Bird surveys of Cattai Wetlands (2006 to 2014) on the mid-north coast of New South Wales

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Avifaunal surveys were undertaken by members of Manning Great Lakes Birdwatchers at Cattai Wetlands, ~20km northeast of Taree in New South Wales, between July 2006 and June 2014. 178 species were recorded from 63 surveys with an additional seven species recorded by others during unscheduled visits and a single species observed in farmland immediately adjacent. Of these, ten species are listed as either vulnerable or endangered under the *Threatened Species Conservation Act 1995* (NSW). 38 species were recorded as breeding, of which one, the Comb-crested Jacana *Irediparra gallinacea*, is a listed species.

The initial purchase of the land, incorporating Cattai Wetlands, by Greater Taree City Council was to remediate land affected by acid sulphate soil. Sections of land surrounding the affected areas include examples of seven vegetation communities listed under the *Threatened Species Conservation Act 1995* (NSW), within which some of the surveys were conducted. This variety of habitats also supported several over-wintering species typically considered to be partly or fully migratory within the Hunter Region. Revegetation works and ongoing weed control will enhance the areas surveyed into the future.

INTRODUCTION

A parcel of land (~450 ha), containing Cattai Wetlands (**Figure 1**), was purchased by Greater Taree City Council (GTCC) in 2003. Whilst remediation of land affected by acid sulphate soil, which ultimately discharges into the Manning River, was the principal reason for the purchase, additional benefits of a wildlife corridor linking Crowdy Bay National Park in the east with Coopernook State Forest to the west and providing an educational centre for wetland management for GTCC, were also identified.

During an ecological assessment of the property by Graham (2004), 72 bird species were identified during three days of field survey in the month of December. Realising an opportunity to contribute ongoing avifaunal data through systematic surveys, Win Filewood (LWF) contacted GTCC in early 2006, on behalf of Manning Valley Birdwatchers (now Manning Great Lakes Birdwatchers Inc. MGLBW), regarding access to Cattai Wetlands to undertake regular bird surveys.

Site Description

Cattai Wetlands (31°50'S, 152°38'E) are located ~20 km north-east of Taree, on the mid-north coast of New South Wales (NSW). The site is ~10 km west and ~6 km northwest of the coastal villages of Crowdy Head and Harrington respectively. Land portions around Cattai Wetlands were alienated from the crown in 1876 (B. Crisp pers. comm.). A compilation of portion plans from that time indicates that Cattai Wetland was a 'Tea Tree swamp heavily timbered', the area either side of the 'Saltwater channel' (Coopernook Creek) being 'dry ferny land' and the northern bank of Coopernook Creek, west of Cattai Wetland, was a 'Tea tree swamp' (Smith *et al*. 2006, p. 40). Atkinson *et al*. (2003) suggest that as recently as 2000 years ago (late Holocene period), Cattai Wetlands was an open-water coastal lagoon. Sedimentation of the Manning River delta over the ensuing years has resulted in the formation of the surrounding coastal floodplain area.

From the original purchase by GTCC, four 10 ha lots in the central western section were subdivided and sold off. Of the remaining parcel, surveys were undertaken in the lower portion covering ~84 ha and were divided into five distinct areas (**Figure 2**) with vegetation types, as described by Graham (2004), as follows:

Giants Footprint (GF) is the main perched freshwater wetland (Cattai Wetland) with fringing swamp sclerophyll forest, dominated by Broad-leaved Paperbark *Melaleuca quinquenervia* and

Figure 1. Location of areas surveyed (hatched) within the whole Cattai Wetlands parcel (black outline). Aerial image courtesy of Greater Taree City Council.

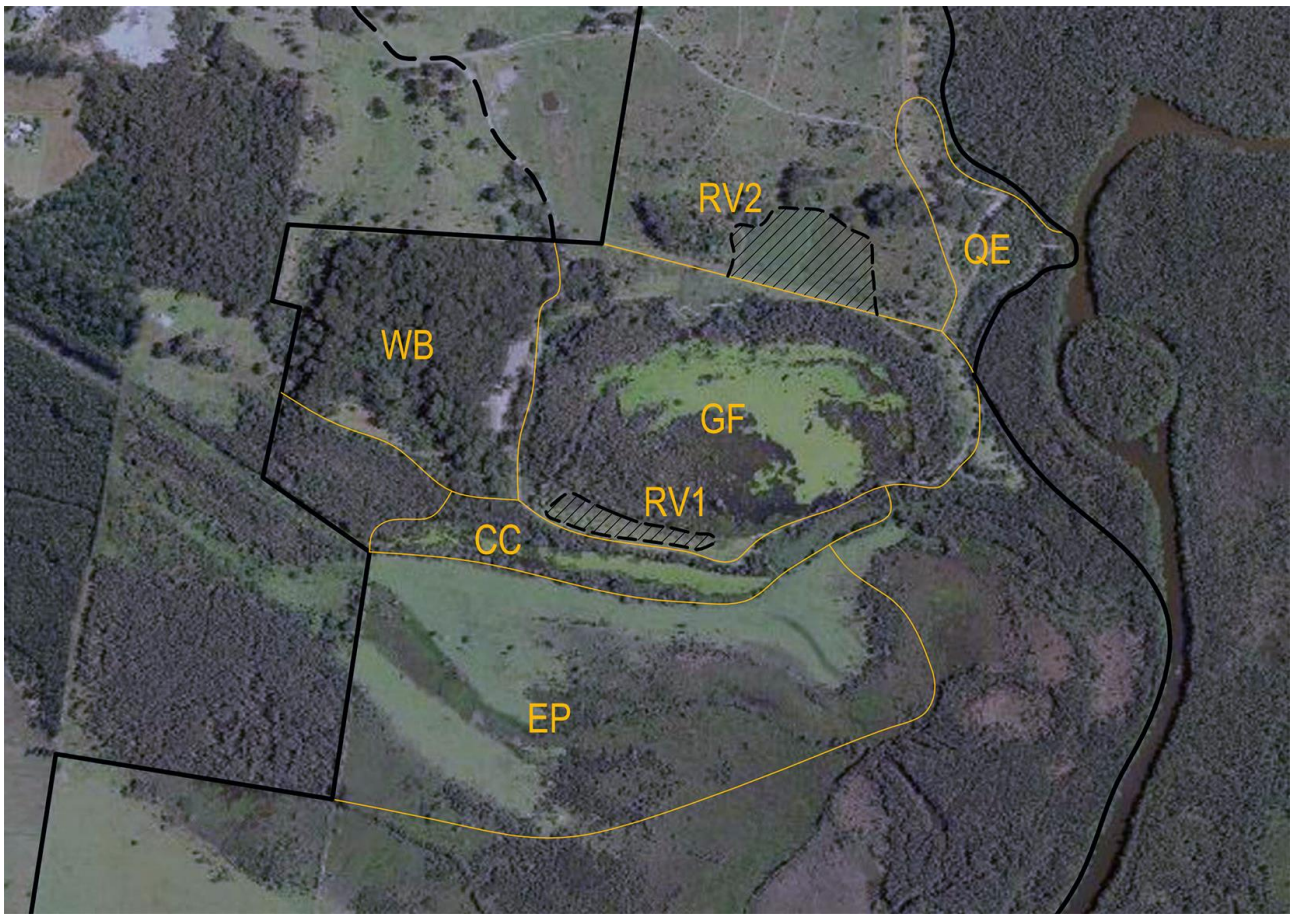

Figure 2. Location of individual survey areas at Cattai Wetlands. GF = Giants Footprint; CC = Coopernook Creek; QE = Quarry Extension; WB = Western Block; EP = Electric Paddock; RV1& RV2 = Revegetation Areas 1 and 2 (refer to text for descriptions). Aerial image courtesy of Greater Taree City Council.

Swamp Oak *Casuarina glauca*. Covering an area of ~17 ha, the wetland has a maximum depth of 0.8 m. The open water is fringed by a diverse range of sedges and rushes (e.g. *Elaeocharis* and *Triglochin spp*.) and approximately half the open water area is covered by flowering Cape Waterlily *Nymphaea sp*. during the warmer months. Numerous emergent Swamp Oaks are scattered throughout the open water and provide roosting areas at their bases for aquatic birds. When purchased by GTCC the wetland water level was controlled by a natural earth bank overflow, which was often soft and boggy and which discharges into Coopernook Creek. In March 2008 GTCC constructed a concrete causeway, with a small low-flow channel, which deliberately raised the water level by approximately 200mm.

Coopernook Creek (CC) flows along the southern side of the GF and enters Cattai Creek, which forms the eastern boundary of the site. Once known as Saltwater Creek, CC is now predominantly a freshwater lagoon which overtops a redundant floodgate during rainfall events. Riparian vegetation along CC is classed as floodplain rainforest and characterised by emergent sclerophyll eucalypts mixed with fig trees *Ficus spp*., palms, Cheese Tree *Glochidion ferdinandii* and a dense ground layer of *Lomandra spp*. A previously cleared strip of land between CC and GF has been revegetated (RV1; planted in 2006) with floodplain rainforest species.

Quarry Extension (QE) forms the northeastern section of the survey area and contains the remains of a gravel pit. The elevated ridge in this vicinity contains dry sclerophyll forest species of Blackbutt *Eucalyptus pilularis*, Tallowwood *E. microcorys*, Flooded Gum *E. grandis*, Northern Grey Ironbark *E. siderophloia*, Grey Gum *E. punctata* and White Bottlebrush *Callistemon salignus*. Downslope to the south, towards GF, is a stand of Brush Box *Lophostemon confertus* while on the eastern slopes is the mangrove forest and woodland complex of riparian vegetation along Cattai Creek dominated by Grey *Avicennia marina* and River Mangroves *Aegiceras corniculatum* and Swamp Oak.

Western Block (WB) is an elevated knoll on the western end of the survey area and is bordered on the north (cleared) and west (heavily vegetated) by private property and to the south by Coopernook Creek. The knoll is covered by mature closed dry sclerophyll forest consisting of the same species as those listed in QE above. A small section of Brush Box wet sclerophyll forest is also present on the southern foot slopes which grade to CC.

Electric Paddock (EP) is located on the southern side of Coopernook Creek and was previously used for grazing. With stock removed, the land now consists of tall rank mixed grass species. Several remnant paddock trees suggest that this area was previously covered by Floodplain Rainforest species. Saltmarsh is located to the southeast of this area and was not included in the surveys.

Many of these vegetation types are listed as ecologically endangered communities (EEC), under the NSW *Threatened Species Conservation Act 1995* (*TSC Act*):

- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Freshwater Wetlands on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Lowland Rainforest on Floodplain in the NSW North Coast Bioregion
- Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- River-Flat Eucalypt Forest on Coastal Floodplains in the NSW North Coast, Sydney Basin and South East Corner Bioregions

Additional to the revegetation area (RV1) between CC and GF, a second area, located centrally to the north of GF, has also been revegetated (RV2; planted in 2010) with a mixture of wet and dry sclerophyll species.

METHODS

Between July 2006 and June 2009, surveys were undertaken monthly. From July 2009 to June 2014, surveys were programmed to alternate between every second and third month, which over five years resulted in an additional two surveys for each month and a total of five surveys per month over the eight year duration. Although five distinct areas were recognised within the site, not all of these were surveyed each time due to numbers of observers available on any given survey day. When there was a minimum number of observers, priority was given to surveying GF. Although recorded separately, surveys of the adjacent CC were undertaken at the same time, with analysis combining both areas. Surveys of the QE did not begin until January 2009, and, from that time on, they were usually included as an addition while surveying GF. LWF undertook two additional surveys, one in November 2007 and another in July 2012, which have been included in the analyses covering those areas surveyed. Unfortunately, following LWF's death in January 2014, it became apparent that the results of five surveys from July 2010 to May 2011 had been lost.

Surveys generally started within an hour of sunrise and lasted ~3 hours. Observers recorded both species and numbers of individuals sighted in each distinct area. Movement by birds between areas was noted so that they could be recorded for each site in which they were observed but only counted once for the entire area. Additionally, some observers tracked across the same areas, at different times, to commence or return from their specific survey areas (e.g. around GF and along CC to get to EP). At the completion of surveys, estimates were made of any overlaps in counts, and the total figures reduced accordingly. Occasionally, birds were observed in another area (not being properly surveyed) and recorded against that area. Therefore, areas that recorded fewer than 5 species were not counted as a survey for analysis purposes, but the observations were included in any overall analysis. Birds were recorded either visually or audibly by survey teams consisting mostly of two observers, occasionally three, and rarely a single observer. Abilities varied considerably amongst observers, for both visual and audio detection and identification, from relative beginners to experienced. Beginners were paired with experienced observers.

For seasonal comparisons, the following months have been combined: winter (June, July and August), spring (September, October and November), summer (December, January and February) and autumn (March, April and May). Due to the variation in months surveyed during the winter and summer periods, calculations for winter and summer visitors compared the percentage of surveys that the species was present during both these seasons. For inclusion, a species needed to be recorded a minimum of four times during either winter or summer and at least five times more frequently during summer than winter or vice-versa.

A comparison of aquatic species, recorded in more than ten surveys within GF only, has also been made between numbers before and after construction of the

concrete causeway. Both the percentage of surveys observed in and average number of individuals recorded have been compared in this calculation.

Breeding records were based on the following criteria: active visible nest, feeding of dependent juvenile, observing a recently fledged juvenile, downy (runner) aquatic species or repeated visits to a nest (e.g. termitarium by a kingfisher or bank hole by pardalote) or small patch of vegetation (e.g. clump of grass by a fairy-wren) with food.

Supplementary records have also been sourced from observations published on the local Hunterbirding network (https://au.groups.yahoo.com/neo/groups/hunterbirding/info), a campout held by the Hunter Bird Observers Club (HBOC) from 1-5 October 2010 and observations by members of the MGLBW during non-scheduled visits.

RESULTS

In total, 63 surveys were completed. With the loss of five data sets, **Table 1** lists 58 counts, which includes two additional surveys undertaken by LWF and also correlates with the number of surveys undertaken around GF and CC. Surveys undertaken in individual months varied from 4 to 7, with an average of 4.8 surveys per month over the 8-year period. For the other individual areas, QE, WB and EP, counts are 25, 54 and 44 respectively. Excluding the two additional surveys, there was an average of 6.8 (n = 56; range 3-11) observers present for each of the surveys.

From these surveys, 178 species of birds were recorded within the survey area, one additional species, Restless Flycatcher *Myiagra inquieta*, was recorded within the farmland immediately adjacent and 38 species were recorded breeding (see species list in the **Appendix**). A further seven species have been recorded by observers supplementally to these surveys and are also shown in the **Appendix**. Ten of these species are listed as either vulnerable or endangered under the *TSC Act*. Numbers of bird species and total number of birds observed on a seasonal basis for all and individual survey areas are summarised in **Table 2**.

Species recorded in more than 75% of surveys of individual areas have been considered as resident within this data set (refer **Appendix**). Of these 30 species, only four, namely Superb Fairy-wren *Malurus cyaneus*, Brown Thornbill *Acanthiza pusilla*, Lewin's Honeyeater *Meliphaga lewinii* and Grey Fantail *Rhipidura fuliginosa*, were present during all surveys (n = 58) of the combined GF and CC areas, while Striped Honeyeater *Plectorhyncha lanceolata* and Red-browed Finch *Neochmia temporalis* were absent from one survey (n = 57) in these same areas. Within QE, both Brown Gerygone *Gerygone mouki* and Lewin's Honeyeater were recorded in all but one survey (n = 24) while the most recorded species in WB was Grey Fantail, which was absent from two surveys (n = 52).

35 species were classed as either a winter or a summer visitor to Cattai Wetlands as indicated in the **Appendix**. Winter visitors include Cattle Egret *Ardea ibis* (EP), Striated Pardalote *Pardalotus striatus* (GF/CC and WB), Scarlet Honeyeater *Myzomela sanguinolenta* (EP), Olive-backed Oriole *Oriolus sagittatus* (EP) and White-breasted Woodswallow *Artamus leucorynchus* (EP). Summer visitors include Swamp Harrier *Circus approximans* (EP), Red-backed Fairy-wren *Malurus melanocephalus* (GF/CC) and Crested Shrike-tit *Falcunculus frontatus* (WB).

Excluding GF and CC, the following eight species of birds were recorded in single areas only, with the number of times recorded shown in brackets: Lewin's Rail *Lewinia pectoralis* (1 immature specimen found dead tangled in fence wire) in QE; Square-tailed Kite *Lophoictinia isura* (5), Crimson Rosella *Platycercus elegans* (6) and Bassian Thrush *Zoothera lunulata* (1) in WB; and Rock Dove *Columba livia* (1), Australasian Bittern *Botaurus poiciloptilus* (1), Jacky Winter *Microeca fascinans* (1) and Double-barred Finch *Taeniopygia bichenovii* (1) in EP.

Recording rates and average numbers of individuals of aquatic species before and after construction of the concrete causeway are shown in **Table 3**. Beneficiaries of the resultant increased water levels include the dominant Anseriforme and Gruiforme species as well as Australasian Grebe *Tachybaptus novaehollandiae*. Conversely, several of the wading Ciconiiforme species were impacted negatively. Of the 17 compared, four species showed an increase in recording rates and only a single species a decrease, being Straw-necked Ibis *Threskiornis spinicollis*. However when comparing the average number of individuals, eight species showed an increase with three reflecting a decrease.

Table 1. Number of surveys within and months of surveys undertaken at Cattai Wetlands between July 2006 and June 2014. x = months where data was lost (refer to comments in Methods)

Month	2006	2007	2008	2009	2010	2011	2012	2013	2014	Monthly Totals
January		1	1	1					1	4
February		1	1	1	1	x		1		5
March		1	1	1			1			4
April		1	1	1	1			1	1	6
May		1	1	1		x	1			4
June		1	1	1					1	4
July	1	1	1		x	1	1 [a]	1		6
August	1	1	1				1	1		5
September	1	1	1	1	x					4
October	1	1	1			1				4
November	1	2[a]	1	1			1	1		7
December	1	1	1	1	x	1				5

[a] - Additional survey undertaken by Win Filewood

Table 2. Summary of seasonal numbers of bird species and individuals recorded during surveys at Cattai Wetlands between July 2006 and June 2014

Survey Areas		Overall	Winter	Spring	Summer	Autumn
All surveys combined						
Bird Species	Count (*n*)	58	15	15	14	14
	Average	69.9	62.5	76.5	75.1	65.8
	Minimum	41	48	61	57	41
	Maximum	94	81	86	94	79
Number of Birds	Average	720.1	733.1	714.1	683.6	748.9
	Minimum	232	265	272	291	232
	Maximum	1192	1042	1192	810	1100
Cattai Wetland and Coopernook Creek						
Bird Species	Count (*n*)	58	15	15	14	14
	Average	57.2	51.8	63.0	60.8	53.0
	Minimum	26	41	52	45	26
	Maximum	80	67	73	80	65
Number of Birds	Average	454.6	471.8	452.8	427.5	465.3
	Minimum	90	214	186	165	90
	Maximum	915	727	915	581	788
Quarry Extension						
Bird Species	Count (*n*)	25	7	4	7	7
	Average	20.7	20.7	21.5	20.6	20.4
	Minimum	9	11	9	14	13
	Maximum	31	28	31	29	24

Table 2. Summary of seasonal numbers of bird species and individuals recorded during surveys at Cattai Wetlands between July 2006 and June 2014 (cont.)

Survey Areas		**Overall**	**Winter**	**Spring**	**Summer**	**Autumn**
Quarry Extension cont.						
Number of Birds	Average	67.4	66.6	84.8	66.7	59.1
	Minimum	16	16	5	49	25
	Maximum	118	107	118	101	82
Western Block						
Bird Species	Count (*n*)	54	12	15	14	13
	Average	32.1	28.7	33.5	31.4	34.3
	Minimum	16	17	16	18	25
	Maximum	53	37	44	40	53
Number of Birds	Average	161.6	180.2	138.3	132	203.2
	Minimum	38	38	45	49	123
	Maximum	476	476	262	259	346
Electric Paddock						
Bird Species	Count (*n*)	44	9	13	11	11
	Average	22.3	22.6	22.5	24.5	19.6
	Minimum	7	10	7	14	8
	Maximum	41	36	41	37	31
Number of Birds	Average	91.3	106.4	91.0	92.4	78.4
	Minimum	9	31	9	46	14
	Maximum	208	188	208	151	135

Table 3. Summary of aquatic bird species and individuals recorded before and after construction of the concrete causeway during surveys at Cattai Wetlands between July 2006 and June 2014. Ratio values greater than 1.5 are considered to be an increase (**bolded**) and values less than 0.7 a decrease (*italicised*).

Common Name	**Scientific Name**	**Percentage of Surveys Recorded (%)**			**Average Number of Individuals Recorded**		
		Pre	**Post**	**Ratio**	**Pre**	**Post**	**Ratio**
Black Swan	*Cygnus atratus*	81.8	88.6	1.1	7.1	10.0	1.4
Grey Teal	*Anas gracilis*	54.5	68.6	1.3	15.7	13.8	0.9
Chestnut Teal	*Anas castanea*	77.3	68.6	0.9	7.9	17.6	**2.2**
Pacific Black Duck	*Anas superciliosa*	90.9	100.0	1.1	20.9	57.1	**2.7**
Hardhead	*Aythya australis*	18.2	57.1	**3.1**	4.5	15.3	**3.4**
Australasian Grebe	*Tachybaptus novaehollandiae*	77.3	62.9	0.8	3.4	6.0	**1.8**
Little Pied Cormorant	*Microcarbo melanoleucos*	13.6	68.6	**5.0**	2.0	2.8	1.4
Little Black Cormorant	*Phalacrocorax sulcirostris*	36.4	48.6	1.3	5.9	6.6	1.1
Australian Pelican	*Pelecanus conspicillatus*	45.5	48.6	1.1	4.6	2.4	*0.5*
White-necked Heron	*Ardea pacifica*	22.7	17.1	0.8	3.4	1.5	*0.4*
Intermediate Egret	*Ardea intermedia*	18.2	20.0	1.1	1.5	1.6	1.0
White-faced Heron	*Egretta novaehollandiae*	50.0	48.6	1.0	3.4	4.0	1.2
Straw-necked Ibis	*Threskiornis spinicollis*	27.3	14.3	*0.5*	19.0	11.4	*0.6*
Purple Swamphen	*Porphyrio porphyrio*	63.6	68.6	1.1	4.2	17.2	**4.1**
Dusky Moorhen	*Gallinula tenebrosa*	18.2	57.1	**3.1**	1.3	3.7	**2.9**
Eurasian Coot	*Fulica atra*	9.1	54.3	**6.0**	3.0	29.5	**9.8**
Masked Lapwing	*Vanellus miles*	45.5	34.3	0.8	3.5	2.8	0.8

DISCUSSION

The following paragraphs provide some commentary on the observations of the various orders / family groups of birds recorded during the survey period July 2006 to June 2014.

Quails (Galliformes): Brown Quail *Coturnix ypsilophora* is the sole representative of this group observed during the surveys, with low to moderate recording rates. Observed in small family groups (range 1-9; average 3.3) predominantly within or adjacent to rank grasslands, this species could be considered resident. Revegetation of the previously cleared areas both south and north of the wetland may have a negative impact on the Brown Quail. Although not recorded during these surveys, King Quail *Excalfactoria chinensis* has been recorded within the GF/CC areas on two occasions (Kearns 2013; Stuart 2015a), the latter a confirmed record.

Ducks (Anseriformes): Well represented with ten species recorded, of which four have been observed breeding (refer **Appendix**). This figure also includes three species considered dispersive (Marchant & Higgins 1990), being Wandering Whistling-Duck *Dendrocygna arcuate* (four times with up to 21 birds present), Pink-eared Duck *Malacorhynchus membranaceus* (single bird; Stuart 2015b) and Australasian Shoveler *Anas rhynochotis* (13 times with up to 16 birds present). However within the Hunter Region, Stuart (2014) lists both Wandering Whistling-Duck and Australasian Shoveler as 'resident'. 20 Plumed Whistling-Duck *Dendrocygna eytoni*, a migratory species (Marchant & Higgins 1990), have also been observed (McKay 2015) outside these surveys. Five Anseriforme species were compared before and after causeway construction. Only Hardhead *Aythya australis* recorded an increased observation ratio, being 3.1. However, three species recorded increased average individuals ratios of 2.2, 2.7 and 3.4, being Chestnut Teal *Anas castanea* and Pacific Black Duck *Anas superciliosa* and Hardhead respectively. The preferred habitat of Hardheads is large, deep water, terrestrial wetlands with abundant aquatic vegetation where most food is obtained from diving (Marchant & Higgins 1990). The increase in water levels by only 200mm appears to have improved the wetland favourably for this species. Both Chestnut Teal and Pacific Black Duck feed predominantly by surface dabbling and up-ending (Marchant & Higgins 1990). It is suggested that the increased surface area, as a result of the higher water level, is now capable of supporting a greater number of individuals.

Grebes (Podicipediformes): Two of the three Australian species have been recorded, with Australasian Grebe being reasonably common at GF. Its congener, the Hoary-headed Grebe *Poliocephalus poliocephalus* was only recorded on two occasions, also within GF, conforming to Stuart's (2014) noted status of a 'bird of passage' within the Hunter Region. The Australasian Grebe was also compared before and after causeway construction recording a neutral, but slightly decreased, observation ratio of 0.8 but an increased average individuals ratio of 1.8. Similar to the Hardhead above, Australasian Grebes feed by diving, but also take food from the water's surface (Marchant & Higgins 1990), and appear to have benefited from the higher water level.

Pigeons & Doves (Columbiformes): Although well represented with 11 species observed, most were recorded in low numbers, being less than 10 birds and averaging 2-4. The most common species recorded was the Bar-shouldered Dove *Geopelia humeralis* which averaged 8.4 individuals per survey (n = 56). With this species also being one of the most vocal, this may have resulted in the increased recording rates and individuals. Another species with a higher average number of individuals (n = 9; 14.9) recorded was the flocking Topknot Pigeon *Lopholaimus antarcticus*. This species and two others, White-headed Pigeon *Columba leucomela* and Brown Cuckoo-Dove *Macropygia amboinensis*, which were both recorded moderately often, may also benefit from the revegetation works both north and south of GF.

Nightbirds (Caprimulgiformes): During the surveys, only the Tawny Frogmouth *Podargus strigoides* was observed. Although only recorded on two occasions, roosting near the entry gate of the wetlands, they are more than likely a permanent resident. During a campout at the wetlands, two additional species, White-throated Nightjar *Eurostopodus mystacalis*, a 'summer migrant' (Stuart 2014), and Australian Owlet-nightjar *Aegotheles cristatus*, were observed or heard (HBOC 2010).

Swifts (Apodiformes): Recorded regularly as a summer migrant, the White-throated Needletail *Hirundapus caudacutus* was the only species observed from this order.

Cormorants (Phalacrocoraciformes): All four local species of cormorant, as well as the Australasian Darter *Anhinga melanogaster* have been observed, mostly within GF. Both Little Cormorant species, Pied *Microcarbo melanoleucos* and Black *Phalacrocorax sulcirostris*, were compared before and after causeway construction, with both recording a neutral to slightly increased average individuals recording ratio. However the Little Pied was observed five times more often post construction. Although both these species utilise terrestrial wetlands for feeding by pursuit diving (Marchant & Higgins 1990), the Little Pied hunts alone while Little Black Cormorants often hunt co-operatively, which is also reflected in the average individuals observed post construction, being 2.8 and 6.6 respectively.

Egrets & Ibis (Ciconiiformes): Both families of egrets and ibis have been represented well with nine and four species recorded respectively, which includes two species, Black-necked Stork *Ephippiorhynchus asiaticus* and Australasian Bittern, both listed as endangered under the *TSC Act*. Four of the five Ciconiiforme species compared before and after causeway construction recorded neutral observation ratios with Straw-necked Ibis recording a decreased ratio of 0.5. Three species, however, recorded decreased average individuals ratios, namely Australian Pelican *Pelecanus conspicillatus* (0.5), White-necked Heron *Ardea pacifica* (0.4) and Straw-necked Ibis (0.6). Both White-necked Heron and Straw-necked Ibis utilise soft substrate habitats for foraging, including shallow water (Marchant & Higgins 1990), however required depths are <70mm and <250mm, respectively. The increased water level has reduced the opportunity for drying and exposure of shallow / muddy edges for these two species.

Eagles, Hawks & Falcons (Accipitriformes & Falconiformes): 16 species have been recorded within these two orders, with one, the Grey Goshawk *Accipiter novaehollandiae*, recorded breeding. This group also includes two species listed as vulnerable under the *TSC Act*, being Square-tailed Kite and Little Eagle *Hieraaetus morphnoides*. A pair of Square-tailed Kites has been regularly breeding in the Coopernook State Forest for many years (R. Langdown pers. comm.), and these may be the same birds to appear during surveys.

Crakes & Rails (Gruiformes): Three of the five species have been recorded regularly. However both Lewin's and Buff-banded Rails *Gallirallus philippensis* have been observed only once each. Unfortunately the observation of the Lewin's Rail was that of a juvenile's carcass caught in a fence. This suggests that there is breeding occurring within the vicinity of the wetlands. Both being cryptic species, their presence in the area may be substantially understated. The three regularly recorded species, Purple Swamphen *Porphyrio porphyrio*, Dusky Moorhen *Gallinula tenebrosa* and Eurasian Coot *Fulica atra*, were also compared before and after causeway construction with all three recording increased average individuals ratios of 4.1, 2.9 and 9.8 respectively. The Moorhen and Coot also recorded increased observation ratios of 3.1 and 6.0 respectively. Although only the Swamphen and Coot tend to utilise aquatic growth for feeding (Marchant & Higgins 1993) it is suggested that all three species have benefited from the taller marginal vegetation, resulting from elevated water level, for breeding.

Plovers & Waders (Charadriiformes): A poorly represented order with nine species observed, the most commonly recorded species being the Masked Lapwing *Vanellus miles*. Many of these species require shallow water or exposed mud, which is only present, mainly in the CC lagoon, following a prolonged dry period. The species of note within this group is the Comb-crested Jacana *Irediparra gallinacea*, which is listed as vulnerable under the *TSC Act* and is a breeding resident. Of four migratory (East Asian – Australasian Flyway) wader species observed during the surveys and the single supplementary species, Marsh Sandpiper *Tringa stagnatilis* (B. McCauley pers. comm.), only Latham's Snipe *Gallinago hardwickii* was recorded as a regular summer migrant. The last species compared between before and after causeway construction is the Masked Lapwing, which recorded neutral ratios for both observations and average individuals.

Cockatoos & Parrots (Psittaciformes): Represented by nine species and dominated by Rainbow *Trichoglossus haematodus* and Scaly-breasted Lorikeets *T. chlorolepidotus* and Eastern Rosella. Observed on four occasions, the Little Lorikeet *Glossopsitta pusilla* is listed as vulnerable under the *TSC Act*.

Cuckoos (Cuculiformes): Of the eight species observed during surveys, three species have been recorded breeding. A Little Wattlebird *Anthochaera chrysoptera* was recorded feeding an Eastern Koel *Eudynamys orientalis* fledgling while young juveniles of both Fan-tailed *Cacomantis flabelliformis* and Brush Cuckoos *C. variolosus*

were observed. Fan-tailed Cuckoos were recorded all year round and were a dominant call heard throughout winter.

Owls (Strigiformes): The only species recorded was the Eastern Barn Owl *Tyto alba delicatula* during one survey, which was suggested (LWF pers. comm.) to be a transient individual.

Kingfishers (Coraciiformes): Of the six species observed in this order, three have been recorded breeding, which includes a Forest Kingfisher *Todiramphus macleayii* at the southern end of its range (Higgins 1999, Barrett *et al*. 2003). Although not observed breeding, Dollarbird *Eurystomus orientalis* is a regular summer migrant.

Passeriformes

Treecreepers (Climacteridae): Only the one species likely to be observed in this environment, being the White-throated Treecreeper *Cormobates leucophaea*, was observed in low numbers across all survey areas.

Bowerbirds (Ptilonorhynchidae): Both local bowerbirds, Regent *Sericulus chrysocephalus* and Satin *Ptilonorhynchus violaceus* were observed in low numbers across most survey areas.

Fairy-wrens (Maluridae): Well represented with four species observed, of which three species were recorded breeding. One species of particular interest is the Red-backed Fairy-wren, which is towards the southern limit of its range (Higgins *et al*. 2001) and was recorded breeding. Within the GF/CC area, Red-backed Fairy-wrens are considered a summer migrant, with Higgins *et al*. (2001) indicating that some non-breeding season movement occurs away from breeding territories. Two suggestions for the summer visitor status are 1) that birds vocalise or are more visible generally during the breeding season and are hence located more readily and/or 2) that small localised movements occur during the year to and from this particular site.

Scrubwrens, Gerygones & Thornbills (Acanthizidae): Two, Brown Thornbill and Brown Gerygone, of the eight species in this group were the most regularly observed species within two survey areas, being GF/CC and QE respectively. Along with the Brown Gerygone, Yellow Thornbill *Acanthiza nana* was recorded breeding during the surveys.

Pardalotes (Pardalotidae): The two commonly recorded species along the east Australian coast, Spotted *Pardalotus punctatus* and Striated, were observed during the surveys. Comparisons between winter and summer counts indicated Striated Pardalotes predominantly occurred as winter visitors, yet they were also recorded breeding during spring. Stuart (2014) notes Striated Pardalotes as 'usual residents' within the Hunter Region, Higgins & Peter (2002) indicate that they can be 'resident, migratory or dispersive' while Griffioen & Clarke (2002) had strong evidence for the movement classification of this species as 'Towards north inland and coast'. This could suggest the replacement of spring/summer breeding individuals with southern individuals during autumn/winter rather than a full-time resident population.

Honeyeaters (Meliphagidae): Another well represented family with 15 species observed. Six of these species were recorded in more than 75% of surveys and five species were recorded as breeding. Lewin's Honeyeater was one of the most observed species in both GF/CC and QE survey areas while Striped Honeyeater also featured in the top GF/CC observed species. Of particular interest was the observation of a Painted Honeyeater *Grantiella picta* by Rudder (2014), which is listed as vulnerable under the *TSC Act*. Generally found west of the Great Dividing Range, there are only scattered records of this species east of the divide (Higgins *et al*. 2001).

Quail-thrushes & Whipbirds (Psophodidae): Only the Eastern Whipbird *Psophodes olivaceus* was observed within this family.

Sittella (Neosittidae): Represented by a single species, Varied Sittella *Daphoenositta chrysoptera* is listed as vulnerable under the *TSC Act* and had low observation rates across all survey areas.

Cuckoo-shrikes & Trillers (Campephagidae): Well represented with five species observed at low to moderate rates across most sites. Cicadabird *Coracina tenuirostris* was a summer migrant in both the GF/CC and WB survey areas. Several other species may indeed be summer migrants to the Manning Region, but were insufficiently recorded to be calculated as such.

Whistlers & Shrike-thrushes (Pachycephalidae): Crested Shrike-tit was recorded in low numbers within three of the survey areas. Both Golden Whistler *Pachycephala pectoralis* and Grey Shrike-thrush *Colluricincla harmonica* are considered resident.

Orioles & Figbird (Oriolidae): Based on the summer/winter ratio, Olive-backed Orioles are not considered a visitor in the GF/CC area, where they have been recorded breeding during spring and into summer (Carlson 2014). Orioles are considered partially migratory (Marchant 1992; Griffioen & Clarke 2002; Newman 2007 & 2014; Walther & Jones 2008; AJC pers. obs.) with birds dispersing primarily in search of food sources (Walther & Jones 2008). The presence of a fruiting fig tree within EP would support the winter visitor status to this area and with fig trees also present within GF/CC the decreased winter/summer ratio negated the summer visitor status for this survey area.

Woodswallows, Butcherbirds & Currawongs (Artamidae): Three of the six species observed within this family have been recorded breeding. Within the GF/CC area, White-breasted Woodswallows have been recorded in most months of the year, with sightings within the EP only occurring during late winter and spring. In Forster, ~40km south of Cattai Wetlands, White-breasted Woodswallows generally arrive in early/mid spring and depart in mid/late autumn (AJC per. obs.). Moreover, Stuart (2014) lists them as a 'common summer migrant' for the Hunter Region. This suggests that the combined areas provide sufficient food resources to partially sustain an over-wintering population. Generally known as open area foragers, revegetation of previously cleared grazing areas may result in a reduction of both Grey Butcherbird *Cracticus torquatus* and Australian Magpie *Cracticus tibicen* observations within the GF/CC survey area.

Drongo (Dicruridae): Another single species family, Spangled Drongos *Dicrurus bracteatus* were recorded in low numbers across most survey areas, however the autumn count (n = 9) was generally three to four times greater than the other three seasons (n = 2-3). Analysis of Drongo movements by Wood (2012) recognises two distinct patterns for sub-species within NSW. Firstly, a southward movement in autumn from 32°S (Forster) to the far south coast of NSW and a return northward movement in spring and secondly, an altitudinal eastward movement following breeding from the Great Dividing Range to the lower coastal areas with a corresponding westward movement in spring. This altitudinal movement was evident between 21°S (Mackay, Qld) and 31°S (Nambucca Heads). Although Cattai Wetlands are located at the northern end of the north/south movement pattern (31°50'S), altitudinal movements may also be influencing population at this site. Again in Forster, Spangled Drongos were recorded in 77 of 106 survey months in an urban environment, with seasonal percentages (%) being Winter 100, Spring 68, Summer 38 and Autumn 89 (AJC *unpub. data*).

Fantails (Rhipiduridae): Two, Grey Fantail and Willie Wagtail *Rhipidura leucophrys*, of the three species observed are considered resident with both also recorded breeding. Grey Fantail was also one of the most common species in both GF/CC and WB survey areas. The third fantail species, the Rufous Fantail *R. rufifrons*, was recorded as a summer migrant at both GF/CC and WB.

Corvids (Corvidae): Recording rates of the three corvid species observed are lower (low to moderate across all survey areas) than their actual site presence due to the ability, or inability, of observers to differentiate calls if and when they were made. A separate record of Corvid *sp*. was not made.

Flycatchers & Monarchs (Monarchidae): Of the five species observed, only the Magpie-lark *Grallina cyanoleuca* was recorded breeding. While observations of both Leaden Flycatcher *Myiagra rubecula* and Black-faced Monarch *Monarcha melanopsis* were sufficient to calculate their migratory status as a summer visitor, the two Spectacled Monarch *Symposiarchus trivirgatus* and single Restless Flycatcher sightings were in summer also.

Robins (Petroicidae): In contrast to the single observations of a Jacky Winter in the EP and Pale-yellow Robin *Tregellasia capito* at GF/CC, Eastern Yellow Robin was recorded in 98% of all surveys with breeding recorded in several different locations. Considered an 'altitudinal migrant' by Stuart (2014), a pair of Rose Robins *Petroica rosea*, were observed during two separate winter seasons.

Cisticolas (Cisticolidae): Golden-headed Cisticola *Cisticola exilis* was observed at low rates across most survey areas, with more than 50% of records occurring during spring months. This correlates with the propensity for males of the species to call from prominent perches during the breeding season (Higgins *et al*. 2006). As females remain cryptic and do not sing (Higgins *et al*. 2006), numbers observed are most likely underestimated.

Reed-Warblers (Acrocephalidae): The Australian Reed-Warbler *Acrocephalus australis* was recorded throughout the year, but half of these

observations, similar to the Cisticola above, were during spring and another quarter during summer months. Griffioen & Clarke (2002) suggest there is strong evidence for a 'north-west slope line' migration pattern, while Higgins *et al*. (2006) suggests that the species is partly migratory, but that the full range of movements is not clear. Observations throughout the year here suggest that at least some individuals remain all year.

Grassbirds (Megaluridae): Two species of the rank grassland and aquatic vegetation, Australian Tawny *Megalurus timoriensis* and Little Grassbirds *M. gramineus* were recorded in moderate and low rates respectively.

White-eyes (Timaliidae): Although Silvereyes were recorded in more than 75% of surveys and thus assigned a resident status, migratory patterns of sub-species are not well understood (Higgins *et al*. 2006). Observations of the nominate sub-species *lateralis*, commonly referred to as the Tasmanian form, during winter months, supports Griffioen & Clarke's (2002) suggestion of a 'south Y' migration pattern of southern individuals. Therefore the resident population may in fact be a compilation of several transient sub-species rather than a year-round population of individuals.

Swallows & Martins (Hirundinidae): Represented by three species with Welcome Swallow *Hirundo neoxena* recorded breeding under the viewing platform. Observed all year round, average numbers of individuals were three times greater during winter (n = 11; 14.6) than summer (n = 9; 4.9). Griffioen & Clarke (2002) suggest that all three Hirundinidae species observed have strong evidence to support a 'mid line north' migration pattern. As with the White-breasted Woodswallows, the wetland complex appears to support over-wintering swallows that would otherwise migrate further north. Both Fairy *Petrochelidon ariel* and Tree Martins *P. nigricans* were recorded in low numbers in both GF/CC and EP survey areas.

Thrushes (Turdidae): A lone Bassian Thrush was observed at WB during one survey (April 2013) only. Seasonal movement of both ground thrush species is not well understood in the Hunter Region (Williams 2013). The presence of this individual may superficially support the hope of GTCC for the area to act as a conduit for movement of species from the coastal areas into the hinterland.

Starlings (Sturnidae): Common Mynas *Sturnus tristis* were only observed during eight survey months. Stock removal from and revegetation of previous open grazing areas should further reduce the presence of this introduced species from the wetland complex. This species was not recorded after the April 2010 survey.

Mistletoebird (Nectariniidae): Mistletoebirds *Dicaeum hirundinaceum* were recorded consistently throughout the year, but overall average numbers were higher during winter (n = 15; 15.7) than summer (n = 12; 6.5).

Finches (Estrildidae): Red-browed Finch was recorded in all surveys and breeding. As noted earlier, Double-barred Finch was observed only once, as a flock of six. A species favouring the seed heads of rank grasses, Chestnut-breasted Mannikins *Lonchura castaneothorax* were only observed on six occasions. Again, the revegetation works undertaken may impact adversely on this species.

CONCLUSION

The various habitats and communities, many of which are listed under the *TSC Act*, of Cattai Wetlands provide either a home or refuge for a great diversity of bird species. As indicated above, the area may also be partially supporting year-round populations of species that are generally considered migratory. It may also be acting as a conduit for transient species between the coastal reserve of Crowdy Bay National Park and the hinterland area of Coopernook and Lansdowne State Forests, one of the intended outcomes for GTCC. However, the evidence for this is superficial at this stage. Of particular importance is the recording of ten species scheduled under the *TSC Act*, with one, the Comb-crested Jacana, breeding.

Construction of the concrete causeway by GTCC to replace the existing earth bank raised the water level by approximately 200mm which appears to have impacted on the avifaunal composition of species utilising the wetland. This higher level requires longer dry spells to create the muddy margins required for wading species, like egrets and herons, whose observation rates and average numbers have decreased post construction. Not only has the aquatic vegetation surrounding the wetland appeared to have changed in composition

but also the health of the casuarinas standing within the wetland. With the prolonged wetting of their root system combined with an increased impact by birds roosting at their bases, the health of these trees may be in permanent decline. Wet and dry periods are still occurring in the adjacent CC.

Over the duration of the survey period, GTCC has slowly developed small areas surrounding the wetland with the construction of a parking area, walking tracks, information boards, toilets and a large covered seating area. It has also been opened up to the public on weekends and public/school holidays (daylight hours only). This low-key development has helped facilitate GTCC's commitment to use the area as an environmental education centre. Revegetation on previously cleared grazing land and ongoing weed control works will ultimately enhance the area. In the light of these plans, ongoing periodic surveys would be beneficial so that changes over time can be monitored, particularly as the revegetation areas mature, but also to note any impacts that may result from an increase in the visiting public. Nocturnal surveys may also confirm the presence of additional species or clarify the status of bittern species, particularly during spring when they call. The overall results would be instructive for public bodies planning similar rehabilitation of wetlands in the future.

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APPENDIX

Avifaunal list for Cattai Wetlands: List of birds and percentage (%) of times recorded during surveys of Cattai Wetlands between July 2006 and June 2014 and supplementary observations. GF = Giants Footprint, CC = Coopernook Creek, QE = Quarry Extension, WB = Western Block, EP = Electric Paddock (refer to text for descriptions). Birds recorded breeding are shown in bold and supplementary observations are indented. Birds considered as either a winter (W) or a summer (S) visitor have their status shown in the respective survey area column. For species with a visitor status shown in the GF column, the status has been calculated in combination with CC survey area.

Common Name	**Scientific Name**	**GF**	**CC**	**QE**	**WB**	**EP**
Brown Quail	*Coturnix ypsilophora*	29	7	16	4	5
King Quail	*Excalfactoria chinensis*					
Plumed Whistling-Duck	*Dendrocygna eytoni*					
Wandering Whistling-Duck	*Dendrocygna arcuata*	5				
Black Swan	***Cygnus atratus***	84	47	4	2	16
Australian Wood Duck	*Chenonetta jubata*	9	5			
Pink-eared Duck	*Malacorhynchus membranaceus*					
Australasian Shoveler	*Anas rhynchotis*	17	9			
Grey Teal	***Anas gracilis***	62	30	4		5
Chestnut Teal	***Anas castanea***	71	53	4		7
Mallard / Pacific Black Hybrid	*Anas hybrid*	2				
Pacific Black Duck	***Anas superciliosa***	95	82	16	11	43
Hardhead	*Aythya australis*	41	9			

Common Name	Scientific Name	GF	CC	QE	WB	EP
Australasian Grebe	*Tachybaptus novaehollandiae*	67	9			
Hoary-headed Grebe	*Poliocephalus poliocephalus*	3				
Rock Dove	*Columba livia*					2
White-headed Pigeon	*Columba leucomela*	21	18	12	28	16
Spotted Dove	*Streptopelia chinensis*	3			2	
Brown Cuckoo-Dove	*Macropygia amboinensis*	29	18	20	35	5
Emerald Dove	*Chalcophaps indica*	3	2		4	
Common Bronzewing	*Phaps chalcoptera*	2			7	
Crested Pigeon	*Ocyphaps lophotes*	5	18		4	23
Peaceful Dove	*Geopelia striata*	3				
Bar-shouldered Dove	*Geopelia humeralis*	79	63	64	67	50
Wonga Pigeon	*Leucosarcia melanoleuca*		2			
Topknot Pigeon	*Lopholaimus antarcticus*	10	2		9	5
Tawny Frogmouth	*Podargus strigoides*	2				2
White-throated Nightjar	*Eurostopodus mystacalis*					
Australian Owlet-nightjar	*Aegotheles cristatus*					
White-throated Needletail	*Hirundapus caudacutus*	10 S		8	11 S	2
Australasian Darter	*Anhinga melanogaster*	14 S	7			
Little Pied Cormorant	*Microcarbo melanoleucos*	47	18	12	4	7
Great Cormorant	*Phalacrocorax carbo*	16 S	2		4	2
Little Black Cormorant	*Phalacrocorax sulcirostris*	43	18		2	2
Pied Cormorant	*Phalacrocorax varius*	10	2	4	2	
Australian Pelican	*Pelecanus conspicillatus*	47	14		19	32 S
Black-necked Stork [E]	*Ephippiorhynchus asiaticus*	10 W	7			7
Australasian Bittern [E]	*Botaurus poiciloptilus*					2
White-necked Heron	*Ardea pacifica*	19	16			18
Great Egret	*Ardea alba*	14	14		2	11
Intermediate Egret	*Ardea intermedia*	19	4		4	5
Cattle Egret	*Ardea ibis*	9	9		2	16 W
Striated Heron	*Butorides striatus*		2			
White-faced Heron	*Egretta novaehollandiae*	48	39	8		48
Little Egret	*Egretta garzetta*	3				
Nankeen Night-Heron	*Nycticorax caledonicus*	5	2			
Glossy Ibis	*Plegadis falcinellus*	2				2
Australian White Ibis	*Threskiornis molucca*	16	12		6	18
Straw-necked Ibis	*Threskiornis spinicollis*	19	11	12	7	27 W
Royal Spoonbill	*Platalea regia*	9	2			7
Osprey [V]	*Pandion haliaetus*	7	2			2
Black-shouldered Kite	*Elanus axillaris*	10	4			9
Square-tailed Kite [V]	*Lophoictinia isura*				7	
Pacific Baza	*Aviceda subcristata*		2		2	
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	40	9	4	9	5
Whistling Kite	*Haliastur sphenurus*	48	28	8	15	27

[V] - Vulnerable under *Threatened Species Conservation Act 1995* (NSW)
[E] - Endangered under *Threatened Species Conservation Act 1995* (NSW)

Common Name	Scientific Name	GF	CC	QE	WB	EP
Brahminy Kite	*Haliastur indus*	9	2		2	5
Brown Goshawk	*Accipiter fasciatus*	7	9	4	9	5
Collared Sparrowhawk	*Accipiter cirrocephalus*	3	2	4		
Grey Goshawk	***Accipiter novaehollandiae***	9	2	8	11	7
Swamp Harrier	*Circus approximans*	29	16	4	4	25 S
Wedge-tailed Eagle	*Aquila audax*	3			2	11
Little Eagle [V]	*Hieraaetus morphnoides*	5			2	
Nankeen Kestrel	*Falco cenchroides*	3	4			7
Brown Falcon	*Falco berigora*	3	2	4		5
Australian Hobby	*Falco longipennis*	3		4		5
Purple Swamphen	***Porphyrio porphyrio***	66	74			14
Lewin's Rail	*Lewinia pectoralis*			4		
Buff-banded Rail	*Gallirallus philippensis*	2				
Dusky Moorhen	***Gallinula tenebrosa***	41	11			2
Eurasian Coot	*Fulica atra*	36	9			
Black-winged Stilt	*Himantopus leucocephalus*	7				
Black-fronted Dotterel	*Elseyornis melanops*		5			
Masked Lapwing	*Vanellus miles*	38	26		6	57
Comb-crested Jacana [V]	***Irediparra gallinacea***	28	2			
Latham's Snipe	*Gallinago hardwickii*	17 S	18		2	11
Black-tailed Godwit [V]	*Limosa limosa*	2				
Eastern Curlew	*Numenius madagascariensis*	2				
Marsh Sandpiper	*Tringa stagnatilis*					
Sharp-tailed Sandpiper	*Calidris acuminata*	3				
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	14	7	4	11	5
Galah	*Eolophus roseicapillus*	3	2		6	5
Rainbow Lorikeet	***Trichoglossus haematodus***	36	16	28 W	41	9
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	55	26	24	39	14
Musk Lorikeet	*Glossopsitta concinna*	3	2	8	7	2
Little Lorikeet [V]	*Glossopsitta pusilla*	2		4	6	
Australian King-Parrot	*Alisterus scapularis*	7	4		4	7
Crimson Rosella	*Platycercus elegans*				9	
Eastern Rosella	*Platycercus eximius*	81	70	16	63	91
Pheasant Coucal	*Centropus phasianinus*	26 S			19 S	5
Eastern Koel	***Eudynamys orientalis***		2		2	2
Channel-billed Cuckoo	*Scythrops novaehollandiae*	12 S	9		15 S	
Horsfield's Bronze-Cuckoo	*Chalcites basalis*	12	11		7	7
Shining Bronze-Cuckoo	*Chalcites lucidus*	31	19		26 S	7
Fan-tailed Cuckoo	***Cacomantis flabelliformis***	64	53	36	63	25
Brush Cuckoo	***Cacomantis variolosus***	21 S	23	4	24 S	11
Pallid Cuckoo	*Cacomantis pallidus*	3	4		6	
Barn Owl	*Tyto alba*	2				
Azure Kingfisher	*Ceyx azureus*	34	14	4		
Laughing Kookaburra	***Dacelo novaeguineae***	84	47	36	78	66

[V] - Vulnerable under *Threatened Species Conservation Act 1995* (NSW)

Common Name	Scientific Name	GF	CC	QE	WB	EP
Forest Kingfisher	***Todiramphus macleayii***	7	5	4		
Sacred Kingfisher	***Todiramphus sanctus***	40 S	33	4	41 S	23 S
Rainbow Bee-eater	*Merops ornatus*	3	4			2
Dollarbird	*Eurystomus orientalis*	16 S	9	16	13 S	7
White-throated Treecreeper	*Cormobates leucophaea*	36	32	32	63	7
Regent Bowerbird	*Sericulus chrysocephalus*	14	11		11	
Satin Bowerbird	*Ptilonorhynchus violaceus*	14 S	14	16	28	5
Superb Fairy-wren	***Malurus cyaneus***	100	86	68	89	77
Red-backed Fairy-wren	***Malurus melanocephalus***	21 S	4	16	22	
Variegated Fairy-wren	***Malurus lamberti***	71	49	44	61	18
Southern Emu-wren	*Stipiturus malachurus*	41	33	12	28	39
White-browed Scrubwren	*Sericornis frontalis*	55	18	20	33	7
Large-billed Scrubwren	*Sericornis magnirostris*	3			7	
Brown Gerygone	***Gerygone mouki***	81	51	96	85	
White-throated Gerygone	*Gerygone olivacea*	21 S	30	12	39 S	9
Striated Thornbill	*Acanthiza lineata*	2	2	4	6	7
Yellow Thornbill	***Acanthiza nana***	93	61	44	35	27
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	2	7		6	5
Brown Thornbill	*Acanthiza pusilla*	97	82	84	85	41
Spotted Pardalote	*Pardalotus punctatus*	14	9	16	30	2
Striated Pardalote	***Pardalotus striatus***	9 W	11	12	24 W	
Eastern Spinebill	*Acanthorhynchus tenuirostris*	66	68	48	69	27 W
Lewin's Honeyeater	*Meliphaga lewinii*	100	70	96	94	34
Yellow-faced Honeyeater	***Lichenostomus chrysops***	67	56	48	70	34
White-eared Honeyeater	*Lichenostomus leucotis*	2				
Noisy Miner	*Manorina melanocephala*	74	26	28 S	80	16
Little Wattlebird	***Anthochaera chrysoptera***	28	26		19	9
Red Wattlebird	*Anthochaera carunculata*	12	4		2	2
Scarlet Honeyeater	***Myzomela sanguinolenta***	69	63	40	69	18 W
Brown Honeyeater	*Lichmera indistincta*	41	54	12	9	7
New Holland Honeyeater	*Phylidonyris novaehollandiae*	2			4	
White-cheeked Honeyeater	***Phylidonyris niger***	41	21	20	57	7
White-naped Honeyeater	*Melithreptus lunatus*	2	2		13 W	
Noisy Friarbird	*Philemon corniculatus*	43	37	28	52	23
Little Friarbird	*Philemon citreogularis*	2				
Striped Honeyeater	***Plectorhyncha lanceolata***	79	84	44	37	80
Painted Honeyeater [V]	*Grantiella picta*					
Eastern Whipbird	*Psophodes olivaceus*	84	37	72	85	11
Varied Sittella [V]	*Daphoenositta chrysoptera*	2	5	4	13	2
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	45	40	8	46	34
White-bellied Cuckoo-shrike	*Coracina papuensis*	16	7		22	2
Cicadabird	*Coracina tenuirostris*	16 S	16	12	30 S	5
White-winged Triller	*Lalage tricolor*	3				
Varied Triller	*Lalage leucomela*		2		2	

[V] - Vulnerable under *Threatened Species Conservation Act 1995* (NSW)

Common Name	**Scientific Name**	**GF**	**CC**	**QE**	**WB**	**EP**
Crested Shrike-tit	*Falcunculus frontatus*	3	7		20 S	
Golden Whistler	*Pachycephala pectoralis*	79	53	64	74	11
Rufous Whistler	*Pachycephala rufiventris*	45 S	35	28	31	27
Grey Shrike-thrush	*Colluricincla harmonica*	84	68	52	69	45
Australasian Figbird	*Sphecotheres vieilloti*	14 S	23	12	9	5
Olive-backed Oriole	***Oriolus sagittatus***	38	37	12	33	16 W
White-breasted Woodswallow	***Artamus leucorynchus***	48	33	4	9	14 W
Dusky Woodswallow	*Artamus cyanopterus*	5			2	5
Grey Butcherbird	***Cracticus torquatus***	72	58	36	80	61
Pied Butcherbird	***Cracticus nigrogularis***	57	40	28	41	66
Australian Magpie	*Cracticus tibicen*	76	51	16	70	77
Pied Currawong	*Strepera graculina*	5	4		19	2
Spangled Drongo	*Dicrurus bracteatus*	16	9	12	15	
Rufous Fantail	*Rhipidura rufifrons*	14 S	11	12	24 S	2
Grey Fantail	***Rhipidura fuliginosa***	100	84	88	96	48
Willie Wagtail	***Rhipidura leucophrys***	81	77	20	13	57
Australian Raven	*Corvus coronoides*	26	33	8	26	36
Forest Raven	*Corvus tasmanicus*	17	11	24	17	14
Torresian Crow	*Corvus orru*	45	25	12	26	27
Leaden Flycatcher	*Myiagra rubecula*	5	4		17 S	2
Restless Flycatcher[a]	*Myiagra inquieta*					
Black-faced Monarch	*Monarcha melanopsis*	10 S	7	4	24 S	
Spectacled Monarch	*Symposiarchus trivirgatus*		2		2	
Magpie-lark	***Grallina cyanoleuca***	33	32	4	7	48
Jacky Winter	*Microeca fascinans*					2
Rose Robin	*Petroica rosea*	2	2		2	
Pale-yellow Robin	*Tregellasia capito*	2			2	
Eastern Yellow Robin	***Eopsaltria australis***	91	54	88	93	14
Golden-headed Cisticola	*Cisticola exilis*	7	5		2	9
Australian Reed-Warbler	*Acrocephalus australis*	9	30		2	5
Tawny Grassbird	*Megalurus timoriensis*	40	28	16	7	41
Little Grassbird	*Megalurus gramineus*	7	21			7
Silvereye	***Zosterops lateralis***	78	63	52	61	23 S
Welcome Swallow	***Hirundo neoxena***	55	39		4	23
Fairy Martin	*Petrochelidon ariel*	7	7			7
Tree Martin	*Petrochelidon nigricans*	12	9			5
Bassian Thrush	*Zoothera lunulata*				2	
Common Myna	*Sturnus tristis*	2	4			16 S
Mistletoebird	***Dicaeum hirundinaceum***	69	72	40	15	50
Double-barred Finch	*Taeniopygia bichenovii*					2
Red-browed Finch	***Neochmia temporalis***	98	70	80	85	41
Chestnut-breasted Mannikin	*Lonchura castaneothorax*	5	4		2	
Totals	186	163	142	85	125	122

[a] - Recorded in farmland immediately adjacent