	
Coolart Lagoon	1984–1985	0	0	BirdLife Australia (2024)	
Coolart Lagoon	1985–1986	Some	0	BirdLife Australia (2024)	
Coolart Lagoon	1986–1987	Some	0	BirdLife Australia (2024)	
Coolart Lagoon	1987–1988	380	0	BirdLife Australia (2024)	
Coolart Lagoon	1988–1989	450	0	BirdLife Australia (2024)	
Coolart Lagoon	1989–1990	450	0	BirdLife Australia (2024)	
Coolart Lagoon	1990–1991	330	0	BirdLife Australia (2024)	
Coolart Lagoon	1991–1992	400	0	BirdLife Australia (2024)	
Coolart Lagoon	1992–1993	550	0	BirdLife Australia (2024)	
Coolart Lagoon	1993–1994	430	0	BirdLife Australia (2024)	
Coolart Lagoon	1994–1995	265	0	BirdLife Australia (2024)	
Coolart Lagoon	1995–1996	525	0	BirdLife Australia (2024)	
Coolart Lagoon	1996–1997	480	0	BirdLife Australia (2024)	
Coolart Lagoon	1997–1998	15	0	BirdLife Australia (2024)	
Coolart Lagoon	1998–1999	0	0	BirdLife Australia (2024)	
Coolart Lagoon	1999–2000	0	0	BirdLife Australia (2024)	
Coolart Lagoon	2000–2001	0	0	BirdLife Australia (2024)	
Coolart Lagoon	2001–2002	190	0	BirdLife Australia (2024)	
Coolart Lagoon	2002–2003	45	0	BirdLife Australia (2024)	
Coolart Lagoon	2003–2904	0	0	BirdLife Australia (2024)	
Coolart Lagoon	2004–2005	120	0	BirdLife Australia (2024)	
Coolart Lagoon	2005–2006	110	0	BirdLife Australia (2024)	
Coolart Lagoon	2006–2007	40	0	BirdLife Australia (2024)	
Coolart Lagoon	2007–2008	0	0	BirdLife Australia (2024)	
Coolart Lagoon	2008–2009	0	0	BirdLife Australia (2024)	
Coolart Lagoon	2009–2010	0	0	BirdLife Australia (2024)	
Coolart Lagoon	2010–2011	0	0	BirdLife Australia (2024)	
Coolart Lagoon	2011–2012	30	0	BirdLife Australia (2024)	
Coolart Lagoon	2012–2013	85	0	BirdLife Australia (2024)	
Coolart Lagoon	2013–2014	35	0	BirdLife Australia (2024)	
Coolart Lagoon	2014–2015	130	0	BirdLife Australia (2024)	
Coolart Lagoon	2015–2016	25	0	BirdLife Australia (2024)	
Coolart Lagoon	2016–2017	40	0	BirdLife Australia (2024)	
Coolart Lagoon	2017–2018	15	0	BirdLife Australia (2024)	
Coolart Lagoon	2018–2019	14	0	BirdLife Australia (2024)	
Coolart Lagoon	2019–2020	22	0	BirdLife Australia (2024)	
Coolart Lagoon	2020–2021	25	0	BirdLife Australia (2024)	

Appendix 2 continued

Site name	*Year of record*	*Maximum no. nests AWI*	*Maximum no. nests SNI*	*Source*	*Personal communications and location details*
Coolart Lagoon	2022–2023	32	0	BirdLife Australia (2024)	
Coolart Lagoon	2023–2024	37	0	BirdLife Australia (2024)	
Doctors Swamp, Murchison	1989–1990	46		UNSW (2025)	
Doctors Swamp, Murchison	1993–1994	66		UNSW (2025)	
Dowd Morass	2021–2022	Some	Some	Adrian Clements	
Dowd Morass	2022–2023	Some	Some	Adrian Clements	
Dowd Morass	2023–2024	Some	Many	Adrian Clements	
Dowdle Swamp					
Ecklin South Swamp	2021–2022	150	650	eBird (2024)	
Ecklin South Swamp	2022–2023	65		eBird (2024)	
Edithvale Seaford Wetlands	2020–2021	1	0	eBird (2024)	
Edwardes Lake	2023–2024	14		eBird (2024)	
Ettrick Swamp					
Gemmill Swamp		0	0	Don Roberts	No breeding last 30 years due to loss of reeds. Pers. comm. 2024
Glenelg	2010–2011	15		eBird (2024)	
Goose Lagoon					
Gowangardie					
Greens property					
Gunbower Forest	2021–2022	0	0	Cook & Brown (2023)	
Gunbower Forest	2022–2023	1	0	Cook & Brown (2023)	
Guthridge, Lake	2021–2022	100	0	eBird (2024)	
Guthridge, Lake	2022–2023	90	0	eBird (2024)	
Guthridge, Lake	2023–2024	110	0	eBird (2024)	
Gutteram Swamp					
Hattah Lake	2021–2022	12	0	G	
Hattah Lake	2022–2023	4	0	GHD (2023)	
Healesville Fauna Park	1981–1982	292	0	Kim Lowe	Pers. obs. 1981.
Healesville Fauna Park	1982–1983	279	0	Kim Lowe	Pers. obs. 1982.
Healesville Fauna Park		0	0	Ross Williamson	Last breeding since *c.* 2019 after control methods. Pers. comm. 2024.
Healesville Hotel	2017–2018	6		eBird (2024)	
Heifer Swamp		0	0	Gemma Hocking	No breeding both species last 15 years. Pers. comm. 2024
Hird Swamp		0	0	Damien Cook	No breeding last 12 years Pers. comm. 2024
Hume Reservoir, Mitta Mitta Arm	2022–2023	20	0	eBird (2024)	

Appendix 2 continued

Site name	*Year of record*	*Maximum no. nests AWI*	*Maximum no. nests SNI*	*Source*	*Personal communications and location details*
Jack Roper Reserve	2018–2019	350	0	eBird (2024)	
Jack Roper Reserve	2019–2020	260	0	eBird (2024)	
Jack Roper Reserve	2020–2021	450	0	eBird (2024)	
Jack Roper Reserve	2021–2022	350	0	eBird (2024)	
Jack Roper Reserve	2022–2023	450	0	eBird (2024)	
Jack Roper Reserve	2023–2024	200	0	eBird (2024)	
Jack Smith Lake	1984–1985	22		UNSW (2025)	
Jacob Swamp					
Jells Park Lake	2016–2017	200	0	eBird (2024)	
Jells Park Lake	2017–2018	350	0	eBird (2024)	
Jells Park Lake	2018–2019	250	0	BirdLife Australia (2024)	
Jells Park Lake	2019–2020	180	0	BirdLife Australia (2024)	
Jells Park Lake	2020–2021	225	0	BirdLife Australia (2024)	
Jells Park Lake	2021–2022	250	2	BirdLife Australia (2024)	
Jells Park Lake	2022–2023	780	1	BirdLife Australia (2024)	
Jells Park Lake	2023–2024	300	1	eBird (2024)	
Johnson Swamp	2022–2023	36	0	BirdLife Australia (2024)	
Kaladbro Swamp					
Karngun Bridges Swamp	2019–2020	Many	Many	eBird (2024)	
Kerr Swamp					
Kew Golf Club Billabong	2020–2021	70	0	eBird (2024)	
Kew Golf Club Billabong	2021–2022	211	0	eBird (2024)	
Kew Golf Club Billabong	2022–2023	85	0	eBird (2024)	
Kew Golf Club Billabong	2023–2024	50	0	eBird (2024)	
Kialla Lakes	2021–2022	150	0	eBird (2024)	
King River Floodplain	2012–2013	30		UNSW (2025)	
Kings Billabong	2020–2021	0	223	eBird (2024)	
Kings Billabong	2022–2023	0	120	BirdLife Australia (2024)	
Kirwans Bridge	1993–1994	Some		eBird (2024)	
Konardin Lake, Hattah	2021–2022	3	0	GHD (2022)	
Konardin Lake, Hattah	2022–2023	22	0	GHD (2023)	
Koomba Park	2019–2020	27	0	eBird (2024)	
Kow Swamp	2019–2020	0	160	eBird (2024)	
Kow Swamp	2022–2023	Hundreds	Thousands	BirdLife Australia (2024)	
Kuranga Native Nursery	2023–2024	8	0	BirdLife Australia (2024)	
Leskes Duck Holes					
Loch Garry					
Lockie, Lake					
Lorne, Lake	2022–2023	3	0	eBird (2024)	
MacLeod Morass	2008–2009	667		UNSW (2025)	
MacLeod Morass	2020–2021	80	4000–5000	BirdLife Australia (2024)	
MacLeod Morass	2021–2022	2000	5000	BirdLife Australia (2024)	

Appendix 2 continued

Site name	*Year of record*	*Maximum no. nests AWI*	*Maximum no. nests SNI*	*Source*	*Personal communications and location details*
MacLeod Morass	2022–2023		100	BirdLife Australia (2024)	
MacLeod Morass	2023–2024		2500	BirdLife Australia (2024)	
Martin, Lake		0	0	Adam Fry	No breeding last 5–10 years. Pers. comm. 2024
McDonald Swamp	2023–2024	32	0	eBird (2024)	
Merriwa Park, Wangaratta	2019–2020	10	0	Dan Pendavingh	Pers. comm. 2024
Mininera, Lake	2020–2021	0	6000	eBird (2024)	
Mininera, Lake	2021–2022	0	1000	eBird (2024)	
Mokoan, Lake (Winton Wetlands)	2000–2001	8		UNSW (2025)	
Mokoan, Lake (Winton Wetlands)		0	0	Dan Pendavingh	No breeding last 10 years. Pers. comm. 2024
Morphetts Swamp, Violet Town	1989–1990	59		UNSW (2025)	
Mt Evelyn Garden Centre	2018–2019	2	0	BirdLife Australia (2024)	
Mud Islands	2008–2009	200+	0	Menkhorst (2010)	
Mud Islands	2009–2010	7616	56,166	Menkhorst (2010)	
Mud Islands	2012–2013	2000	10,000	eBird (2024)	
Mud Islands	2013–2014	5000	2000	eBird (2024)	
Mud Islands	2016–2017	5000	50000	eBird (2024)	
Mud Islands	2018–2019	Some	Huge	BirdLife Australia (2024)	
Mud Islands	2022–2023		Many	BirdLife Australia (2024)	
Mud Islands	2023–2024	Some	Some	BirdLife Australia (2024)	
Muller Swamp, Nagambie					
Mulwala, Lake					
Myers Creek Swamp	1986–1987	7	450	UNSW (2025)	
Nerrin Nerrin					
Newhaven Swamp	2003–2004	50		UNSW (2025)	
Newhaven Swamp	2020–2021	Some	Some	BirdLife Australia (2024)	
Nine Mile Creek, Shepparton					
One Mile Creek Path, Wangaratta	2021–2022	40	0	Dan Pendavingh	Pers. comm. 2024
One Tree Swamp	1993–1994	15		UNSW (2025)	
One Tree Swamp	1994–1995	Some		eBird (2024)	
Purrumbete, Lake	2021–2022	200	0	iNaturalist	Adam Fry
Railway Dam, Glenthompson	2021–2022	Some		BirdLife Australia (2024)	
Redleap Reserve	2019–2020	18	0	BirdLife Australia (2024)	
Redleap Reserve	2021–2022	30	0	eBird (2024)	
Redleap Reserve	2022–2023	10+	0	eBird (2024)	
Reedy (First) Lake, Kerang	2008–2009	221		UNSW (2025)	
Reedy (First) Lake, Kerang	2011–2012	250		UNSW (2025)	
Reedy (First) Lake, Kerang	2012–2013	50		UNSW (2025)	

Appendix 2 continued

Site name	*Year of record*	*Maximum no. nests AWI*	*Maximum no. nests SNI*	*Source*	*Personal communications and location details*
Reedy (First) Lake, Kerang	2013–2014	100		UNSW (2025)	
Reedy (First) Lake, Kerang	2014–2015	375		UNSW (2025)	
Reedy (First) Lake, Kerang	2016–2017	200	50	UNSW (2025)	
Reedy (First) Lake, Kerang	2017–2018	100	20	UNSW (2025)	
Reedy (First) Lake, Kerang	2018–2019	100	50	UNSW (2025)	
Reedy (First) Lake, Kerang	2019–2020	40	14	BirdLife Australia (2024)	
Reedy (First) Lake, Kerang	2020–2021	16	0	BirdLife Australia (2024)	
Reedy (First) Lake, Kerang	2021–2022	100	120	UNSW (2025)	
Reedy (First) Lake, Kerang	2022–2023	330	0	BirdLife Australia (2024)	
Reedy (First) Lake, Kerang	2023–2024	20	0	BirdLife Australia (2024)	
Reedy (Middle) Lake, Kerang	2010–2011	26,600	26,600	UNSW (2025)	
Reedy (Middle) Lake, Kerang	2011–2012	0	300	UNSW (2025)	
Reedy (Middle) Lake, Kerang	2012–2013	210	620	UNSW (2025)	
Reedy (Middle) Lake, Kerang	2013–2014	200	900	UNSW (2025)	
Reedy (Middle) Lake, Kerang	2014–2015	1250	3125	UNSW (2025)	
Reedy (Middle) Lake, Kerang	2016–2017	510	6400	UNSW (2025)	
Reedy (Middle) Lake, Kerang	2017–2018	50	2400	UNSW (2025)	
Reedy (Middle) Lake, Kerang	2019–2020	100	700	BirdLife Australia (2024)	
Reedy (Middle) Lake, Kerang	2021–2022	130	5000	UNSW (2025)	
Reedy (Middle) Lake, Kerang	2022–2023	50	1800	BirdLife Australia (2024)	
Reedy (Middle) Lake, Kerang	2023–2024	140	4000	BirdLife Australia (2024)	
Reedy (Third) Lake, Kerang	2010–2011	160		UNSW (2025)	
Reedy (Third) Lake, Kerang	2011–2012	0	300	UNSW (2025)	
Reedy (Third) Lake, Kerang	2012–2013	20		UNSW (2025)	
Reedy Swamp, Geelong	2011–2012	75		eBird (2024)	
Reedy Swamp, Geelong	2018–2019	0	Failed	Dutson (2021)	
Reedy Swamp, Geelong	2020–2021	A few. Tens	500–1200	Dutson (2021)	
Reedy Swamp, Geelong	2021–2022	40		eBird (2024)	
Reedy Swamp, Geelong	2022–2023	235		eBird (2024)	
Reedy Swamp, Geelong	2023–2024	30		eBird (2024)	
Reedy Swamp, Shepparton	2022–2023	35		eBird (2024)	
Reedy Swamp, Shepparton	2023–2024	200	400	eBird (2024)	
Rhyll Swamp	1981–1982	500	300	Kim Lowe	Pers. obs. 1981
Rhyll Swamp	1982–1983	500	300	Kim Lowe	Pers. obs. 1982
Rhyll Swamp	1999–2000	5	0	UNSW (2025)	
Rhyll Swamp	2000–2001	20	0	UNSW (2025)	
Rhyll Swamp	2001–2002	200	400	UNSW (2025)	
Rhyll Swamp	2004–2005	862	812	UNSW (2025)	
Rhyll Swamp	2005–2006	1370	865	UNSW (2025)	
Rhyll Swamp	2006–2007	80	0	UNSW (2025)	
Rhyll Swamp	2007–2008	430	0	UNSW (2025)	
Rhyll Swamp	2008–2009	500	67	UNSW (2025)	

Appendix 2 continued

Site name	*Year of record*	*Maximum no. nests AWI*	*Maximum no. nests SNI*	*Source*	*Personal communications and location details*
Rhyll Swamp	2010–2011	300	0	UNSW (2025)	
Rhyll Swamp	2012–2013	40	150	UNSW (2025)	
Rhyll Swamp	2013–2014	200	20	UNSW (2025)	
Rhyll Swamp	2016–2017	200	0	UNSW (2025)	
Rhyll Swamp	2017–2018	190	50	UNSW (2025)	
Rhyll Swamp	2018–2019	154	0	UNSW (2025)	
Rhyll Swamp	2019–2020	50	1800	UNSW (2025)	
Rhyll Swamp	2020–2021	25	25	BirdLife Australia (2024)	
Rhyll Swamp	2021–2022	740		UNSW (2025)	
Rhyll Swamp	2022–2023	20		BirdLife Australia (2024)	
Riggs Creek Swamp	1988–1989	40	0	UNSW (2025)	
Riggs Creek Swamp	1989–1990	64	0	UNSW (2025)	
Riggs Creek Swamp	1992–1993	20	0	UNSW (2025)	
Rivergum Creek Reserve	2023–2024	70		eBird (2024)	
Roberts property					
Royal Melbourne Zoo	2022–2023	Some		eBird (2024)	
Ryan Island					
Serendip Sanctuary	2006–2007	500		eBird (2024)	
Serendip Sanctuary	2013–2014	100		eBird (2024)	
Shanks Lagoon					
Skip Road, Wonthaggi	2018–2019	Some	Some	BirdLife Australia (2024)	
Skip Road, Wonthaggi	2020–2021	Some	Some	BirdLife Australia (2024)	
Skip Road, Wonthaggi	2021–2022	6	Some	BirdLife Australia (2024)	
Skip Road, Wonthaggi	2022–2023	9	2	BirdLife Australia (2024)	
Skip Road, Wonthaggi	2023–2024	108	10	BirdLife Australia (2024)	
Springvale Botanical Cemetery	2016–2017	300	0	eBird (2024)	
Springvale Botanical Cemetery	2018–2019	18	0	BirdLife Australia (2024)	
Springvale Botanical Cemetery	2022–2023	40	0	Helen Tuton	Pers. comm. 2025
Springvale Botanical Cemetery	2023–2024	40	0	Helen Tuton	Pers. comm. 2025
Taminick	2016–2017	200	0	eBird (2024)	
Taminick	2017–2018		20	eBird (2024)	
Taminick	2021–2022	35	0	eBird (2024)	
Taminick	2022–2023	42	0	eBird (2024)	
Tarra River Lagoon	1994–1995	25		UNSW (2025)	
Thorpdale	2021–2022	4	0	BirdLife Australia (2024)	Private land wetland, 103 Dingley Dell Rd
Thurrambong, Lake					
Tragowel Swamp					
Turnbull Research Institute					

Appendix 2 continued

Site name	*Year of record*	*Maximum no. nests AWI*	*Maximum no. nests SNI*	*Source*	*Personal communications and location details*
Twelve Mile Creek					
Two Mile Swamp					
Two Tree Swamp	1989–1990	26		UNSW (2025)	
Two Tree Swamp	1993–1994	479	1919	UNSW (2025)	
Undrained swamp					
Unnamed wetland, Birndale	1989–1990	50		UNSW (2025)	
Unnamed wetland, Jeetho	2009–2010	100		UNSW (2025)	
Unnamed wetland, Leongatha	2002–2003	50		UNSW (2025)	
Unnamed wetland, Leongatha	2003–2004	0	40	UNSW (2025)	
Unnamed wetland, Leongatha	2004–2005	100		UNSW (2025)	
Unnamed wetland, Leongatha	2006–2007	20		UNSW (2025)	
Unnamed wetland, Phillip Island	1986–1987	600		UNSW (2025)	
Unnamed wetland, Tamleugh	1988–1989	10		UNSW (2025)	
Unnamed wetland, Upotipotpon	1985–1986	30	10	UNSW (2025)	
Unnamed wetland, Whitelaw	2004–2005	350		UNSW (2025)	
Vaughan Island					
Wallenjoe Swamp	1989–1990	263		UNSW (2025)	
Wallenjoe Swamp	1993–1994	120	300	UNSW (2025)	
Wannon River					
Weeroona, Lake	2017–2018	250	0	eBird (2024)	
Weeroona, Lake	2022–2023	21	0	eBird (2024)	
Wendouree, Lake	2019–2020	200	0	eBird (2024)	
Wendouree, Lake	2020–2021	300	0	eBird (2024)	
Wendouree, Lake	2022–2023	38	0	eBird (2024)	
Wilkur Creek Lagoon	1985–1986	150		UNSW (2025)	
Williams Landing	2019–2020	Very many		eBird (2024)	
Winghee Swamp	1983–1984	10		UNSW (2025)	
Winghee Swamp	1989–1990	0	719	UNSW (2025)	
Winghee Swamp	1992–1993	0	240	UNSW (2025)	
Winter Swamp	1988–1989	5		Kentish (1999)	
Winter Swamp	1990–1991	30		Kentish (1999)	
Winter Swamp	1991–1992	42		Kentish (1999)	
Winter Swamp	1992–1993	79		Kentish (1999)	
Winter Swamp	1993–1994	125		Kentish (1999)	
Winter Swamp	1994–1995	5		Kentish (1999)	
Winter Swamp	1995–1996	84. Both species		Kentish (1999)	
Winter Swamp	1996–1997	380. Both species		Kentish (1999)	
Winter Swamp	1997–1998	175		Kentish (1999)	
Wool Wool Rocks	2014–2015	0	Thousands	eBird (2024)	
Woolongoon					
Yambuk	2022–2023	Some		eBird (2024)	
Yando Lake					
Yelwell, Lake, Hattah	2022–2023	15	0	GHD (2023)	