

Prospect Nature Reserve, New South Wales

(Supplementary data)

Aim: Avian research at Prospect Nature Reserve has been conducted as part of an ongoing longitudinal study to document and monitor the avian faunas occupying remnant areas of the Cumberland Plain Woodland in the north-western sector of the Cumberland Plain. Other study sites include: Scheyville National Park (Egan *et al.* 1997), Agnes Banks Nature Reserve (Farrell *et al.* 2012), Nurragingy Reserve (Farrell *et al.* 2015), Windsor Downs Nature Reserve and Wianamatta Nature Reserve.

Location: 33° 48' S; 150° 54' E. Elevation 61 metres above sea level. The reserve is located at Prospect, approximately five kilometres south of Blacktown.

Description: Prospect Nature Reserve (Fig. 1) borders Prospect Reservoir and comprises an area of 325.3 hectares.

The reserve is located on the Cumberland Plain, with a surface geology of predominantly Wianamatta Group shales. The vegetation of the reserve consists of remnant Cumberland Plain Woodland, listed as a *Critically Endangered Ecological Community* under the NSW Threatened Species Conservation Act 1995 (TSC Act) and the Commonwealth Environment

Protection and Biodiversity Conservation Act 1999 (EPBC Act). Within Prospect Nature Reserve, both Shale Plains Woodland and Shale Hills Woodland elements of the Cumberland Plain Woodland are present (Tozer 2003).

Approximately two-thirds of the reserve has been mapped as Shale Hills Woodland, with a canopy comprising Grey Box *Eucalyptus moluccana*, Forest Red Gum *E. tereticornis* and Narrow-leaved Ironbark *E. crebra*, and a shrubby understorey dominated by Blackthorn *Bursaria spinosa*. The remainder of the reserve is Shale Plains Woodland, with *E. moluccana*, *E. tereticornis*, Spotted Gum *Corymbia maculata* and Thin-leaved Stringybark *E. eugenioides* representing the dominant canopy species, and an understorey similar to that of Shale Hills Woodland. The study site (Fig. 1) contains both Shale Hills and Shale Plains Woodlands.

The margins of the reservoir form a shallow wetland environment. Although this habitat was created by planned inundation, it is now dominated by *Juncus* spp. and is one of the few intact examples of this vegetation type on the Cumberland Plain.



Figure 1. Banding Site Prospect Reservoir.

Image courtesy of Google Earth

A number of exotic plant species occur at the banding site: African Lovegrass *Eragrostis curvula* and Bridal Creeper *Asparagus asparagoides* are now widespread and established, and Crofton Weed *Ageratina adenophora*, *Asparagus* spp., African Olive *Olea europea* subsp. *cuspidata* and Scotch Thistle *Onopordum acanthium* are also present in substantial numbers.

There is a section in the east of the reserve which is open to the public. The reserve also contains a network of unsealed fire-trails, as well as cleared powerline and water infrastructure easements.

Land use adjacent to the site includes: rural properties, sporting and recreational facilities (including Eastern Creek International Raceway, Western Sydney International Dragway, Eastern Creek International Karting Raceway and Wet 'n' Wild water park) and industrial areas. Due to this surrounding development there is little connectivity between the reserve and other areas of remnant vegetation. South-east of the Reservoir, some very small remnants are contained in Mar-Rong Reserve, Grey Box Reserve and Gipps Road Park, and a very narrow corridor of vegetation remains along Prospect Creek. The nearest large protected areas are Nurragingy Reserve (~5km to the north-east) and Kemps Creek Nature Reserve (~10km south-west).

A corridor of vegetation along Eastern Creek may provide limited connectivity between Prospect and Nurragingy reserves.

Status History: Prospect Reservoir was established in 1869 as the central distribution site for Sydney's water supply and most of the surrounding area has been restricted from public access since that time (DECC 2008). Prospect Nature Reserve was gazetted in February 2007 (OEH 2012) and is part of the now Prospect Special Area where public entry is prohibited to protect the water supply from possible contamination. The Nature Reserve is managed by the Office of Environment and Heritage (OEH) whilst the Sydney Catchment Authority (SCA) has responsibility for management of the Water Supply Reserve on the southern shore of the reservoir.

Previous Records: A list of bird species for Prospect Nature Reserve (Appendix 1) has previously been presented in DECC (2008).

Duration of Project: March 2005 – May 2007 (first study period = 19 months), July 2010 – June 2011 (second study period = 10 months) and August 2014 – June 2015 (third study period = 7 months). Entry into the site was forbidden if more than 10 millimetres of rain had fallen across the area 48 hours prior to our planned visit. Due to these restrictions visits were not made in: July 2005; January, April, June, July and September 2006; February and March 2007; January and April 2011; December 2014 and January, March and April 2015.

METHODS

The banding site was established in the north-east corner of the reserve which, at the time of commencement of this study, was more heavily wooded (Fig. 1).

Banding was carried out once per month, weather permitting. On most occasions, 14 nets of mesh size 31 millimetres were erected, giving a total average length of 197 metres (range 126

– 222 metres) and were open from sunrise for an average of 4.6 hours (range 3.5 – 5.5 hours). Nets were erected in the same positions during every banding session. Birds were individually marked using bands supplied by the Australian Bird and Bat Banding Scheme (ABBBS).

Capture rates are presented as the number of birds trapped per hour per 100 metres of net erected. Any bird caught subsequent to the day it was banded was designated a 're-trap', no matter how many times it was captured or the length of time that had passed since it was banded. The percentage of recaptures for each species was then calculated as a proportion of banded birds that were re-trapped.

On each banding day during the first study period, a member of the team traversed the reserve and listed all birds seen and heard. During the second and third study periods only a list of all bird species incidentally heard or sighted in and near the study site was compiled. In this study we primarily examine the community of terrestrial birds; however, a list of waterbirds is also presented in Appendix 1. Scientific names follow Christidis and Boles (2008).

RESULTS AND DISCUSSION

A total of 1019 individual birds of 40 species (Table 1) were trapped during the three study periods. Overall, a total of 108 bird species was recorded, excluding waterbirds (Tables 1 and 2).

Species capture rates are presented in Table 1. Overall capture rates are displayed in Figure 2. The three main peaks seen in June 2005, October 2006 and June 2015 are a consequence of a high capture rate of Silvereyes *Zosterops lateralis*. Some minor peaks reflect periodically high capture rates of some common species including Superb Fairy-wrens *Malurus cyaneus* (e.g. June 2011) and Red-browed Finches *Neochmia temporalis* (e.g. September 2014).

Total average monthly capture rates for all birds during the first and second study periods were identical (3.9) whereas the rate for the third period was 5.2. The higher capture rate during the third study period was mainly due to the large number of Silvereyes caught in May and June. Average combined monthly capture rates for all species for the three periods (Fig. 3) show a marked spike in June due to an increase in the number of Silvereyes and to a lesser extent Superb Fairy-wrens. Capture rates fell during the hotter summer months.

The most numerous species in order of numbers captured were the Silvereye, Superb Fairy-wren, Red-browed Finch, Yellow-faced Honeyeater *Lichenostomus chrysops*, Golden Whistler *Pachycephala pectoralis*, White-browed Scrubwren *Sericornis frontalis* and Grey Fantail *Rhipidura albiscapa* (Table 1).

Table 3 shows the percentage contribution of these species to the overall number of captures for October–May in 2005–06, 2006–07, 2010–11 and 2014–2015 (comparison was restricted to these months because banding did not occur in some months due to inclement weather). Variability in capture rates of Yellow-faced Honeyeaters and Silvereyes over the three study periods can be attributed to the timing of banding visits and numbers of birds comprising the migratory flocks passing through the reserve.

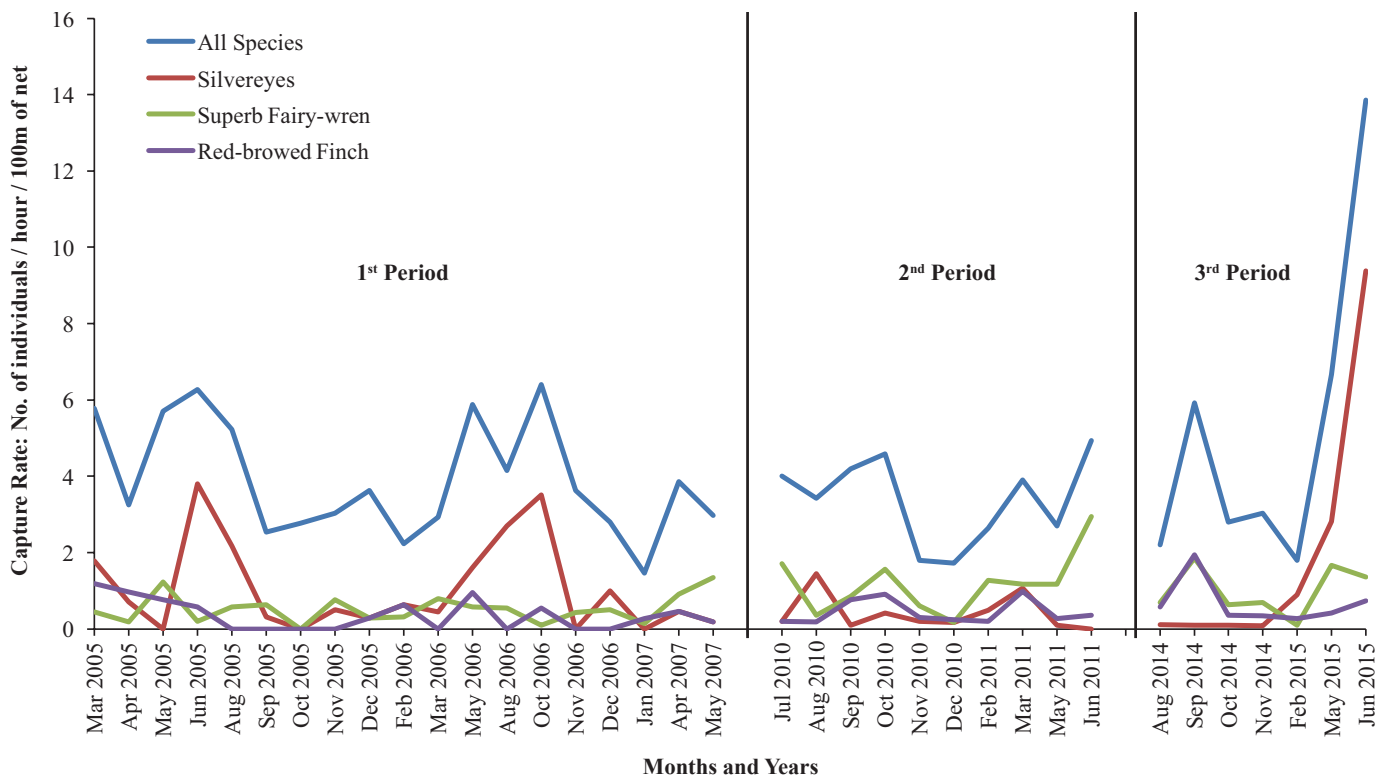


Figure 2. Capture rates for the 1st, 2nd and 3rd periods of the study.

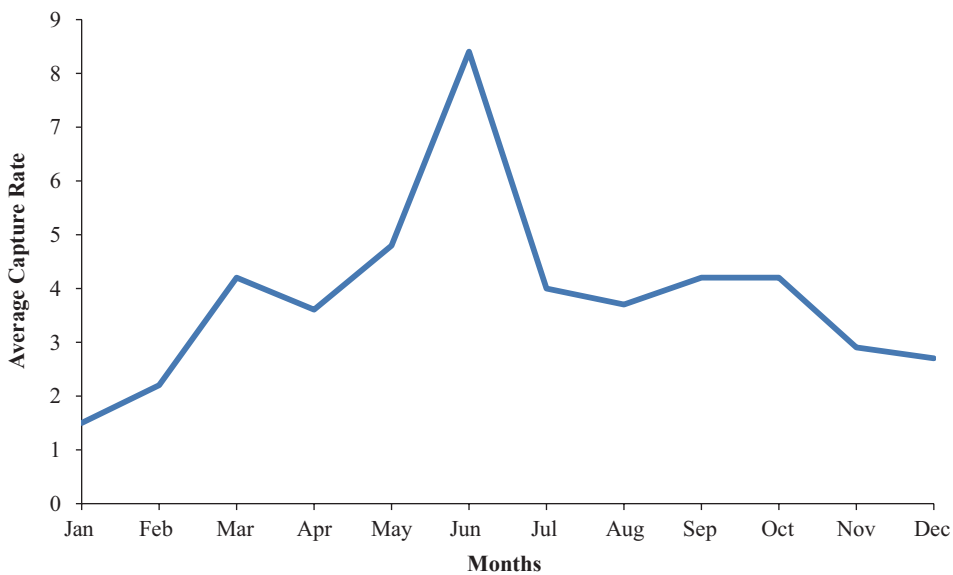


Figure 3. Average capture rate of all species per month – includes data from all three study periods.

Several honeyeater species (Scarlet Honeyeater *Myzomela sanguinolenta*, White-naped Honeyeater *Melithreptus lunatus*, Eastern Spinebill *Acanthorhynchus tenuirostris* and Brown-headed Honeyeater *Melithreptus brevirostris*) were intermittent visitors to the banding site and generally were present when the tree species in the reserve were in flower.

Re-traps

Over the three study periods, 15 species were re-trapped (Table 1), of which 11 species were re-trapped in study periods subsequent to their original banding (Table 4). Survival of

banded individuals within each study period is shown in Table 5, and survival between study periods is shown in Table 4. The two longest-surviving individuals in this study had minimum ages of 8 years 7 months (Golden Whistler) and 9 years 5 months (Yellow Thornbill *Acanthiza nana*).

The number of re-traps between study periods was higher at Prospect Nature Reserve than at other published sites on the Cumberland Plain: Agnes Banks Nature Reserve (Farrell *et al.* 2012) and Nurragingy Reserve (Farrell *et al.* 2015). This may be a consequence of the greater length of time between study periods at Agnes Banks (7 years) and Nurragingy (6 years).

Table 3

Percentage contribution of the seven most common species to total captures during October to May in 2005–06, 2006–07, 2010–11 and 2014–15.

Species	2005–06	2006–07	2010–11	2014–15
Silvereye	18.8	28.3	13.5	26.0
Superb Fairy-wren	13.6	15.5	33.7	21.3
Red-browed Finch	10.2	6.4	16.6	10.0
Golden Whistler	6.8	7.0	2.1	2.7
White-browed Scrubwren	4.5	3.2	11.9	10.0
Grey Fantail	4.5	3.2	1.0	0.7
Yellow-faced Honeyeater	1.1	5.9	3.1	10.7
Total contribution	59.5	69.5	81.9	81.4

The majority of the species re-captured were resident species. The only exceptions were Golden Whistlers (a winter migrant at the site) and one Rufous Whistler *Pachycephala rufiventris* (summer migrant).

Migrant species

Seventeen well-known 'summer' migratory species were recorded visiting the site. They include six species of cuckoo (Channel-billed Cuckoo *Scythrops novaehollandiae*, Brush Cuckoo *Cacomantis variolosus*, Fan-tailed Cuckoo *C. flabelliformis*, Pallid Cuckoo *C. pallidus*, Horsfield's Bronzecuckoo *Chalcites basalis* and Eastern Koel *Eudynamis orientalis*), White-throated Gerygone *Gerygone albogularis*, Black-faced Monarch *Monarcha melanopsis*, Rufous Whistler, White-winged Triller *Lalage sueurii*, Dusky Woodswallow *Artamus cyanopterus*, Fairy Martin *Hirundo ariel*, Dollarbird *Eurystomus orientalis*, Sacred Kingfisher *Todiramphus sanctus*, Clamorous Reed-warbler *Acrocephalus australis*, Rufous Songlark *Cincloramphus mathewsi*, Leaden Flycatcher *Myiagra rubecula* and Rufous Fantail *Rhipidura rufifrons*. Of these, only the Brush Cuckoo, Fan-tailed Cuckoo, Black-faced Monarch, Sacred Kingfisher and Rufous Fantail were captured (the remainder being observed or heard only), and none were re-trapped.

Silvereye capture rates show a prominent peak in June, which was nearly double that of other months (Fig. 2) and reflect the northward movement of the migratory races/subspecies of this species. The slight increase in September/October may reflect the migrating birds returning southward. The flocks, during the winter months, consisted of a mixture of sub-species (*Z. l. cornwalli*, *Z. l. westernensis* and *Z. l. lateralis*).

'Winter' migrants included the Rose Robin *Petroica rosea*, which was recorded at the site from April to September and captured on several occasions, Brown Gerygone *Gerygone mouki* (captured in May, June and August) and the Swift Parrot *Lathamus discolor* sighted in August 2005.

Golden Whistlers arrived at Prospect Nature Reserve as early as March and departed in November. Rufous Whistlers arrived in September/October and left in March/April the following year, with the exception of one record in June 2005.

Table 4

Longest time interval between banding and re-trapping for those species re-trapped in period/s subsequent to the one in which they were banded.

	1st period to 2nd period	2nd period to 3rd period	1st period to 3rd period
Eastern Yellow Robin	6 yrs 2 mths 6 yrs	4 yrs 4 mths	
Golden Whistler		4 yrs 11 mths	8 yrs 7 mths*
Yellow Thornbill			9 yrs 5 mths*
White-browed Scrubwren		4 yrs 4 mths 4 yrs 1 mth 3 yrs 8 mths	
Superb Fairy-wren	3 yrs 7 mths 3 yrs 5 mths 5 yrs 2 mths	4 yrs 1 mth 4 yrs 1 mth 4 yrs 7 mths 3 yrs 9 mths 4 yrs 4 mths 4 yrs 11 mths 4 yrs 7 mths 4 yrs 8 mths 3 yrs 6 mths 3 yrs 5 mths 4 yrs	
Variagated Fairy-wren		4 yrs 3 mths	
Silvereye	4 yrs 6 mths		
Yellow-faced Honeyeater	3 yrs 11 mths		
Noisy Miner	5 yrs 4 mths 3 yrs 9 mths		
Red-browed Finch		4 yrs 1 mth	
Red-whiskered Bulbul	5 yrs 3 mths		

*Also trapped in the 2nd period.

These two species are not mutually exclusive at Prospect Nature Reserve; an overlap of three months was recorded in 2005 and one to two months overlap recorded in other years (Table 1). An overlap in residency of these species of up to three months has also been reported for Nurragingy Reserve (Farrell *et al.* 2015), and an overlap of one to two months was apparent at Agnes Banks Nature Reserve (Farrell *et al.* 2012).

At Prospect Nature Reserve most Golden Whistlers were only re-trapped during the season in which they were originally banded although one individual returned to the site over many years (Table 4). Site fidelity by some individuals of this species has also been reported from several other localities on the Cumberland Plain: Nurragingy Reserve (Farrell *et al.* 2015), and Agnes Banks Nature Reserve (Farrell *et al.* 2012) where one bird returned for two seasons after banding (Farrell 2012a).

A similar pattern of return is also apparent in Rufous Whistlers; one individual returned to Prospect Nature Reserve in the season subsequent to its banding. This was also the case at Agnes Banks Nature Reserve where two individuals returned in two subsequent seasons after banding (Farrell 2012a).

Table 5

Survival of banded individuals within each study period based on re-traps. Figures are numbers of individuals known to be alive. Longest periods are highlighted for those species not re-trapped in subsequent study periods. Longest periods for other species are shown in Table 4.

Species	Months																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Grey Fantail	3	1	1						1																	
Eastern Yellow Robin	5	3	2	3	1	2	2	2	1		1	2	1				1		2							
Golden Whistler	6	3	1		1		1							1												
Rufous Whistler												1														
Yellow Thornbill																								1		1
Striated Thornbill	3	1	1		1	1		2				1														
White-browed Scrubwren	8	11	7	1	2	6	1		5			1		1			1	1	2	1						
Superb Fairy-wren	20	7	22	7	3	10	5	6	11	6	2	3			2			2	2							
Variiegated Fairy-wren	4	2	1		2	1			1	1		1														
Silveryeye	3	5	1	1	1	2	1		1						1	1		1				1			1	
Yellow-faced Honeyeater	2	7	1		1	1			1																	
Noisy Miner							1																			
Red-browed Finch	16	4	4	3	3			1	7	2	1		1	1		1		1				1				
Red-whiskered Bulbul					1	1		1													1					
Common Blackbird	1	1																								

The Black-faced Monarch, a summer breeding migrant to coastal south-east Australia from New Guinea, was captured on only two occasions, both in October. On the first occasion, five were trapped on the same morning in the same net, suggesting that they were moving in a flock during their southward migration. Whilst this species is generally seen singly or in pairs, it has on occasion been observed to move in small family groups or small parties during migration (Higgins 2006), and sometimes joins mixed-species flocks (Coates 1990a; Makin 1961; Marchant 1986). Flocks of 8–10 birds have been reported during southward migration in north-east Queensland (Campbell and Barnard 1917), and groups of at least three have been observed on southward migration near Sydney (McGill 1943).

Intraspecific interactions

Of three Striated Thornbills *Acanthiza lineata* banded together on the same day in May 2005, two were recaptured together two years later in May 2007, but their sexes were not ascertained so it is not known whether they were a pair or just feeding companions.

Two White-browed Scrubwrens were caught together on three separate occasions over a period of five months. The female was banded in November 2010 as a first-year bird, then subsequently re-trapped with the male (age 2+ when banded) in December 2010, February 2011 and May 2011 (Farrell 2012b). White-browed Scrubwrens generally breed in pairs or trios consisting of a dominant pair and subordinate male helper, though occasionally there may be more than one male helper (Magrath *et al.* 2000). Females are largely site-faithful once they have found a breeding vacancy, and male dominance is stable within the breeding season and between

years (Whittingham *et al.* 1997). It is likely, therefore, that the two birds captured together on multiple occasions were either the dominant breeding pair, or a subordinate male together with the breeding female.

Movements

No banded birds were reported to the ABBBS from outside the Reserve.

Threatened species

A number of threatened species were recorded in the reserve during our study. The Swift Parrot was recorded in August 2005. This species is listed as *critically endangered* under the EPBC Act and as *endangered* under the TSC Act. The following species recorded in the reserve are all listed as *vulnerable* under the TSC Act: the Little Lorikeet *Glossopsitta pusilla* (recorded once in January 2007); Little Eagle *Hieraaetus morphnoides* (one individual sighted in June 2011); Dusky Woodswallow *Artamus cyanopterus* (recorded once during the first period); and Varied Sittellas *Daphoenositta chrysoptera* (recorded during nearly every visit in the first study period and one individual was trapped in October 2006, three times during the second but only once during the third period). The apparent decline in sightings of the latter species may be an artefact of our sampling; active observational surveys were conducted during the first period, whilst only incidental observations were recorded during the subsequent periods.

Exotic species

Several exotic species were recorded in the reserve during our study: Spotted Dove *Streptopelia chinensis*, European

Goldfinch *Carduelis carduelis*, Common Myna *Sturnus tristis*, Red-whiskered Bulbul *Pycnonotus jocosus* and Common Blackbird *Turdus merula*. The latter two species were the only species trapped – Red-whiskered Bulbuls were caught throughout the study while Common Blackbirds were only captured during the first study period. There are also several introduced species that have previously been recorded in the reserve but were not sighted or heard during our study: the Rock Dove *Columba livia*, House Sparrow *Passer domesticus* and Common Starling *Sturnus vulgaris*.

Changes in avian community

Several species were captured during the first banding period but not trapped during the second or third period:

- Brush Cuckoo – one individual of this species was banded in January 2007, but none were recorded subsequently. This represented the first record of the species for the reserve.
- Striated Thornbill – several individuals were trapped during autumn in 2005 and 2007, and the species was sighted periodically throughout this first study period. It was not sighted during the second period and only once during the third period.
- Double-barred Finch *Taeniopygia bichenovii* – two individuals were captured in February-March 2006 and the species was recorded intermittently throughout the first study period, but not at all during the second or third period. The last record for the reserve seems to be a sighting reported in 2009 (Vella and Zografos 2009). A similar pattern of decline has previously been observed at other reserves on the Cumberland Plain. The species was no longer recorded at Nurragingy Nature Reserve after June 2002 (Farrell *et al.* 2015). It was not seen at Agnes Banks Nature Reserve from August 2008 to July 2009, a site at which they had previously been regularly captured (Farrell *et al.* 2012). Double-barred Finches were sighted after this period and documented on the Cumberland Bird Observers Club Bird Atlas Database but no indication of numbers present was given. This pattern of decline/disappearance from reserves raises concerns about the species' viability in the region.
- Rufous Fantails – visitors to the site during Spring/Summer/Autumn months in 2005–06, 2006–07 and 2010–11 but were neither trapped nor sighted during the third study period of 2014–15.
- White-plumed Honeyeaters – dramatically declined over the three study periods. This species was sighted during most banding visits during the first period with eight individuals being banded, but then it was only recorded on two occasions during the second period and not at all during the third period.

There were a large number of different species that were heard or sighted during the first period and not recorded in subsequent periods. Many of these were single or infrequent sightings. This is a consequence of the more thorough sampling during the first period and the shorter duration of the second and third study periods so direct comparisons should be treated with caution.

During the course of this study there was a notable decline in both capture rates and sightings of the White-plumed Honeyeater *Lichenostomus penicillatus*, Spotted Pardalote *Pardalotus punctatus*, Striated Thornbill, Weebill *Smicromis brevirostris* and an increase in the captures of Noisy Miners *Manorina melanocephala* and observations of Bell Miners *Manorina melanocephala*. At other sites on the Cumberland Plain (Nurragingy Reserve and Scheyville National Park) Bell Miners have displaced resident species that feed either partially or exclusively on sap sucking insects (authors' pers. ob.; Farrell *et al.* in prep.).

Bell Miners were first recorded at the reserve on two occasions in 2004 prior to our study: two individuals were observed in the first instance and then a single bird on the second occasion (Vella 2004a,b); it was noted at the time that no colony had yet been established. Whilst no Bell Miners were heard or sighted during our first study period in 2005–07, their presence during nearly every visit in the second period suggests a colony was established sometime between 2007 and 2010. Vella (2009) reported that Bell Miners were present in the reserve in 2009, which he believed could be a newly-established colony.

Whilst it may be tempting to attribute the decline in capture rates of leaf-gleaning species (Weebill, Spotted Pardalote, Striated and Yellow Thornbills) and the White-plumed Honeyeater during the second and third study period to the establishment of the Bell Miner colony, Bell Miners were not present within the banding area or immediate surrounds. It is therefore unlikely that their presence would have affected our capture rates. The Noisy Miner, on the other hand, was sighted on every banding visit and caught with increasing frequency across the duration of the study. Increased abundance of Noisy Miners has been shown to be associated with a decline in the diversity and abundance of smaller honeyeaters and insectivores; these species are particularly vulnerable to aggressive interference by Noisy Miners as they are smaller in body size and overlap with the species in terms of food resource use (Dow 1976; Grey *et al.* 1997; Mac Nally *et al.* 2012; Piper and Catterall 2003). It is possible that the increase in Noisy Miners at our study site has contributed to the decline of the Weebill, Spotted Pardalote, Striated and Yellow thornbills and the White-plumed Honeyeater; however, no definitive conclusions can be drawn from our data.

Historical changes in the avian community

A comprehensive list of species recorded previously for the reserve has been published in DECC (2008) and is reproduced here with the records from this study added (Appendix 1). In addition to the Brush Cuckoo the only other species recorded during this study that had not been previously documented in the reserve was the Australian King-Parrot *Alisterus scapularis*.

Many species historically recorded in the reserve (DECC 2008) were not recorded during this study. This was due to a number of factors:

- Some species are very rare visitors to the site and the Cumberland Plain generally (e.g. Topknot Pigeon *Lopholaimus antarcticus*, Pheasant Coucal *Centropus phasianinus*, Spangled Drongo *Dicrurus bracteatus*) – chances of recording these are low.

- Some are very cryptic (e.g. Baillon's Crane *Porzana pusilla*, Spotless Crane *P. tabuensis* and Australian Spotted Crane *P. fluminea*) and take concerted and specific effort to locate them.
- Waterbirds (e.g. Pied Cormorant *Phalacrocorax varius*, White-necked Heron *Ardea pacifica*) travel between water resources and may have been elsewhere during our visits.
- Raptor species tend to have large ranges and may only visit this site on rare occasions (e.g. Black Falcon *Falco subniger*, Collared Sparrowhawk *Accipiter cirrocephalus*).
- As we had restricted access to the site we were unable to survey for any nocturnal species.

Nevertheless, some disappearances and declines do raise concern.

The Double-barred Finch was captured and sighted during the first study period but had disappeared from this site during the second and third periods. Although included in DECC (2008) list (Appendix 1) the following bush birds were neither sighted nor heard during our study: Buff-rumped Thornbill *Acanthiza reguloides*, Yellow-rumped Thornbill *A. chrysorrhoa*, Speckled Warbler *Chthonicola sagittata*, Jacky Winter *Microeca fascinans*, Flame Robin *Petroica phoenicea*, Scarlet Robin *P. boodang*, and Zebra Finch *Taeniopygia guttata*. Whilst Zebra Finches were recorded at the reserve in 2003 (Vella 2003) no records exist since this time. This species has been slowly declining across the Cumberland Plain over many years (Saunders 2016) but can still be seen at isolated sites (e.g. adjacent to the Nepean River near Penrith; K. Middleton, pers. comm.). Only one species historically found in the reserve, the Bush Stone-curlew *Burhinus grallarius*, is now thought to be extinct on the Cumberland Plain.

The loss or decline of the species listed above can, in all likelihood, be attributable to changes in, or disappearance of, habitat due to urban development (Egan *et al.* 1997; Farrell *et al.* 2015; Recher 2010). This reinforces the importance of setting aside reserves (such as Prospect), and the need to establish vegetated corridors linking these remnant natural areas across the Cumberland Plain.

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Appendix 1

Historical list of species reproduced from DECC (2008). X = sighting/heard during the 1st, 2nd and 3rd study periods.

Species	1st	2nd	3rd	Species	1st	2nd	3rd
Stubble Quail <i>Coturnix pectoralis</i>	X			Masked Lapwing <i>Vanellus miles</i>	X		
Brown Quail <i>Coturnix ypsilophora</i>				Silver Gull <i>Larus novaehollandiae</i>	X		X
Musk Duck <i>Biziura lobata</i>				Caspian Tern <i>Sterna caspia</i>			
Black Swan <i>Cygnus atratus</i>	X			Whiskered Tern <i>Chlidonias hybridus</i>	X		
Australian Wood Duck <i>Chenonetta jubata</i>	X	X	X	Rock Dove <i>Columba livia</i>			
Pacific Black Duck <i>Anas superciliosa</i>	X	X		Spotted Dove <i>Streptopelia chinensis</i>	X		X
Australasian Shoveler <i>Anas rhynchos</i>	X			Common Bronzewing <i>Phaps chalcoptera</i>	X		
Grey Teal <i>Anas gracilis</i>				Crested Pigeon <i>Ocyphaps lophotes</i>	X		
Chestnut Teal <i>Anas castanea</i>				Peaceful Dove <i>Geopelia placida</i>	X		
Hardhead <i>Aythya australis</i>	X			Bar-shouldered Dove <i>Geopelia humeralis</i>	X		X
Australasian Grebe <i>Tachybaptus novaehollandiae</i>	X	X	X	Topknot Pigeon <i>Lopholaimus antarcticus</i>			
Hoary-headed Grebe <i>Poliiocephalus poliocephalus</i>	X		X	Yellow-tailed Black-Cockatoo <i>Calyptorhynchus funereus</i>		X	
Great Crested Grebe <i>Podiceps cristatus</i>	X	X	X	Galah <i>Eolophus roseicapillus</i>	X		
Darter <i>Anhinga melanogaster</i>				Long-billed Corella <i>Cacatua tenuirostris</i>	X		
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>	X	X		Little Corella <i>Cacatua pastinator</i>	X		
Pied Cormorant <i>Phalacrocorax varius</i>				Sulphur-crested Cockatoo <i>Cacatua galerita</i>	X	X	
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>	X			Rainbow Lorikeet <i>Trichoglossus haematodus</i>	X	X	X
Great Cormorant <i>Phalacrocorax carbo</i>	X			Scaly-breasted Lorikeet <i>Trichoglossus chorolepidotus</i>			
Australian Pelican <i>Pelecanus conspicillatus</i>	X		X	Musk Lorikeet <i>Glossopsitta concinna</i>	X		
White-faced Heron <i>Egretta novaehollandiae</i>	X	X	X	Little Lorikeet <i>Glossopsitta pusilla</i>	X		
Little Egret <i>Egretta garzetta</i>				Australian King-Parrot <i>Alisterus scapularis</i>	X	X	
White-necked Heron <i>Ardea pacifica</i>				Crimson Rosella <i>Platycercus elegans</i>	X	X	X
Great Egret <i>Ardea alba</i>	X			Eastern Rosella <i>Platycercus adscitus eximius</i>	X	X	X
Intermediate Egret <i>Ardea intermedia</i>				Swift Parrot <i>Lathamus discolor</i>	X		
Cattle Egret <i>Ardea ibis</i>				Red-rumped Parrot <i>Psephotus haematonotus</i>	X		
Nankeen Night Heron <i>Nycticorax caledonicus</i>				Pallid Cuckoo <i>Cuculus pallidus</i>	X		
Australian White Ibis <i>Threskiornis molucca</i>	X	X	X	Fan-tailed Cuckoo <i>Cacomantis flabelliformis</i>	X	X	X
Straw-necked Ibis <i>Threskiornis spinicollis</i>				Brush Cuckoo <i>Cacomantis variolosus</i>	X		
Royal Spoonbill <i>Platalea regia</i>	X	X	X	Horsfield's Bronze-Cuckoo <i>Chalcites basalis</i>	X		
Yellow-billed Spoonbill <i>Platalea flavipes</i>				Shining Bronze-Cuckoo <i>Chalcites lucidus</i>			
Pacific Baza <i>Aviceda subcristata</i>				Pacific Koel <i>Eudynamis orientalis</i>	X	X	X
Black-shouldered Kite <i>Elanus axillaris</i>	X			Channel-billed Cuckoo <i>Scythrops novaehollandiae</i>	X	X	X
Whistling Kite <i>Haliastur sphenurus</i>	X			Pheasant Coucal <i>Centropus phasianinus</i>			
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	X		X	Southern Boobook <i>Ninox boobook</i>	X		
Spotted Harrier <i>Circus assimilis</i>	X			Barn Owl <i>Tyto alba</i>			
Swamp Harrier <i>Circus approximans</i>	X			Tawny Frogmouth <i>Podargus strigoides</i>	X		

Appendix 1 (Cont.)

Species	1st	2nd	3rd	Species	1st	2nd	3rd
Brown Goshawk <i>Accipiter fasciatus</i>	X			White-throated Needletail <i>Hirundapus caudacutus</i>			
Grey Goshawk <i>Accipiter novaehollandiae</i>	X		X	Fork-tailed Swift <i>Apus pacificus</i>			
Collared Sparrowhawk <i>Accipiter cirrocephalus</i>				Azure Kingfisher <i>Alcedo azurea</i>			
Wedge-tailed Eagle <i>Aquila audax</i>	X			Laughing Kookaburra <i>Dacelo novaeguineae</i>	X	X	X
Little Eagle <i>Hieraetus morphnoides</i>		X		Sacred Kingfisher <i>Todiramphus sanctus</i>	X	X	X
Brown Falcon <i>Falco berigora</i>	X			Dollarbird <i>Eurystomus orientalis</i>	X		X
Black Falcon <i>Falco subniger</i>				White-throated Treecreeper <i>Cormobates leucophaeus</i>	X	X	
Australian Hobby <i>Falco longipennis</i>	X			Superb Fairy-wren <i>Malurus cyaneus</i>	X	X	X
Peregrine Falcon <i>Falco peregrinus</i>	X	X	X	Variiegated Fairy-wren <i>Malurus lamberti</i>	X	X	X
Nankeen Kestrel <i>Falco cenchroides</i>				Spotted Pardalote <i>Pardalotus punctatus</i>	X	X	X
Buff-banded Rail <i>Gallirallus philippensis</i>	X			Striated Pardalote <i>Pardalotus striatus</i>	X	X	X
Lewin's Rail <i>Rallus pectoralis</i>			X	White-browed Scrubwren <i>Sericornis frontalis</i>	X	X	X
Baillon's Crake <i>Porzana pusilla</i>				Speckled Warbler <i>Chthonicola sagittata</i>			
Australian Spotted Crake <i>Porzana fluminea</i>				Weebill <i>Smicronis brevirostris</i>	X	X	X
Spotless Crake <i>Porzana tabuensis</i>				Brown Gerygone <i>Gerygone mouki</i>	X	X	
Purple Swamphen <i>Porphyrio porphyrio</i>	X	X		White-throated Gerygone <i>Gerygone albogularis</i>	X	X	
Dusky Moorhen <i>Gallinula tenebrosa</i>	X	X		Brown Thornbill <i>Acanthiza pusilla</i>	X		
Eurasian Coot <i>Fulica atra</i>	X	X	X	Buff-rumped Thornbill <i>Acanthiza reguloides</i>			
Painted Button-quail <i>Turnix varia</i>	X			Yellow-rumped Thornbill <i>Acanthiza chrysorrhoa</i>			
Latham's Snipe <i>Gallinago hardwickii</i>	X			Yellow Thornbill <i>Acanthiza nana</i>	X	X	X
Bush Stone-curlew <i>Burhinus grallarius</i>				Striated Thornbill <i>Acanthiza lineata</i>	X	X	X
Black-winged Stilt <i>Himantopus himantopus</i>				Red Wattlebird <i>Anthochaera carunculata</i>	X	X	X
Black-fronted Dotterel <i>Elseornis melanops</i>	X			Little Wattlebird <i>Anthochaera chrysoptera</i>	X		X
Noisy Friarbird <i>Philemon corniculatus</i>	X	X		White-winged Triller <i>Lalage tricolor</i>	X		
Bell Miner <i>Manorina melanophrys</i>		X	X	Olive-backed Oriole <i>Oriolus sagittatus</i>	X	X	X
Noisy Miner <i>Manorina melanocephala</i>	X	X	X	Masked Woodswallow <i>Artamus personatus</i>			
Lewin's Honeyeater <i>Meliphaga lewinii</i>				White-browed Woodswallow <i>Artamus superciliosus</i>	X		
Yellow-faced Honeyeater <i>Lichenostomus chrysops</i>	X	X	X	Dusky Woodswallow <i>Artamus cyanopterus</i>	X		
Fuscous Honeyeater <i>Lichenostomus fuscus</i>	X			Grey Butcherbird <i>Cracticus torquatus</i>	X	X	X
White-plumed Honeyeater <i>Lichenostomus penicillatus</i>	X	X		Australian Magpie <i>Gymnorhina tibicen</i>	X	X	X
Brown-headed Honeyeater <i>Melithreptus brevirostris</i>	X			Pied Currawong <i>Strepera graculina</i>	X	X	X
White-naped Honeyeater <i>Melithreptus lunatus</i>		X		Australian Raven <i>Corvus coronoides</i>	X	X	X
New Holland Honeyeater <i>Phylidonyris novaehollandiae</i>	X			White-winged Chough <i>Corcorax melanorhamphos</i>			
Eastern Spinebill <i>Acanthorhynchus tenuirostris</i>	X	X	X	Satin Bowerbird <i>Ptilonorhynchus violaceus</i>			X
Scarlet Honeyeater <i>Myzomela sanguinolenta</i>	X	X	X	Australian Pipit <i>Anthus australis</i>			
Jacky Winter <i>Microeca fascinans</i>				House Sparrow <i>Passer domesticus</i>			
Scarlet Robin <i>Petroica boodang</i>				Zebra Finch <i>Taeniopygia guttata</i>			
Flame Robin <i>Petroica phoenicea</i>				Double-barred Finch <i>Taeniopygia bichenovii</i>	X		
Rose Robin <i>Petroica rosea</i>	X	X	X	Red-browed Finch <i>Neochmia temporalis</i>	X	X	X
Eastern Yellow Robin <i>Eopsaltria australis</i>	X	X	X	Nutmeg Mannikin <i>Lonchura punctulata</i>			
Eastern Whipbird <i>Psophodes olivaceus</i>			X	Chestnut-breasted Mannikin <i>Lonchura castaneothorax</i>	X		
Variied Sittella <i>Daphoenositta chrysoptera</i>	X	X	X	European Goldfinch <i>Carduelis carduelis</i>	X		
Crested Shrike-tit <i>Falcunculus frontatus</i>	X	X	X	Mistletoebird <i>Dicaeum hirundinaceum</i>	X	X	X
Golden Whistler <i>Pachycephala pectoralis</i>	X	X	X	Welcome Swallow <i>Hirundo neoxena</i>	X		
Rufous Whistler <i>Pachycephala rufiventris</i>	X	X	X	Tree Martin <i>Hirundo nigricans</i>			
Grey Shrike-thrush <i>Colluricincla harmonica</i>	X	X	X	Fairy Martin <i>Petrochelidon ariel</i>	X	X	
Black-faced Monarch <i>Monarcha melanopsis</i>	X	X		Red-whiskered Bulbul <i>Pycnonotus jocosus</i>	X	X	X
Leadon Flycatcher <i>Myiagra rubecula</i>	X	X		Australian Reed-Warbler <i>Acrocephalus australis</i>	X	X	
Restless Flycatcher <i>Myiagra inquieta</i>				Little Grassbird <i>Megalurus gramineus</i>	X		
Magpie-lark <i>Grallina cyanoleuca</i>	X	X	X	Rufous Songlark <i>Cincloramphus mathewsi</i>	X		
Rufous Fantail <i>Rhipidura rufifrons</i>	X	X	X	Golden-headed Cisticola <i>Cisticola exilis</i>	X		
Grey Fantail <i>Rhipidura albiscapa</i>	X	X	X	Silveryeye <i>Zosterops lateralis</i>	X	X	X
Willie Wagtail <i>Rhipidura leucophrys</i>	X	X	X	Common Blackbird <i>Turdus merula</i>	X	X	X
Spangled Drongo <i>Dicrurus bracteatus</i>				Common Starling <i>Sturnus vulgaris</i>			
Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>	X	X	X	Common Myna <i>Acridotheres tristis</i>	X		
White-bellied Cuckoo-shrike <i>Coracina papuensis</i>		X					