Avifaunal communities of the River to River Corridors Project study area: April 2012 survey report

InSight Ecology

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InSight Ecology
PO Box 6287
Coffs Harbour Plaza NSW 2450

for

City of Ryde
Locked Bag 2069
North Ryde NSW 1670

June 2012

This is Report 7 in a series for the River to River Corridors Project - a joint initiative of the City of Ryde, Hunter's Hill Council, Sydney Metropolitan Catchment Management Authority, local flora and fauna conservation organisations, Bushcare groups, and local residents, with funding from the NSW Environmental Trust.

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Photographs: Front cover (from top, then left to right down panel) –Lane Cove River from footbridge at end of Magdala Road; eucalypt gully forest in Lane Cove National Park (NP) between Lane Cove River and Delhi Road; recent riparian revegetation at Riverglade Reserve, Hunter's Hill; Powerful Owl *Ninox strenua*; older eucalypt forest in Lane Cove NP near site shown in second photograph above; Gladesville bridge over Parramatta River, from Betts Park at Huntleys Point. All of these photographs were taken by InSight Ecology. Other photographs in this document without credits were taken by InSight Ecology.

Acknowledgements

This study was conducted under Section 132C of the National Parks and Wildlife (NPW) Act 1974 and Clause 22 of the NPW Regulation 2002, using Scientific Licence S11505 issued to Dr Andrew Huggett by NSW Department of Environment, Climate Change and Water (now the Office of Environment and Heritage in NSW Department of Premier and Cabinet).

This study is part of the River to River Corridors Project which is funded by the NSW Environmental Trust, City of Ryde, Sydney Metropolitan Catchment Management Authority, and Hunter's Hill Council. The project is managed by Sam Cappelli (Manager, Environment at City of Ryde) and his team. A Community Reference Group for the project continues to meet regularly.

This report and the survey upon which it is based benefited from discussions with and information from a range of people and organisations in the Ryde-Hunter's Hill district. They include Gith Strid-Nwulaekwe (City of Ryde), Jacqui Vollmer (Hunter's Hill Council), Adam Smith (City of Ryde), Bev Debrincat (Habitat Network and Ryde Hunter's Hill Small Bird Project), and Cathy Merchant (Ryde-Hunter's Hill Flora and Fauna Preservation Society). Historical bird data was referred to in NSW Atlas of Wildlife (OEH), Australian Museum Fauna Database, and Bird Atlasses I and II (Birds Australia). Jacqui also participated in some of the April 2012 field survey. I also thank Ranger Paul Saffery of Hunter's Hill Council for his wildlife rescue knowledge of the Powerful Owl and his company in the field on a follow-up owl search.

Permission to access publicly and privately owned land in the study area was obtained from Office of Environment and Heritage in NSW Department of Premier and Cabinet, City of Ryde, Hunter's Hill Council, Holy Cross College Ryde, and Catholic Theological Union (for access to Villa Maria property, Hunter's Hill). Adam Taylor, Michael McCormack and Rachel Danos of Holy Cross College Ryde were particularly supportive of the survey and overall project.

The support and enthusiasm of these organisations, groups and individuals is gratefully acknowledged.

Executive summary

Urban landscapes are complex interacting systems driven by constant change and re-adjustment. The urbanisation of Sydney has removed, fragmented and substantially modified habitat for native plants and animals. In inner zones such as Ryde-Hunter's Hill these effects have been largely historical with the last phase of large-scale clearing of native vegetation occurring over 60 years ago. In outer areas, however, habitat continues to be lost or degraded as Sydney sprawls west, north-west and south-west.

As a consequence, episodes of local extinctions of native plants and animals have occurred and are still happening. Fauna species unable to move through parts of their former ranges now surrounded by a hostile matrix of sealed surfaces and unsuitable habitat have become isolated within increasingly small and pressured bushland remnants. For birds, these have been species dependent on ground and shrub cover and food and breeding resources provided by a diversity of quality habitats. In Ryde-Hunter's Hill district, the extinction of bush birds such as Spotted Quail-thrush, Eastern Bristlebird, Speckled Warbler, Superb Lyrebird, Rockwarbler and White-fronted Chat – the latter a saltmarsh specialist now confined to just two small populations in Sydney – are cases in point. Other bushland bird species appear to be currently in population decline, placing them at risk of local extinction over time.

A total of 1,860 individual birds from 30 families, 55 species, and 16 foraging guilds were recorded during the survey in the River to River Corridors Project study area. Bushland remnants accounted for most (39 or 70.9%) bird species recorded in the survey. Two of these species - Spotted Dove and Red-whiskered Bulbul - have been introduced into Australia. Eleven (11) terrestrial foraging guilds occurred in bushland remnants and included native insectivores, granivores, nectarivores/insectivores, nectarivores, carnivores, omnivores, and a frugivore/insectivore. Two species of NSW and international conservation significance were recorded in the study area during the survey – Powerful Owl and White-bellied Sea-Eagle, respectively. A further 20 species of local and regional conservation significance were also recorded in the survey. They include core woodland/forest birds of the ground, shrubs and upper canopy that have been confined to bushland remnants along rivers and their tributaries such as Lane Cove National Park, Field of Mars Reserve (Wildlife Refuge) and Boronia Park Reserve.

Bird communities of the study area are a mix of remnant indigenous forest species and hardy, ubiquitous native and introduced birds. Lane Cove River valley and its tributaries - Buffalo Creek, Brickmakers Creek, Kitty's Creek, and to a lesser extent, Tarban Creek - exert a strong and, in conservation terms, important influence over the structure and composition of these communities. Remnant sandstone and shale forest habitats along these zones still support small breeding populations of indigenous birds that have disappeared from much of urban Sydney, e.g. Eastern Yellow Robin, Golden Whistler, White-throated Treecreeper, Eastern Whipbird, Brown Gerygone, Brown Thornbill and Striated Thornbill. Importantly, these habitats also function as corridors for the movement of migratory and nomadic birds such as flycatchers, gerygones, cuckoos and honeyeaters. One female Leaden Flycatcher was detected foraging in the tiny bushland remnant at Putney Point. Small, isolated populations of Variegated Fairy-wren and White-browed Scrubwren continued to survive in weedy bushland remnants and older revegetation at Mallee and Tyagarah Reserves, Bremner Park, Putney Point, Gladesville Reserve and Betts Park.

In contrast, urban neighbourhood habitats were characterised by substantially more individual birds but from fewer species and foraging guilds than recorded in bushland remnants. Urban neighbourhood sites supported 974 birds from 22 different species including 5 introduced taxa across 9 terrestrial guilds. Ground granivores - e.g. the introduced Rock Dove and Spotted Dove, Crested Pigeon and Galah, ground insectivores – the hardy Australian Magpie and introduced Common Blackbird (this latter species was recorded for the first time in the project), omnivores – the introduced Common Myna and Common Starling, Pied Currawong and Australian Raven, nectarivores/insectivores - Noisy Miner and Red Wattlebird, a nectarivore - Rainbow Lorikeet, and carnivores – Laughing Kookaburra and Grey Butcherbird - were the main guilds present at urban neighbourhood sites.

Revegetated parkland sites recorded markedly fewer individual birds and species than in bushland remnants - 225 birds from 21 species across 8 terrestrial guilds. These were dominated by ground granivores, ground insectivores and omnivores. Some revegetated parkland sites - Riverglade Reserve, Gladesville Reserve and Bremner Park – provided habitat for small, isolated breeding populations of Variegated Fairy-wren and White-browed Scrubwren. Open parkland sites supported 302 birds from 23 species and 8 terrestrial guilds, the main guilds being ground granivores (e.g. Rock Dove, Crested Pigeon, Galah, Little Corella), ground insectivores (e.g. Masked Lapwing, Magpie-lark, Australian Magpie), and omnivores (e.g. Australian Raven, Pied Currawong, Common Myna, Common Starling).

Three aquatic bird species were recorded in the survey – Pacific Black Duck, Chestnut Teal and the conservation-significant White-bellied Sea-Eagle, the latter flying towards Sydney Olympic Park where an active nest occurs. An aquatic and terrestrial insectivore – White-faced Heron – was also detected.

Most birds had completed their breeding at the time of the survey. The exceptions were a pair of Magpie-lark at Riverglade Reserve with nestlings and Noisy Miner with recent fledglings and some nestlings. An estimated 134 young Noisy Miner were recorded during the survey – these were in addition to the 206 counted during the preceding survey (October 2011). Juveniles of several other species including Superb Fairy-wren, Variegated Fairy-wren, White-browed Scrubwren, Grey Butcherbird, and Australian Magpie were detected during the survey. The threatened Powerful Owl was recorded in the survey.

The indigenous urban-adaptees Noisy Miner (513 individuals) and Rainbow Lorikeet (401) were the most abundant birds recorded during the survey. Other abundant species included Rock Dove (88), Common Myna (78), Australian Magpie (75) Welcome Swallow (70), Crested Pigeon (64), Little Corella (56), and Pied Currawong (45). Urban neighbourhood habitats containing abundant food and water accounted for more individuals of Noisy Miner (337), Rainbow Lorikeet (251), Australian Magpie (39), and Common Myna (57) than other greenspace types.

Some changes in bird communities of the study area were detected between this survey (autumn 2012) and the preceding one (spring 2011). There were 23% fewer individual birds and 11% less bird species recorded in bushland remnants in autumn relative to spring. This was offset by 18% and 8% more birds, respectively, detected in open parkland and urban neighbourhood sites in autumn 2012. Revegetated parkland sites lost 27% of their bird species in autumn while 15% more species occurred in urban neighbourhood sites in autumn than in spring. Other changes involved shifts in foraging guild composition between autumn and spring. These were decreases in nectarivores/insectivores (25% less member species in autumn

relative to spring), canopy insectivores (33.3%), omnivores (14.3%) and frugivores (50%). Autumnal increases in carnivores (33.3% more member species), ground granivores (12.5%), and ground insectivores (11.1%) partially offset these losses. Interaction between several factors might help account for these changes including variability in climate and its impact on the availability, amount and quality of food, competition and predation pressure, species-specific traits and habitat preferences, landscape effects, human-mediated impacts, and sampling effects.

Managing Ryde-Hunter Hill's avifauna and their habitat requires knowledge of how birds utilise greenspace and interact with each other and their environment at different spatial and temporal scales. This study is supplying new ecological data to help understand and manage these interactions for long-term conservation benefits. This work includes baseline monitoring and evaluation of the performance of proposed new corridor plantings as bird habitat.

Contents

1. Introduction

1.1 Project background

The importance of retaining and integrating viable habitat for biodiversity with human living space has been recognised worldwide (Secretariat of the Convention on Biological Diversity 2006; UNEP Convention on Biological Diversity 2007; Natural Resource Management Ministerial Council 2010). Central to this is a need to understand how biota interacts and functions in complex urban ecosystems, a task that has not yet been accomplished (McDonald et al. 2008; Pickett et al. 2011). Knowledge of how animals utilise different types and configurations of greenspace is essential to guide ecologically sustainable urban planning and design (Commonwealth of Australia 2005; Pickett and Cadenasso 2006; Alberti 2010).

In Sydney, there has been substantial investment in the revegetation of riparian zones, residential streets, parks and housing estates, major transport arteries, and former industrial sites over the past 30-40 years (NSW Department of Planning 2005, 2010). However, there has been little attention paid to determining whether this work is facilitating or hindering the movement and conservation of native fauna and their habitat in these landscapes. For instance, Sydney's inner-west councils have rehabilitated and revegetated tracts of native vegetation along the Cooks River (Cooks River Foreshores Working Group 2006). Similar work has been undertaken by City of Ryde and Hunter's Hill Council in the study area at Mallee Reserve and along Tarban Creek at Riverglade Reserve (Ryde Flora and Fauna Study 2006-2008; Hunter's Hill Council 2009). While these efforts are addressing soil erosion, urban water quality management, and habitat protection and restoration objectives, their contribution to facilitating the movement and dispersal of native fauna has not been properly assessed.

Associated with this is a pressing need to establish functional wildlife corridors across suitable areas of suburban Sydney. These aim to allow area and dispersal-limited species to move between isolated patches of habitat to forage and reproduce. This project studies local bird communities to inform the design and implementation of two key wildlife corridors in Ryde-Hunter's Hill district over the period 2010-2013 and beyond.

1.2 Objectives

The River to River Corridors Project will:

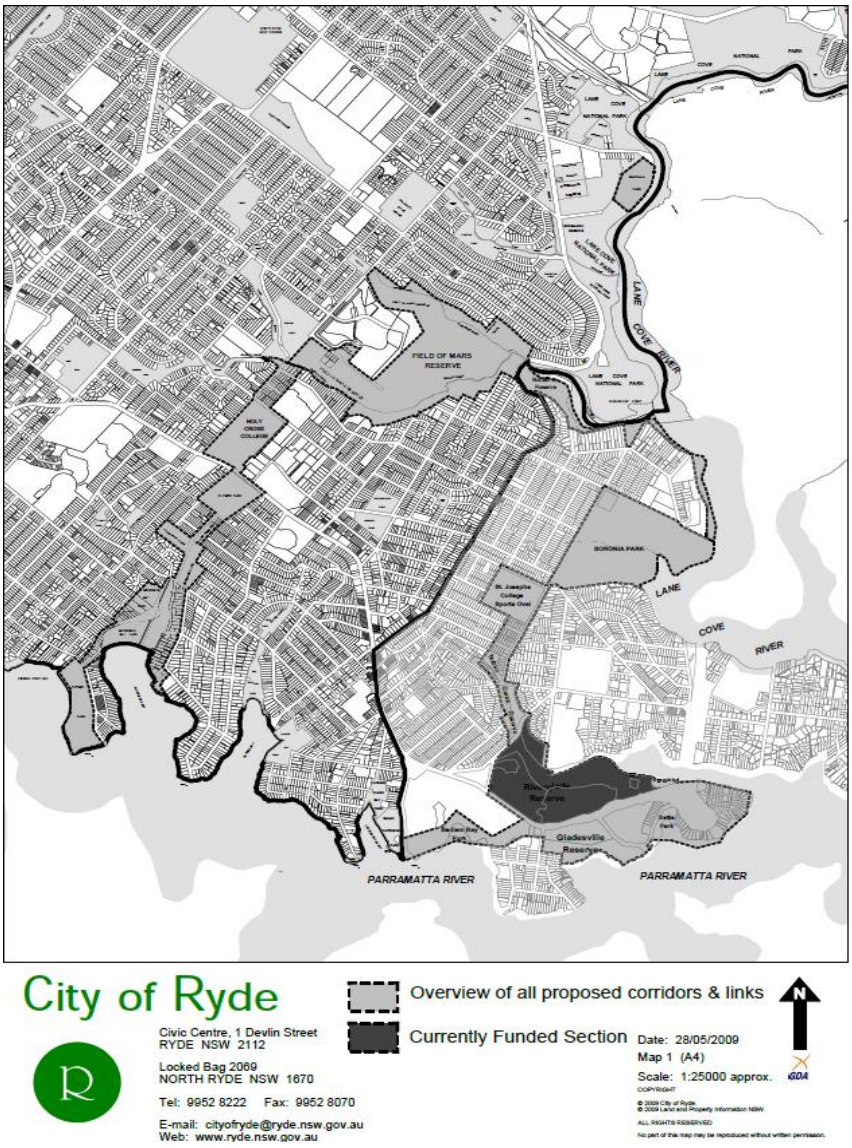
- Describe the composition, structure and habitat requirements of bird communities in different greenspace types in the study area (defined in Figure 1);
- Re-connect two corridors for bushland birds and other fauna based on data obtained from the baseline bird surveys and other studies, best-practice habitat rehabilitation techniques, and effective community participation;
- Enhance the connectivity and condition of existing urban bushland along both corridors;
- Promote community involvement in and ownership of the corridors, especially their monitoring and maintenance over time.

This document reports on the results of an avifaunal survey of the study area conducted in autumn (April) 2012. This is the fourth and final contribution in a set of replicated field investigations of the avifauna of this area – the first being the spring (October) 2010 survey (InSight Ecology 2011a), the second was the autumn (April) 2011 survey (InSight Ecology

2011d), and the third was the spring (October) 2011 survey (InSight Ecology 2011e). Specifically, this report:

- Describes the relative abundance, species richness, composition, and habitat use of bird communities in four different types of greenspace sampled during the survey;
- Provides baseline data to help inform the selection and management of corridor planting sites and provide key reference points for later assessment of corridor performance over time;
- Enhances current knowledge of the biology and ecology of birds of bushland remnants and open urban landscapes in Sydney.

Figure 1: Location of the River to River Corridors Project study area (image: City of Ryde)



2. Methods

2.1 Literature review

A review of existing information on the avifauna and habitats of the study area was undertaken prior to the commencement of the first (October 2010) avifaunal field survey (see InSight Ecology 2010). This included unpublished reports of past fauna surveys (e.g. Ryde Flora and Fauna Study 2006-2008), existing reserve management plans, and maps and reports of bush regeneration and habitat restoration projects conducted in the study area. Bird Atlases I and II (Birds Australia), Atlas of NSW Wildlife (OEH), and Australian Museum's Fauna Database were also reviewed for records of bird species in the study area.

2.2 Field survey

2.2.1 Selection of sites

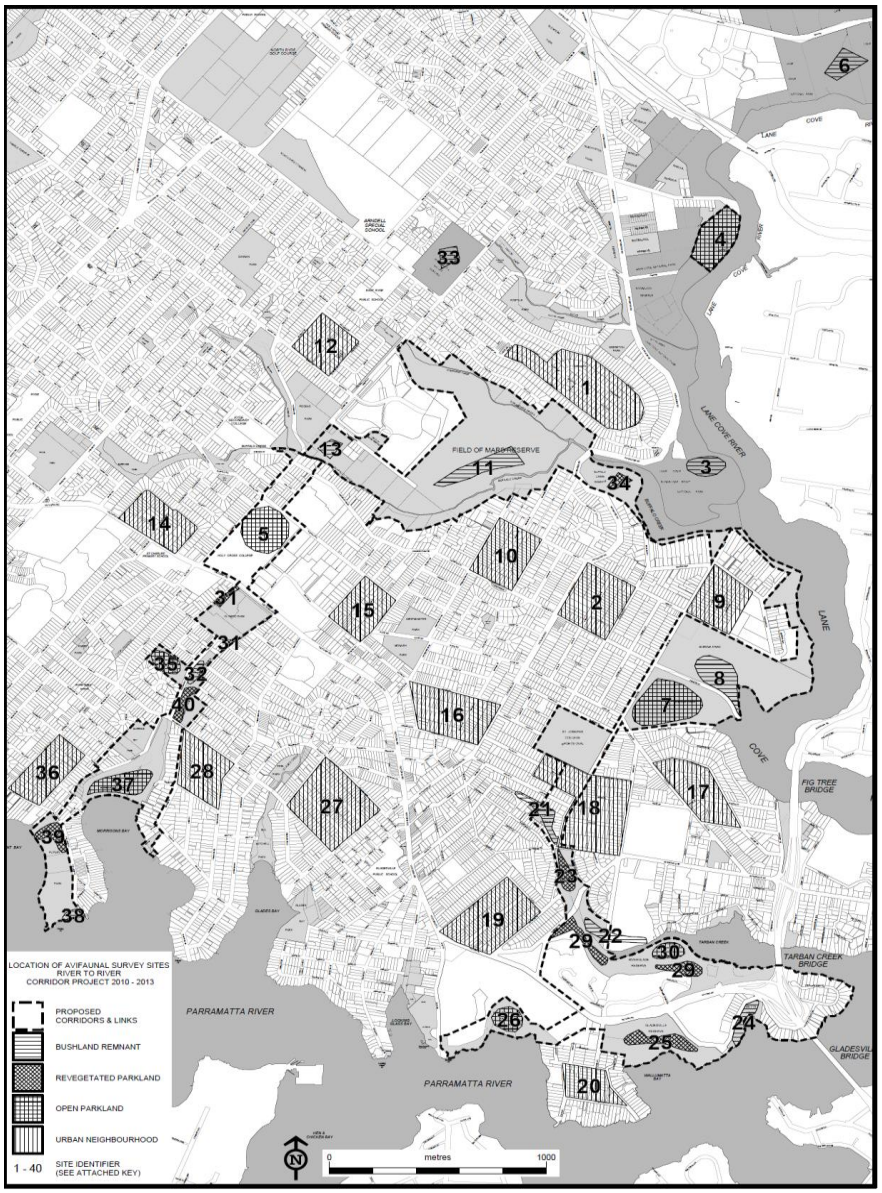
Inspections of the study area were undertaken in March 2008 and October 2010. A sampling design was developed based on the results of these visits, previous bird surveys of western Sydney greenspace undertaken by InSight Ecology, and discussions with City of Ryde and Hunter's Hill Council staff.

A total of 4 greenspace types were surveyed in the study area. These included bushland remnant, revegetated parkland, open parkland, and urban neighbourhood. Bushland remnant sites comprised mainly remnant indigenous vegetation characteristic of Sydney's formerly extensive forest and woodland that existed prior to intensive urban development. The main bushland remnants occur in Lane Cove National Park (NP), Field of Mars Reserve (Wildlife Refuge), Wallumatta Nature Reserve (NR) and Boronia Park Reserve. The latter reserve contains the endangered ecological community (EEC) of Sydney Turpentine Ironbark Forest (STIF), open forest on exposed sandstone slopes (Sydney peppermint, red bloodwood and smooth-barked apple) and sandstone gully forest (blackbutt, blueberry ash and black wattle). Wallumatta NR supports sandstone-shale transition eucalypt forest while Tarban Creek Reserve contains a small pocket of open eucalypt forest on sandstone. Small isolated remnants were also surveyed at Betts Park, Putney Point and Mallee and Tyagarah Reserves, the latter supporting a STIF EEC. Revegetated parkland sites consisted of mostly native tree, shrub and ground cover species planted in blocks or strips at Buffalo Creek, Tarban Creek, Riverglade and Gladesville Reserves and Putney, Olympic Park and Bremner Park. These were typically bush regeneration or beautification projects undertaken by City of Ryde, Hunter's Hill Council and volunteer Bushcare groups. Open parkland sites featured areas dominated by open grassed and paved surfaces with some narrow rows or isolated beds of planted indigenous and exotic vegetation. These typified open recreational space and included several parks with playgrounds, picnic areas, sporting ovals, car parks, and facilities. Urban neighbourhood sites were blocks of usually four residential streets featuring sealed surfaces (roads, streets and footpaths), mown verges of planted and mostly established native and exotic trees and shrubs, overhead powerlines, and houses with or without planted native and exotic shrubs, trees and garden beds in their yards.

A total of 40 sites were surveyed for birds in the study area (Figure 2). Of these, 11 were bushland remnant, 7 revegetated parkland, 7 open parkland, and 15 urban neighbourhood sites. These include:

1 Moncrieff Drive, East Ryde (urban neighbourhood = UN)
2 Blaxland Street, Boronia Park (UN)
3 Lane Cove National Park at Sugarloaf Point (bushland remnant = BR)
4 Magdala Park, East Ryde (open parkland = OP)
5 Holy Cross College, Ryde (OP with planted strips of eucalypts)
6 Lane Cove National Park north (BR)
7 Boronia Park (OP)
8 Boronia Park (BR)
9 Park Road, Boronia Park (UN)
10 Westminster Road, Gladesville (UN)
11 Field of Mars Reserve (Wildlife Refuge) Site A (BR)
12 Badajoz Road, Ryde (UN)
13 Field of Mars Reserve (Wildlife Refuge) Site B (BR)
14 Beazley Street, Ryde (UN)
15 Monash Road, Gladesville (UN)
16 Eltham Street, Gladesville (UN)
17 Abigail Street, Hunter's Hill (UN)
18 Mary Street, Hunter's Hill (UN)
19 Hillcrest Avenue, Hunter's Hill (UN)
20 Kelly Street, Henley (UN)
21 Tarban Creek Reserve, Gladesville (BR)
22 Tarban Creek north bank including Villa Maria property, Hunter's Hill (BR)
23 Tarban Creek Reserve, Gladesville (revegetated parkland = RP)
24 Betts Park, Huntleys Point (BR)
25 Gladesville Reserve, Henley/Huntleys Point (RP)
26 Bedlam Bay (Parramatta Regional Park), Gladesville/Henley (OP with woody weeds and some remnant foreshore vegetation and old planted trees)
27 Western Crescent, Gladesville (UN)
28 Tennyson Road, Gladesville (UN)
29 Riverglade Reserve, Huntleys Cove (RP)
30 Riverglade Reserve, Huntleys Cove (OP)
31 Olympic Park, Ryde (RP)
32 Mallee Reserve, Ryde/Gladesville (BR)
33 Wallumatta Nature Reserve, North Ryde (BR)
34 Buffalo Creek Reserve, Hunter's Hill (RP)
35 Tyagarah Reserve, Ryde (OP, and weedy bushland remnant along drainage line)
36 Stanley Street, Putney (UN)
37 Morrison Bay Park, Putney (OP)
38 Putney Point, Putney (BR)
39 Putney Park, Putney (RP)
40 Bremner Park, Gladesville (RP)

Figure 2: Location of avifaunal survey sites in the study area (courtesy City of Ryde)



2.2.2 Survey methods

Terrestrial bird species were surveyed at each site in the study area. In bushland remnants and larger parkland sites the area search technique (Loyn 1987; InSight Ecology 2008) was deployed. This involved the surveyor steadily walking a loop route in which different forward and return legs, separated where possible by a distance of at least 100 metres, were taken through the main habitats present at each site. In urban neighbourhood sites, a block defined by usually 4 streets was walked, at a steady pace, along footpaths so that each route enclosed the entire sampled block without duplication of the course taken. The area of each of these blocks varied between approximately 5 and 10 ha, depending on allotment size and configuration and street width and length. Single line transects were walked in smaller sites (i.e. Riverglade Reserve, Putney Point, Putney Park, Mallee Reserve, Tyagarah Reserve, Bremner Park and Olympic Park) where it was not feasible to deploy the area search method.

The order of surveying sites was reversed for this survey from that used in the first autumn (April 2011) sampling effort which involved working from the south of the study area to its north. That is, the April 2012 survey commenced in the northern sector of the study area – i.e. Lane Cove NP, Magdala Park, Boronia Park Reserve, Buffalo Creek Reserve, Field of Mars Reserve (Wildlife Refuge), Wallumatta NR and urban neighbourhood sites. It then continued to southern and central sites including Tarban Creek Reserve, Riverglade Reserve, Betts Park, Gladesville Reserve, Bedlam Bay (Parramatta Regional Park) and nearby parkland and urban neighbourhood sites around to Putney Park, Morrison Bay Park, Mallee and Tyagarah Reserves and Olympic Park. This change was undertaken to minimise the potential for the introduction of location or geographic bias into bird abundance, species richness and community structure data collected. This can arise when the same or similar geographical routes are taken to survey especially resident bird communities over more than one season. In addition, sites surveyed in mornings in the first autumn (April 2011) were, where possible, surveyed in afternoons in the second autumn (April 2012). This helped to minimise the potential impact of time-of-day sampling bias in bird data obtained between each autumn.

All area searches and block walks avoided recording the same bird twice, particularly flocking, communally-living, and fast or very frequently moving species such as Noisy Miner, Rainbow Lorikeet, Welcome Swallow, Galah and Long-billed Corella. Particular care was taken in some parkland sites where, due to the small size of the reserve, forward and return search legs occurred within 100 metres of each other. This also helped to avoid committing the same error with more sedentary species such as Masked Lapwing, Australian Magpie, Magpie-lark, and Grey Butcherbird that often employ stalking or “sit-and-wait” foraging strategies.

All birds observed or heard at a site or along a line transect were recorded, including individuals flying over the site. Data recorded included the species present, number of individuals observed, sampling period, date, time and location of record, greenspace type, behaviour (i.e. foraging/feeding, breeding, calling, mobbing, resting, flying), use of habitat, and other relevant information such as age, species composition and condition of remnants, revegetation and urban neighbourhood vegetation, weather, and bird interactions (eg. predation, predator avoidance, mating/mate pursuits). Using nomenclature consistent with Christidis and Boles (2008), these data were entered into a MS Excel spreadsheet in taxonomic order. All observations were made by the same experienced ornithologist (A.H.) using a pair of Zeiss 10x40BT® binoculars fixed to a Pro-Harness® chest-strap. The survey was undertaken over a 9-day period in autumn (October 23-31) 2011. Surveys were generally conducted in peak autumn morning (0715-1030 hours) and afternoon (1530-1730 hours) bird foraging periods (survey sessions) on each survey day. No surveying occurred in windy or wet weather. A total of 11 sessions were completed, with 3 sessions or 21.4% of total available survey time (14 sessions) lost to wet and/or windy weather. This was offset by including additional sessions within the 8-day sampling window.

A total of 18.42 hours was spent on surveying birds in the study area. This was comparable to the April 2011 total survey effort of 20.75 hours and the October 2011 total of 21.09 hours. Bushland remnant sites were surveyed more intensively than other greenspace types - for 7.17 hours (39.1 minutes per site) or 38.9% of the total survey effort. Urban neighbourhood sites, in contrast, were surveyed for a total of 5.58 hours (22.3 minutes per site) representing 30.3% of the total survey effort. Revegetated parkland sites were surveyed for 3 hours (25.7 minutes per site) or 16.3% of the total effort. Open parkland sites were surveyed for 2.67 hours (22.8 minutes per site) or 14.5% of total survey time. This amount and distribution of survey effort

across the different greenspace types was comparable with the spring (October 2010), autumn (April 2011), and spring (October 2011) survey programs.

This variance in proportionate survey effort between remnant bushland and parkland and urban neighbourhood sites was not considered to significantly affect the results obtained or their interpretation. Bushland remnants provided a broader and more complex suite of bird habitats and thus supported taxonomically richer avian assemblages than revegetated and developed sites. Thus, they require more survey effort per unit area to obtain an accurate sample of bird abundance, species richness, community structure and habitat use.

To aid reading, this report generally presents the common names of birds. Their scientific names are provided in the appendix.

2.3 Habitat assessment

A suite of habitat attributes were recorded at representative sites in each greenspace type in the study area. These included dominant plant species and community present, height of main tree species present, habitat condition and connectivity (remnants and revegetation), vegetation structure (in bush remnants and revegetated parkland), bird use of habitats present, estimated age and species composition of plantings (in revegetated parkland and urban blocks), type of urban neighbourhood habitats (i.e. street verge, built structures, front- and rear-yard vegetation), and extent and type of disturbance (i.e. presence of weeds, feral and domestic animals, evidence of predation, level of human incursion). Attributes of landscape context were also noted for selected sites in different greenspace types, i.e. distance of planted or remnant vegetation to nearest neighbouring vegetation patch, position in the local and regional landscape, pattern of vegetation distribution, and edge type and size.

The photographic library of vegetation types, birds, habitats, and landscapes present at each site compiled during the three previous surveys for this project was added to during the April 2012 survey using a Canon PowerShot SX210 IS® 14x zoom digital camera. Images were stored in this library using Microsoft Office Picture Manager 2007® software. Some of these images are presented in this report. All images, data and related material were stored on a standard 500GB ATA HDD backed up to a 500GB external HDD.

2.4 Data analysis

Three key attributes of bird communities were selected for analysis from data collected at each site in each greenspace type in the study area. These were relative abundance, species richness, and composition of foraging guilds (as a key indicative component of bird community structure). A total of 40 replicates of greenspace type were used in analyses undertaken for this report. These were stratified across the surveyed sites and included 11 bushland remnant, 7 revegetated parkland, 7 open parkland, and 15 urban neighbourhood sites. Assignment of species recorded in the surveys to foraging guilds was based on existing professional knowledge and published data, especially from the authoritative “Handbook of Australian, New Zealand and Antarctic Birds (Volumes 1-7)” (various editors, see References). Bird use of habitat was analysed qualitatively from habitat attribute information collected during the previous (October 2010, April 2011 and October 2011) and current (autumn 2012) surveys undertaken for the project at representative sites within each greenspace type.

Bird survey data were examined for the total, mean, standard error and standard deviation from the mean for each greenspace type and for the overall study area using Microsoft Excel 2007® and SigmaPlot Version 11.2® (Systat Software, Inc. 2009), with the results presented in graphical and tabular form. Changes in the key bird community variables sampled between October 2011 and April 2012 data were also examined. Survey effort was calculated by greenspace type and for the study period. Conservation significance was assessed by comparing survey results with historical data for the study area, schedules and provisions under the NSW Threatened Species Conservation Act 1995 and Federal Environment Protection and Biodiversity Conservation Act 1999, and utilising expert ornithological knowledge.

3. Results

3.1 Relative abundance

A total of 1,860 individual birds were recorded during the autumn (April 2012) survey in the study area (Appendix 1). Fifty-two (52.3) percent (974 birds, mean 2.91, standard deviation [sd] 6.84) of these birds were recorded in urban neighbourhood sites. Bushland remnants accounted for 19.3% (359 birds, mean 1.07, sd 2.32) of the total. Revegetated parkland sites provided 12.1% of the total (225 birds, mean 0.67, sd 2.48). Open parkland contributed 16.2% of all birds recorded (302 birds, mean 0.90, sd 3.70). Figure 3 shows this variation in relative abundance of birds between the different greenspace types at the surveyed sites in the study area. Figure 4 depicts the mean number of birds recorded in each greenspace type.

Figure 3: Total number of birds recorded by greenspace type, April 2012

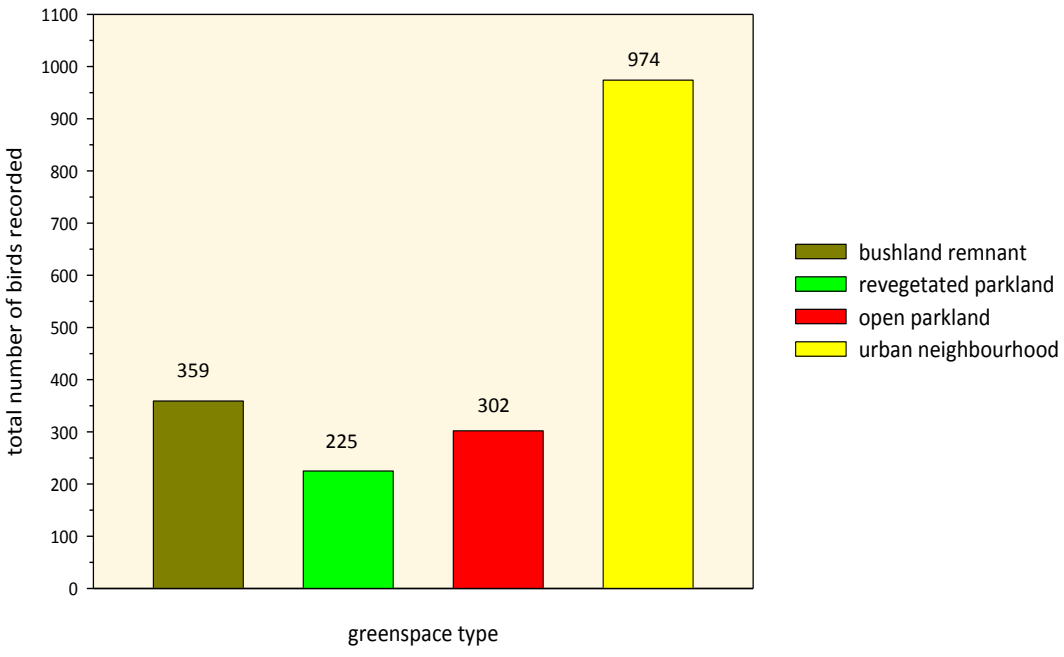
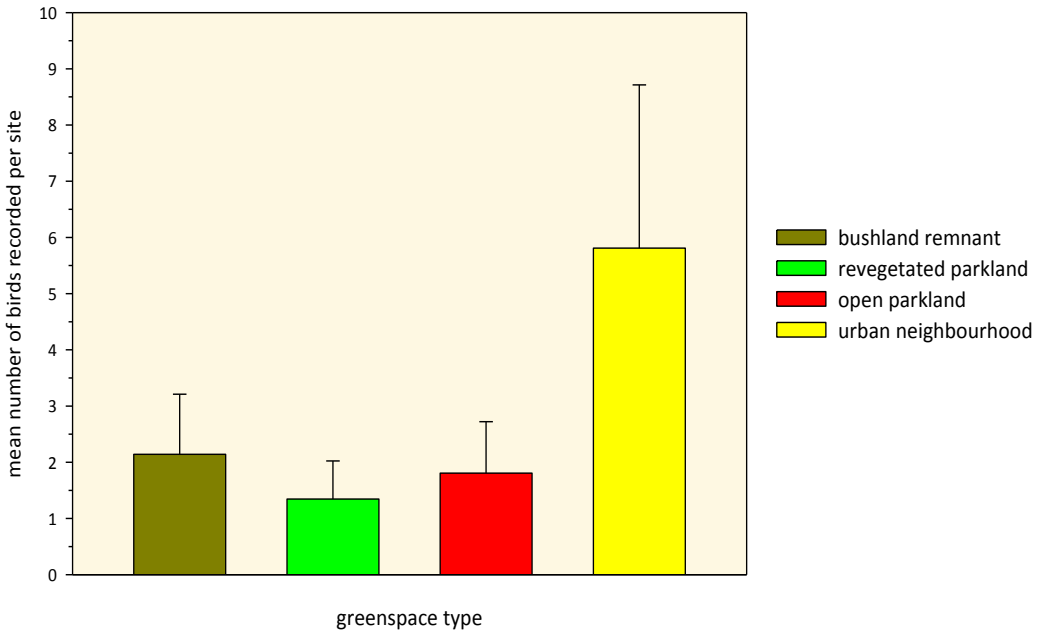


Figure 4: Mean number of birds recorded by greenspace type, April 2012 (per site, with standard error shown)



The most abundant bird species recorded across all greenspace types surveyed in the study area were Noisy Miner (513 individuals), Rainbow Lorikeet (401), the introduced Rock Dove (88), introduced Common Myna (78), Australian Magpie (75), Welcome Swallow (70), Crested Pigeon (64), Little Corella (56), Pied Currawong (45), White-browed Scrubwren (35), introduced Common Starling (35), Variegated Fairy-wren (34), and Australian Raven (34). Bushland remnant sites supported mostly Rainbow Lorikeet (82 individuals), Noisy Miner (48), Variegated Fairy-wren (26), White-browed Scrubwren (23), and Pied Currawong (15). Revegetated parkland sites were dominated by Noisy Miner (83), Rainbow Lorikeet (30), and Welcome Swallow (21). Open parkland sites commonly supported Noisy Miner (45), Little Corella (44 – Plates 1-2), Rainbow Lorikeet (38), Crested Pigeon (32), Australian Magpie (26), Welcome Swallow (26), and Common Myna (21 – especially in Riverglade Reserve – Plate 3). Urban neighbourhood sites were occupied mostly by Noisy Miner (337), Rainbow Lorikeet (251), Common Myna (119), Rock Dove (86 – Plate 4), Common Myna (57), Australian Magpie (39), Spotted Dove (31 – Plate 5), Crested Pigeon (27), Pied Currawong (24), Common Starling (24 – Plate 6), Australian Raven (23), and Welcome Swallow (20). An introduced Common Blackbird was recorded on the footpath lawn and in a front-yard hedge in the Mary Street urban neighbourhood site (Plate 7). No House Sparrow was recorded during the survey. The only other introduced species, Red-whiskered Bulbul (Plate 8), was recorded in low numbers (9) in three bushland remnants – Field of Mars Reserve (Wildlife Refuge), Tarban Creek Reserve and Mallee and Tyagarah Reserves (Appendix 1).

The least abundant bird species recorded across all greenspace types surveyed in the study area were small-medium sized insectivores dependent on larger, contiguous tracts of quality forest, shrub and groundcover habitats. In the study area these habitats exist mostly within Lane Cove River NP, Field of Mars Reserve (Wildlife Refuge), and Boronia Park. These included two summer breeding migrants moving through on their way north - Australasian Figbird and Leaden Flycatcher (Plate 9), small insectivores – Eastern Whipbird, Eastern Yellow Robin, Brown Thornbill, Brown Gerygone (Plate 10), Golden Whistler, White-throated Treecreeper, Fan-tailed

Cuckoo (Plate 11), Tree Martin and Grey Fantail, two canopy granivores - Australian King-Parrot and Yellow-tailed Black-Cockatoo (Plates 12-13), two nectarivores – Musk Lorikeet and Eastern Spinebill (Plates 14-15), and two carnivores – Brown Goshawk and Powerful Owl (Plates 16-18).

Plate 1: Part of a mixed foraging flock of Little Corella and Long-billed Corella (total 44 birds) digging corms out of mown areas at Morrison Bay Park open parkland site.

Plate 2: Contrast between Long-billed Corella (on left) and Little Corella (at right) at Abigail Street urban neighbourhood site outside 13 Martin Street, 15/4/12.

Plate 3: Common Myna was recorded in 2 flocks totalling 20 birds at Riverglade Reserve open parkland site feeding on breadcrumbs provided by a park visitor, 14/4/12.

Plate 4: Introduced Rock Dove was recorded in a large flock (45 birds) in Western Crescent urban neighbourhood site (17/4/12) and in smaller flocks at other urban sites.

Plate 5: Introduced Spotted Dove was recorded in small-medium sized flocks at several urban neighbourhood sites, especially Beazley Street (James Wood).

Plate 6: Introduced Common Starling was recorded in higher numbers in the survey than previously, including flock of 24 at Beazley Street urban site (en.wikipedia.org).

Plate 7: One adult of the introduced Common Blackbird was recorded on a footpath and in a hedge at Mary Street urban neighbourhood site, backing onto upper Tarban Creek Reserve, 15/4/12 (male shown - Stuart Harris)

Plate 8: Small populations of introduced Red-whiskered Bulbul persist at Field of Mars, Tarban Creek and Mallee and Tyagarah Reserves – 9 birds were recorded in the April 2012 survey (calling male shown, FoM, 29/10/11).

Plate 9: The migratory Leaden Flycatcher was recorded in the tiny Putney Point bushland remnant while being stalked by a domestic cat. Female shown, 16/4/12.

Plate 10: Brown Gerygone, a tiny shrub insectivore, was recorded foraging in Lane Cove NP north and Field of Mars Reserve bushland remnant sites on 12 and 13/4/12 (photograph: David Cook, COG).

Plate 11: The part-migratory Fan-tailed Cuckoo was observed foraging in Field of Mars Reserve Site A bushland remnant, 13/4/12 (en.wikipedia.org).

Plate 12: Australian King-Parrot was recorded as singles and pairs in flowering eucalypts at urban sites and in smaller bushland remnants along Tarban Creek (adult male shown).

Plate 13: A small group of Yellow-tailed Black-Cockatoo fed on exotic pine cones in Villa Maria section of Tarban Creek north bank bushland remnant (adult male shown).

Plate 14: Musk Lorikeet was recorded at Lane Cove NP north bushland remnant (12/4/12) – a first record for this species in the project (en.wikipedia.org).

Plate 15: Eastern Spinebills disperse from highland to lowland areas in autumn-winter – recorded at Lane Cove NP and Field of Mars Reserve bushland remnants, 12 & 13/4/12 (adult male shown - Greg Clancy).

Plate 16: A forest raptor - Brown Goshawk was mobbed by miners and currawongs near the north-west edge of Field of Mars Reserve Site A, 13/4/12 (adult female shown – Greg Clancy).

Plate 17: Two Powerful Owls were recorded at a day roost in Boronia Park bushland remnant, 13/4/12

Plate 18: The Powerful Owl is a threatened large forest owl recorded at Boronia Park bushland remnant in each survey except October 2011.

3.2 Bird species richness

A total of 55 bird species from 30 families were recorded during the survey in the study area (Appendix 1). This included 51 terrestrial species and 4 aquatic and aquatic/terrestrial species - Chestnut Teal, Pacific Black Duck, White-faced Heron and White-bellied Sea-Eagle. Six of the terrestrial species recorded have been introduced to Australia – Rock Dove, Spotted Dove, Red-whiskered Bulbul, Common Blackbird, Common Starling and Common Myna. One lone male Common Blackbird was observed foraging along a footpath and adjacent thick hedge at 8 Auburn Street, Hunter's Hill, part of Mary Street urban neighbourhood site. This area backs onto upper Tarban Creek Reserve which contains a small weedy bushland remnant and open mown areas suitable for blackbird foraging and retreat to cover. This is the first record of this species obtained in the River to River Corridors Project. Two other exotics - European Goldfinch and House Sparrow - were not recorded during the survey.

Bushland remnants accounted for 70.9% (39 out of 55) of all bird species recorded during the survey. Small native forest insectivores dependent on larger contiguous tracts of quality forest and woodland were recorded only at the two Lane Cove NP sites, Field of Mars Reserve (Wildlife Refuge), and/or Boronia Park. They included Eastern Whipbird, Eastern Yellow Robin, Brown Gerygone, Brown Thornbill, Golden Whistler, Spotted Pardalote, White-throated Treecreeper, the hollow-nesting Tree Martin, and the partial cool season migrant Fan-tailed Cuckoo.

Revegetated parkland sites supported 21 species or 38.9% of all avifauna recorded in the survey. Some native ground and shrub-foraging insectivores - White-browed Scrubwren and Variegated Fairy-wren - and the omnivorous Silvereye were detected at these sites. The invasive Noisy Miner occurred at high levels in revegetated parkland and moderate-high numbers in bushland remnant sites.

Open parkland supported 23 species (42.6%) of all avifauna recorded during the survey and included 3 introduced species. Birds of open areas such as Welcome Swallow, Crested Pigeon, the introduced Common Myna and Common Starling, Australian Magpie and the granivorous and range-expanding Little Corella, as well Noisy Miner and Rainbow Lorikeet characterised these sites. The latter two species exploited isolated planted eucalypts, flowering Callistemon and paperbark tea-tree around park perimeters and along drainage lines.

Urban neighbourhood sites were dominated by Noisy Miner, Rainbow Lorikeet, Rock Dove, Common Myna, Australian Magpie, Spotted Dove and Crested Pigeon. Together with open parkland sites, these areas were the least diverse in species richness terms, accounting for 40.7% (22 species) of all avifauna surveyed. Figure 5 shows the variation in total bird species richness between the four greenspace types at the surveyed sites in the study area. Figure 6 displays the mean number of bird species recorded in each greenspace type.

Figure 5: Total number of bird species recorded by greenspace type, April 2012

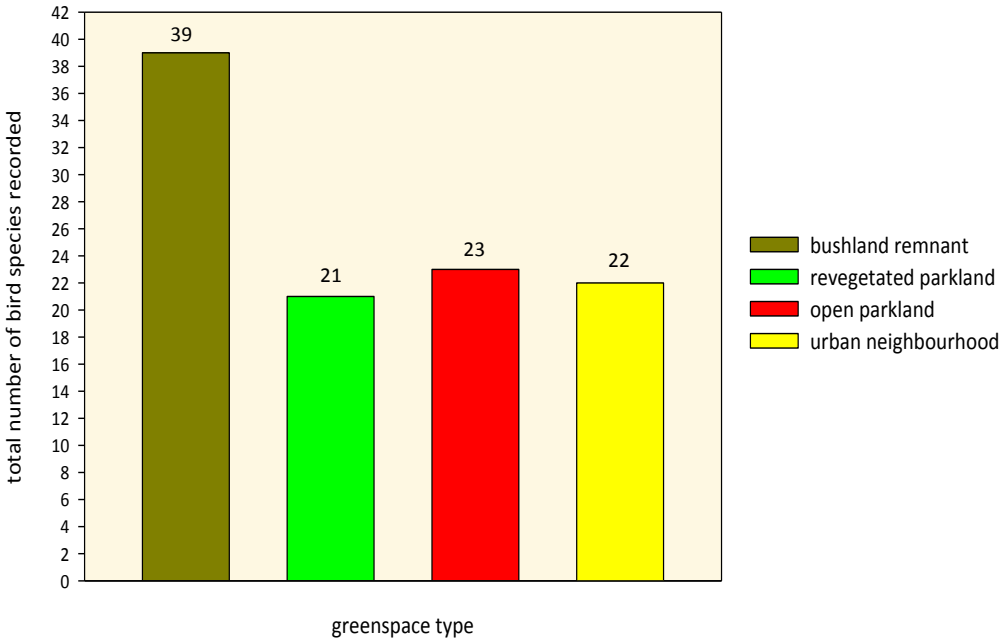
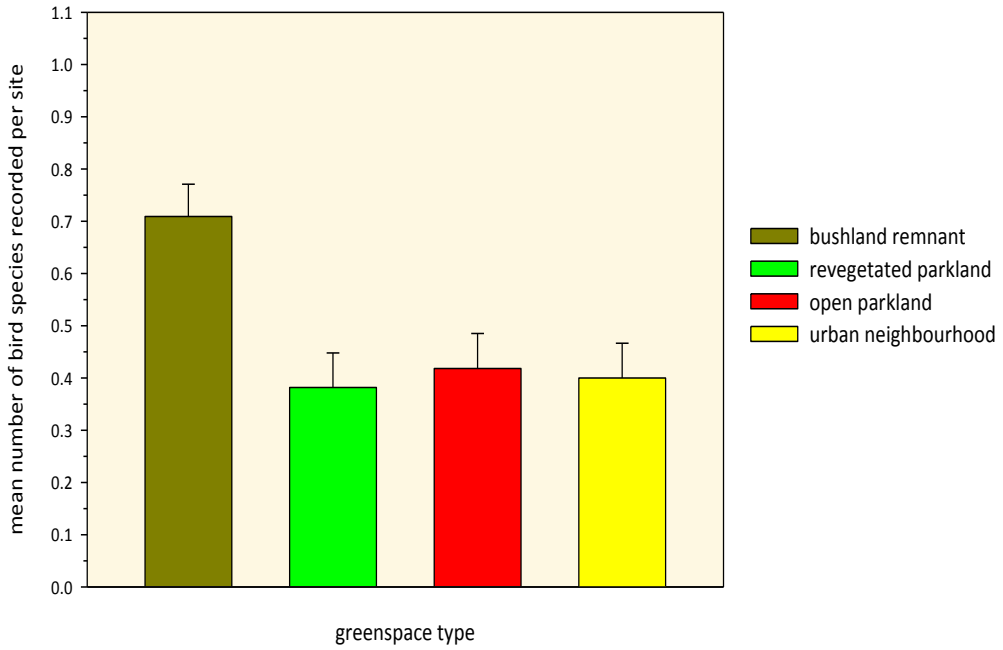


Figure 6: Mean number of bird species recorded by greenspace type, April 2012 (per site, with standard error shown)



3.3 Bird community structure and habitat

3.3. 1 Composition of bird foraging guilds

Foraging guild composition is a key indicative component of bird community structure (Ford 1989; Wiens 1989; Mills 2007). A total of 16 bird foraging guilds were recorded at the surveyed sites in the study area. These included 12 terrestrial guilds (Figure 7), one terrestrial/aquatic guild, and 3 aquatic guilds. The terrestrial guilds comprised ground insectivores (18.2% of all bird species recorded across all greenspace types), ground granivores (16.4%), omnivores (10.9%), shrub insectivores (10.9%), canopy insectivores (7.3%), nectarivores/insectivores (5.4%), carnivores (7.3%), frugivores (1.8%), frugivores/insectivores (1.8%), aerial insectivores (3.6%), canopy granivores (3.6%), and nectarivores (5.4%).

The main ground insectivorous species recorded in the survey were White-browed Scrubwren, Australian Magpie, Variegated Fairy-wren, Superb Fairy-wren, Willie Wagtail, and Magpie-lark. The introduced Common Blackbird, a ground insectivore that seems to have declined in parts of Sydney, was also detected. Ground granivores were represented by Spotted Dove, Rock Dove, Crested Pigeon, Galah, Sulphur-crested Cockatoo, Little Corella, Long-billed Corella and Red-browed Finch. Canopy granivores included Australian King-Parrot and Yellow-tailed Black-Cockatoo. Omnivores comprised Common Myna, Common Starling, Pied Currawong, Silvereye, Australian Raven and Australian White Ibis. Shrub insectivores were Brown Thornbill, Brown Gerygone, Grey Fantail, Leaden Flycatcher, Golden Whistler and the partial cool season migrant Fan-tailed Cuckoo. Canopy insectivores included Spotted Pardalote, Black-faced Cuckoo-shrike and White-throated Treecreeper. Aerial insectivores recorded were Welcome Swallow and Tree Martin. Noisy Miner, Red Wattlebird and Yellow-faced Honeyeater comprised the nectarivores/insectivores. Nectarivores included Rainbow Lorikeet, Musk Lorikeet and Eastern Spinebill. Carnivores included Laughing Kookaburra, Grey Butcherbird, Powerful Owl and Brown Goshawk. Australasian Figbird was the only frugivore recorded in the survey while the introduced Red-whiskered Bulbul was the only frugivore/insectivore detected. A piscivore - the conservation-significant White-bellied Sea-Eagle - was recorded flying over Bedlam Bay oval and heading up Parramatta River. An aquatic herbivore – Pacific Black Duck and an aquatic omnivore – Chestnut Teal were recorded on a pond in revegetated parkland at Riverglade Reserve. The aquatic/terrestrial insectivore White-faced Heron foraged along Bremner Park revegetated parkland edges.

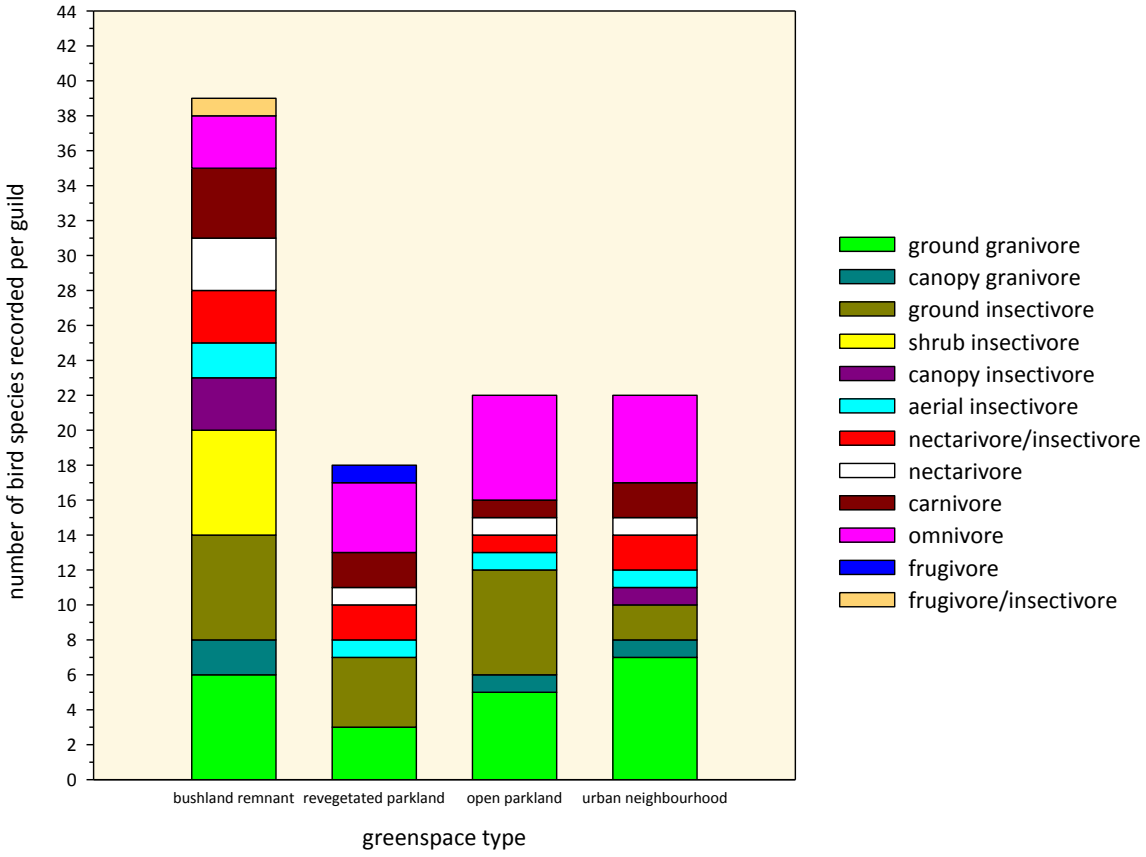
Bushland remnant sites supported taxonomically richer assemblages of birds particularly forest-dependent ground insectivores, shrub insectivores, canopy insectivores, canopy granivores, nectarivores/insectivores, and carnivores than did the other greenspace types (Figure 7). Many of these guilds included species that were not recorded or recorded in substantially lower numbers in the more open greenspace types. Ground granivores were relatively evenly distributed across each greenspace type except in revegetated parkland where only 3 species of this guild were recorded.

Revegetated parkland sites supported taxonomically less diverse avian assemblages than found in bushland remnants. Insectivorous guilds were reduced to a core group of small ‘bush bird’ species that were able to utilise dense weedy and shrubby ground cover. These included Superb Fairy-wren, Variegated Fairy-wren and White-browed Scrubwren. The ubiquitous Australian Magpie foraged in and through planted sites. Shrub and canopy insectivores were not recorded in revegetated parkland sites. Ground granivores included only Crested Pigeon,

Little Corella and Red-browed Finch – the latter species observed foraging in Riverglade Reserve. Only the hardy Red Wattlebird and Noisy Miner utilised surveyed planted sites. Carnivores were reduced to two species – Laughing Kookaburra and Grey Butcherbird. Omnivores, in contrast, increased to 4 species including Australian White Ibis, Pied Currawong, Australian Raven and Silvereye.

Open parkland and urban neighbourhood sites supported more omnivorous species than did bushland remnant and revegetated parkland sites. Additions to open parkland and urban neighbourhood sites included introduced scavenging species – Common Myna and Common Starling. Small-medium-sized (8-25 birds) flocks of Common Myna were recorded, as in previous surveys, wherever more rubbish occurred such as around bins, shopfronts and along street verges. e.g. at the Beazley Street, Badajoz Road and Western Crescent urban neighbourhood sites. A group of 20 Common Starling were detected foraging on littered lawns along Victoria Road at the former Royal Ryde Rehabilitation Hospital on Putney Hill – these birds dispersed into the adjacent Beazley Street urban neighbourhood site. Ground granivores were most numerous in urban neighbourhood sites (7 species) and included Sulphur-crested Cockatoo, Galah, Little Corella, Long-billed Corella, Crested Pigeon, and both introduced doves (Rock and Spotted).

Figure 7: Composition of terrestrial bird foraging guilds by greenspace type, April 2012



3.3.2 Bird habitats and their use

A range of bird habitats were recorded in each greenspace type during the survey in the study area. Bushland remnants were a mixture of larger generally contiguous patches of sandstone slope and gully forest, Allocasuarina woodland and mangroves along Lane Cove River, Kittys Creek, Buffalo Creek and Brickmakers Creek and smaller (0.1-2 ha) isolated patches of Sydney Turpentine Ironbark Forest along Tarban Creek, Parramatta River foreshore (including Putney Point and Bedlam Bay sites), and Mallee and Tyagarah Reserves. These remnants are part of a once more extensive indigenous forest and woodland that occurred prior to Sydney's urbanisation (see Benson and Howell 1990a, 1994). These patches contain a mix of weedy and indigenous ground cover, shrub and canopy layer habitats for insectivorous, granivorous, frugivorous, omnivorous and nectarivorous birds. A core group of forest- and woodland-dependent endemics were recorded in the larger remnants within Lane Cove NP, Field of Mars Reserve (Wildlife Refuge) and Boronia Park Reserve. These included White-throated Treecreeper, Eastern Yellow Robin, Eastern Whipbird, Brown Thornbill, Brown Gerygone, Grey Fantail, Spotted Pardalote, Golden Whistler, Tree Martin, Australian King-Parrot, and Musk Lorikeet. Other habitats occurring in the remnants were grass swards and rushes in Lane Cove NP near Buffalo Creek Reserve, a small number of standing dead trees (stags) in Tarban Creek Reserve, rock shelves and outcrops, fallen logs, and aquatic habitats (pools, running water and fringing vegetation) along Brickmakers, Kittys, Buffalo and Tarban Creeks.

Revegetated parkland sites provided a narrower suite of bird habitats than bushland remnants. The quality of these sites varied according to the age, size, floristic composition, areal extent and distance of the plantings from bushland remnants. Older (10-40 year-old) native mixed species plantings provided more layers of potential bird foraging, shelter and nesting habitat than younger plantings. Older planted sites surveyed included Putney Park, Olympic Park, Gladesville Reserve (oval and west), Riverglade Reserve (east) and Tarban Creek Reserve. Younger sites sampled were at Riverglade Reserve (west), Gladesville Reserve (east), Mallee Reserve, Bremner Park and Buffalo Creek Reserve. Older plantings offered a greater selection of perches, foraging microhabitat such as decorticating bark, leaf rolls and fallen debris, and potential breeding habitat for some indigenous and introduced passerines. In contrast, younger (ca. 3-6 year-old) indigenous plantings comprised fewer foraging, roosting and breeding opportunities, often consisting of only one canopy layer and some ground cover such as *Lomandra longifolia* clumps. A small group of native ground and shrub insectivores were recorded in older planted sites and included Superb Fairy-wren, Variegated Fairy-wren and White-browed Scrubwren. Some nectarivores/insectivores also utilised these plantings – the ubiquitous Noisy Miner and Red Wattlebird – the latter species recorded in lower numbers and at fewer sites than in the October 2011 survey. Tree hollows, stags, fallen decaying logs and in-situ rock substrates were generally rare or absent from revegetated parkland sites.

Open parkland habitats were structurally simpler than their revegetated counterparts. They included grassed open space, weed-infested stormwater drains and drainage lines, built structures (e.g. playgrounds, picnic amenities), isolated individual or single rows of planted trees, and air space. Magdala Park, Boronia Park (ovals), Riverglade Reserve (oval), Bedlam Bay (Parramatta Regional Park) oval and Tyagarah Reserve (oval) typified open parkland habitats sampled in the study area. Holy Cross College and Morrison Bay Park sites contained a mixture of open playing fields, built structures and narrow planted strips of Allocasuarina, tallowwood and other eucalypts, usually fringing ovals or canals. Birds of open parkland habitats were a mix of hardy indigenous and introduced species able to forage, roost, shelter and/or successfully

breed in these more open environments. They included ground granivores - Rock Dove, Crested Pigeon, Galah, Long-billed Corella and Little Corella, ground insectivores - Australian Magpie, Magpie-lark, Willie Wagtail, Masked Lapwing, Superb Fairy-wren and White-browed Scrubwren, an aerial insectivore Welcome Swallow, a nectarivore/insectivore - Noisy Miner, a nectarivore - Rainbow Lorikeet, omnivores - Common Myna, Common Starling, Australian Raven, Silvereye, Australian White Ibis and Pied Currawong, a piscivorous raptor – White-bellied Sea-Eagle.

Urban neighbourhood sites provided a range of novel and often floristically diverse habitats for bird species able to forage, roost, and, in some cases, breed in built-up residential areas. These habitats included sealed surfaces - roads, streets, gutters, footpaths, mown and vegetated street verge - with brush box *Lophostemon confertus* as the dominant native street tree, commonly pruned to a maximum height of 5-16 m, built structures - houses, fences, roof-mounted antennae, powerlines, streetlight poles, stormwater drains and home gardens comprising usually exotic and some indigenous shrubs with dense foliage and nectar-rich flowers to 3 m, and up to 30 m tall indigenous (e.g. eucalypts, paperbarks, silky oak *Grevillea robusta*, Allocasuarina) and exotic (e.g. jacaranda, date palm, poplar, oak, cypress, liquidambar, maple) trees in the front and rear yards of properties. Birds of these habitats were similar to those of open parkland sites, with some inclusions. Typically they included ground granivores - Rock Dove, Spotted Dove (not recorded in open parkland sites), Crested Pigeon, Galah, Little Corella, Long-billed Corella and Sulphur-crested Cockatoo, a canopy granivore – Australian King-Parrot, two ground insectivores - Australian Magpie and the introduced Common Blackbird (not recorded previously in the study), an aerial insectivore – Welcome Swallow, nectarivores/insectivores - Noisy Miner and Red Wattlebird, a nectarivore - Rainbow Lorikeet, omnivores - Australian White Ibis, Common Myna, Common Starling, Australian Raven and Pied Currawong, and two carnivores - Grey Butcherbird and Laughing Kookaburra. Supplementary feeding by residents in backyards may help account for the presence of Grey Butcherbird and Laughing Kookaburra at some of these sites.

A diverse range of habitats, microhabitats and food types were used by birds and other fauna in the study area (Plates 19-30).

Plate 19: Densely planted street verges provided foraging, perching and nesting substrates for some birds – Abigail Street urban neighbourhood site.

Plate 20: A flock of 14 Sulphur-crested Cockatoo ate unripe oranges from a front yard tree in Irvine Crescent at Beazley Street urban neighbourhood site, 11/4/12.

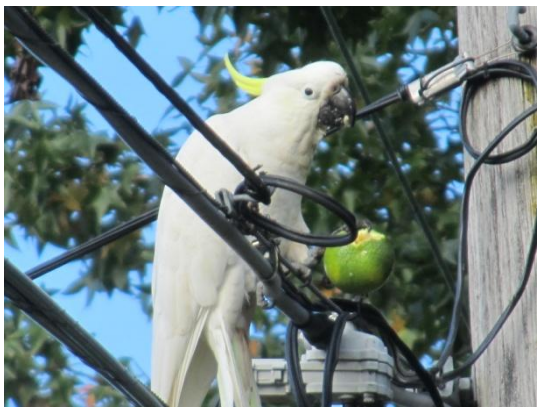


Plate 21: Australian White Ibis bathed in a temporary pool in the carpark at Buffalo Creek Reserve revegetated parkland site, 10/4/12.

Plate 22: Street verges and front yards containing only mown grass and sealed surfaces (fore and mid-ground) provided very little habitat for birds, Eltham Street urban neighbourhood site.

Plate 23: From canopy to ground strata bushland remnant sites such as Field of Mars Reserve below supported a conservation-significant core of native woodland/forest bird species (photograph taken along Sand Track, 13/4/12).

Plate 24: Riparian areas such as along Buffalo Creek at Field of Mars Reserve Site B provided water, food, shelter and potential nest sites for White-browed Scrubwren, Silvereye, Eastern Yellow Robin and others, 13/4/12.

Plate 25: Watering points such as this ‘dog dish’ beside a path at Gladesville Reserve revegetated parkland site allow the invasive Noisy Miner (shown bathing) to continue to dominate urban bird communities, 16/4/12.

Plate 26: Variegated Fairy-wrens foraged in dense woody debris and fern microhabitat at the Lane Cove NP north bushland remnant site, recovering after fire (adult female and juvenile shown at centre right), 12/4/12.

Plate 27: Adult female Leaden Flycatcher took a dragonfly in the tiny Putney Point bushland remnant site (bird shown at centre top right), 16/4/12.

Plate 28: An uncollared domestic cat was observed leaving a property at 86 Pellisier Road and stalking birds in the same site as shown in Plate 27 at 0855 hours, 16/4/12.

Plate 29: Magpie-lark feeding nestlings in mangroves beside main walking path at Riverglade Reserve open parkland site, 14/4/12. Both parents participated in the provisioning, making forays every few minutes to collect and deliver insects from grass on the adjacent oval.

Plate 30: The aquatic omnivore Chestnut Teal (with ducklings including an adopted Pacific Black Duck shown at far left of photograph) foraged and sheltered at Waruda Pond, Riverglade Reserve revegetated parkland site, 14/4/12.

3.4 Interseasonal changes in bird communities

A number of changes in the terrestrial bird communities of the study area occurred between the spring 2011 and autumn 2012 surveys. These included variation in relative abundance, species richness and community structure and are described below.

3.4.1 Relative abundance

There was a negligible difference in the total number of birds recorded in autumn 2012 relative to the spring 2010 sample - 1,860 birds in autumn and 1,859 birds in spring. However, marked autumnal decreases occurred in bushland remnant (109 or 23.3% fewer individuals) and revegetated parkland (13 or 5.5%) sites. These were offset by autumnal increases in open parkland (47 or 18.4% more individuals) and urban neighbourhood (76 or 8.5%) sites. Figure 8 shows this change in bird abundance by greenspace types and across the sampling period.

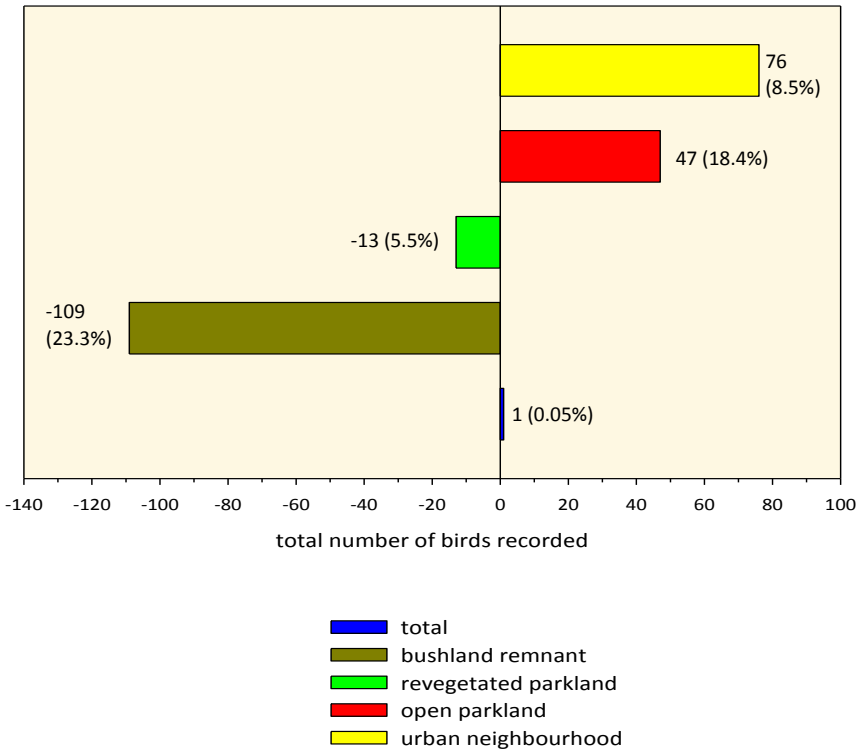
The main 'decreasers' or species that were present in lower numbers in autumn 2012 than spring 2011 were Galah (57.1% less individuals), Superb Fairy-wren (53.6%), Common Myna (41.3%), White-browed Scrubwren (39.6%), Red Wattlebird (29.6%), Pied Currawong (25%), and Welcome Swallow (17.6%). Also, there were several species recorded in spring but not autumn

which thus contributed to this differential, mostly in bushland remnant sites. These included the summer breeding migrants Eastern Koel, Channel-billed Cuckoo, Shining Bronze-cuckoo, Dollarbird, Sacred Kingfisher and Rufous Fantail and the blossom nomads New Holland Honeyeater and Little Wattlebird. Other species - Yellow Thornbill, Striated Thornbill and Crimson Rosella - went undetected in autumn but were recorded in spring.

The main 'increasers' or species that were present in greater numbers in autumn 2012 than spring 2011 were Little Corella (56 birds recorded in autumn and none recorded in spring), Common Starling (77.1% more individuals), Rock Dove (68.2%), Crested Pigeon (50%), Silvereye (50%), Long-billed Corella (42.8%), and Australian Magpie (18.7%). Small numbers of other species were recorded in autumn but not spring – Leaden Flycatcher, Striated Pardalote, Powerful Owl, Musk Lorikeet, Yellow-tailed Black-Cockatoo and White-bellied Sea-Eagle. The sampled Noisy Miner population was 6% larger in autumn than spring. However, this most likely reflected the addition of more young birds following further successful nesting attempts that occurred after the spring 2011 survey, i.e. the second and third clutches.

The sampled population size of some species was similar in both spring and autumn surveys. These included Sulphur-crested Cockatoo, Spotted Dove, Variegated Fairy-wren, Australian Raven, Red-whiskered Bulbul (small at 9-10 birds), Laughing Kookaburra, Brown Thornbill (14-17 birds), Brown Gerygone (very small at 4-5 birds), Eastern Yellow Robin (very small at 3-5 birds), Eastern Whipbird (very small at 2-6 birds), Golden Whistler (very small at 2-4 birds) and White-throated Treecreeper (very small at 5 birds). The six latter species were all confined to larger bushland remnant sites at Field of Mars Reserve (Wildlife Refuge), Lane Cove NP and Boronia Park Reserve. Additional targeted surveying may add to these population size totals.

Figure 8: Change in the total number of birds recorded by greenspace type, October 2011 - April 2012 (% change in brackets)

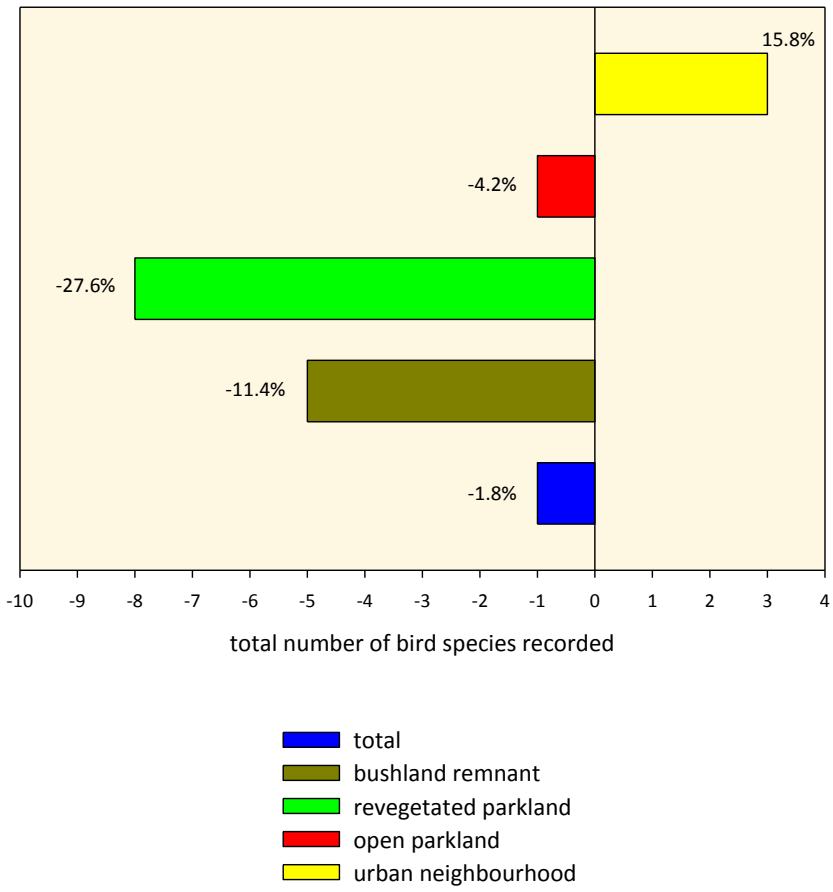


3.4.2 Bird species richness

Only one (1) or 1.8% fewer bird species were recorded in autumn 2012 (55 species) compared with spring 2011 (56 species). Bushland remnant (5 or 11.4% fewer species), revegetated parkland (8 or 27.6%) and open parkland (1 or 4.2%) sites all experienced autumnal 'losses' of species. However, urban neighbourhood sites recorded a 15.8% increase (3 species) in the number of bird species present in autumn compared with the previous spring. Figure 9 depicts these changes in bird species richness by greenspace type and across the sampling period.

Autumnal 'losses' of species from revegetated parkland sites featured mainly warm season migratory birds - Channel-billed Cuckoo, Eastern Koel and Rufous Fantail, the locally nomadic Little Wattlebird, the autumn-winter dispersive Eastern Spinebill, ground granivores – Spotted Dove and Sulphur-crested Cockatoo, Red-whiskered Bulbul, Magpie-lark and Common Myna. Species that were detected in these sites in autumn but not the previous spring were White-faced Heron, Australian White Ibis, Little Corella, Australasian Figbird and Red-browed Finch.

Figure 9: Change in the total number of bird species recorded by greenspace type, October 2011 - April 2012 (% change shown)



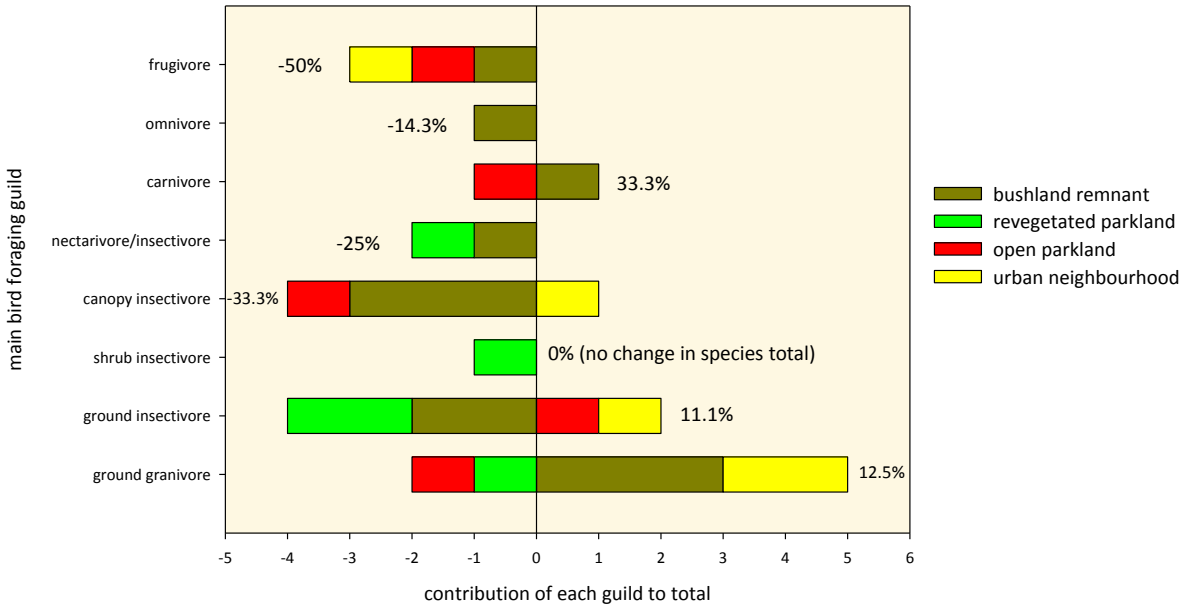
3.4.3 Bird community structure

Some changes in the structure of terrestrial bird communities of the study area, as represented by the composition of foraging guilds, occurred between spring 2011 and autumn 2012. There were small to moderate increases in the number of member species recorded in 3 of the 8 main terrestrial guilds in autumn. These included carnivores (1 or 33.3% increase), ground granivores (1 or 12.5%) and ground insectivores (1 or 11.1%). In contrast, fewer member species were observed for frugivores (1 or 50% decrease), canopy insectivores (2 or 33.3%), nectarivores/insectivores (1 or 25%) and omnivores (1 or 14.3%) in autumn. The number of shrub insectivores remained stable at 6 members in each season. Figure 10 displays these changes in the composition of the main terrestrial bird foraging guilds sampled over this period in the study area.

Bushland remnants recorded the most variation in guild composition across the greenspace types over the spring-autumn period (Figure 10). Autumnal increases in the number and mix of member bird species were recorded for ground granivores (3 species or 100% increase) and carnivores (1 or 33.3%). Contrasting decreases in frugivores (100%), canopy insectivores (3 or 50%), ground insectivores (2 or 25%) and omnivores (25%) also occurred in these remnants. Again, shrub insectivores remained stable at 6 species each between these seasons.

The pattern of spring-autumn change in guild composition in the other greenspace types was comparatively milder than in the bushland remnants with single species additions or deletions commonly recorded (Figure 10). The exceptions were autumnal increases in ground granivores in urban neighbourhood sites (2 species or 40%) and autumnal decreases in ground insectivores in revegetated parkland sites (2 species or 33.3%) (Figure 10). Omnivores remained stable in composition terms across all greenspace types except bushland remnants.

Figure 10: Change in the composition of main terrestrial bird foraging guilds by greenspace type, October 2011 - April 2012. The percent total change per guild across all relevant greenspace types is shown at the end of each bar. Each coloured section of bar represents respective increases or decreases in the number of bird species recorded for each foraging guild in different greenspace types over this period.



3.5 Breeding activity

The bulk of the bird breeding season had finished at the time of the autumn survey. Despite this, a total of 50 records involving 12 species and 176 young were obtained during the survey in the study area (Appendix 1). These were mainly of fledged young still partly or wholly dependent on their parents for food and protection.

Bird species recorded as having recently bred or still breeding at the time of the autumn survey included Chestnut Teal (7 fledglings – see Plate 30), Pacific Black Duck (1 fledgling adopted by Chestnut Teal family at Waruda Pond, Riverglade Reserve), Rainbow Lorikeet (1 fledgling), Superb Fairy-wren (2 juveniles), Variegated Fairy-wren (8 juveniles), White-browed Scrubwren (5 juveniles), Spotted Pardalote (no young, male observed courtship-feeding female), Noisy Miner (28 records, estimated 134 young produced – mostly as dependent or semi-dependent fledglings), Eastern Whipbird (1 juvenile/sub-adult), Australian Magpie (13 juveniles), Magpie-lark (2 nestlings – see Plate 29), and Common Myna (2 juveniles). Noisy Miner accounted for 76.1% of all breeding records. This compares with estimated totals of 193 and 206 young produced respectively by this species in the spring 2010 and spring 2011 surveys for this project (see InSight Ecology 2011a, e).

Most of observed bird breeding activity occurred in bushland remnant and urban neighbourhood sites, with some records from older revegetated parkland sites. The larger bushland reserves – Field of Mars Reserve (Wildlife Refuge), Lane Cove NP and Boronia Park Reserve produced more breeding records across a greater range of bird species than did the smaller remnants. Only the more resilient or adaptable species such as Noisy Miner, Australian Magpie and Superb Fairy-wren were able to breed in small bushland remnants and revegetated parkland.

3.6 Birds of conservation significance

No bird species of international conservation significance were recorded during the survey in the study area. However, 21 species listed under either or all three international conservation agreements – China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) – have been recorded in or near the study area over the past 28 years (see InSight Ecology 2010). These are intercontinental migratory waders that arrive in spring in Australia and depart in autumn for their northern Asian breeding grounds, thus avoiding the northern hemisphere winter. They also include White-throated Needletail, Fork-tailed Swift, White-bellied Sea-Eagle, Cattle Egret, Eastern Great Egret, Crested Tern, Common Tern and Oriental Cuckoo.

No bird species listed as endangered or vulnerable under the national Environment Protection and Biodiversity Conservation Act (1999) (EPBC Act) were recorded during the survey in the study area. However, 5 species listed under this legislation have been previously recorded in or near the study area. These include Swift Parrot (endangered, E1 listing), Eastern Bristlebird (E1), Regent Honeyeater (E1), Crested Shrike-tit (vulnerable), and White-fronted Chat (nominated for listing as vulnerable in September 2010). Three of these species - Eastern Bristlebird, Crested Shrike-tit and White-fronted Chat – have gone or are likely to have gone extinct in the study area (see InSight Ecology 2010).

A further two species - Cotton Pygmy-goose and Black-necked Stork – are listed as endangered in NSW under the NSW Threatened Species Conservation (TSC) Act (1995). These birds have been recorded in Lane Cove River valley in the last 14 years (InSight Ecology 2010) but were not detected during this or the previous three surveys conducted for the River to River Corridors Project.

One species listed as Vulnerable under NSW Threatened Species Conservation Act 1995 (NSW TSC Act) – Powerful Owl – was again recorded in the study area during the survey. This large forest owl had been recorded at the same site during the spring 2010 and autumn 2011 surveys (InSight Ecology 2011a, d). Another species of conservation significance - White-bellied Sea-Eagle – while not listed as threatened under NSW TSC Act is listed as Marine and Migratory under EPBC Act 1999. One individual of this species was recorded flying over Bedlam Bay (Parramatta Regional Park) in this survey, presumably headed to an active nest at Sydney Olympic Park.

Therefore, a total of 9 nationally and NSW-listed threatened bird species have been recorded in or near the study area, either historically or more recently.

A suite of 20 other indigenous bird species of conservation significance within the highly fragmented regional and local Sydney urban landscape were recorded during the survey in the study area. These included 14 ground, shrub, canopy and aerial insectivores, two nectarivores (Eastern Spinebill and Musk Lorikeet), a nectarivore/insectivore Yellow-faced Honeyeater, a canopy granivore Australian King-Parrot, a ground granivore Red-browed Finch, and the carnivorous Brown Goshawk. The most significant of these species in conservation terms within the highly urbanised local and regional environment are the ground-foraging Eastern Whipbird, Eastern Yellow Robin, White-browed Scrubwren, Variegated Fairy-wren and Superb Fairy-wren, shrub insectivores Grey Fantail, Brown Thornbill, Brown Gerygone, Golden Whistler and Leaden Flycatcher, Spotted Pardalote (nominate race *punctatus* is mostly resident but with some dispersal or migration inland in autumn-winter – Higgins and Peter 2002), Striated Pardalote (nominate race *striatus* is a winter migrant to NSW from Tasmania arriving March-May – Higgins and Peter 2002), bark-gleaning White-throated Treecreeper and hollow-nesting Tree Martin.

4. Discussion

4.1 Bird assemblages of the study area – patterns and processes

4.1.1 Bird responses to changes in Sydney's urban greenspace

Over the past 223 years, Sydney's native vegetation cover has been systematically removed and converted to housing for what are now more than 4 million people. All that remains are some small, highly fragmented patches that are experiencing further decline in habitat condition from invasive species and edge impacts. Today's pattern of habitat distribution, size, connectivity and condition in the study area generally reflects this broad-scale process of change to the configuration, composition and continuity of habitats across the Sydney region. It is a process characteristic of the impact of broad-scale landscape change on biodiversity across cities in Australia (e.g. Perth - Recher and Serventy 1991; How and Dell 2000; Adelaide - Tait et al. 2005; Melbourne - van der Ree 2004, White et al. 2005; Sydney - Benson and Howell 1990b;

Flannery 1999; Brisbane - Garden et al. 2006) and worldwide (see UNEP Convention on Biological Diversity 2007).

Counteracting this landscape-scale process of extensive habitat loss, fragmentation and modification, have been episodes of revegetation, mostly on publicly owned land over at least the past three decades. At the local and regional scale, this has introduced an array of indigenous and exotic vegetation into this landscape. Coupled with earlier plantings along streets, on private properties and in parks, these activities have shaped the type, amount, quality and condition of habitats available to birds and other fauna. In effect, there has been an incremental transformation of this landscape, especially in Sydney's inner-west, south and north-west, from one of mainly sealed surfaces with minimal vegetation cover to a complex mosaic of ribbons, patches and conduits of green interwoven with 'red-roof suburbia'.

Bird assemblages have responded to these changes over time by either adapting, colonising or disappearing from habitats in this landscape. A cohort of medium to large bodied indigenous and introduced birds dominates the native and exotic vegetation planted in parks, along streets, and in the front and rear yards of houses across the study area and other districts. These are opportunistic, highly adaptable and often aggressive species that survive, reproduce, and have ultimately colonised these novel urban habitats. These include Noisy Miner, Rainbow Lorikeet, Red Wattlebird, Crested Pigeon, Australian Raven, Australian Magpie, Magpie-lark, Grey Butcherbird and Pied Currawong. The introduced species are the ground-foraging granivores - Spotted Dove and Rock Dove, and the ubiquitous omnivores - Common Myna and Common Starling.

Bird assemblages in the smaller, highly isolated bushland remnants of the study area are much less taxonomically and functionally diverse than those occupying the larger contiguous remnants (Lane Cove River valley and its tributaries – Buffalo, Kittys, and Brickmakers Creeks). The smaller remnants at Betts Park, Tarban Creek, Putney Point, Mallee and Tyagarah Reserves and Wallumatta NR support only a relatively small number of resilient species which are the residual of what were once, prior to intensive urbanisation, much richer guilds. Historical records confirm the incremental loss of small woodland and forest ground and shrub insectivores and nectarivores/insectivores from these and other small Sydney bushland remnants (Blakers et al. 1984; Barrett et al. 2003). Species now apparently extinct from these smaller, isolated remnants include mostly forest and some grassland dependent endemics - Grey Shrike-thrush, Crested Shrike-tit, Varied Sittella, Spotted Quail-thrush, Yellow-tufted Honeyeater, Speckled Warbler, Jacky Winter (despite some more recent reports), Little Grassbird, Diamond Firetail and Australasian Pipit. Small numbers of the ground-foraging insectivore Eastern Yellow Robin still occur in Field of Mars Reserve (Wildlife Refuge) and Lane Cove National Park.

Other native ground-foraging insectivores - White-browed Scrubwren, Variegated Fairy-wren and Superb Fairy-wren - seem to be maintaining small breeding populations in weedy undergrowth of Mallee and Tyagarah Reserves, Putney Point, Tarban Creek Reserve (north bank to Villa Maria property), Gladesville Reserve, Riverglade Reserve, Betts Park, Bedlam Bay (Parramatta Regional Park) and in Lane Cove NP and Field of Mars Reserve (Wildlife Refuge). In the larger remnants of Field of Mars Reserve (Wildlife Refuge), Lane Cove NP and Boronia Park Reserve, birds that have gone locally extinct over the past 50 or more years include Superb Lyrebird, Rockwarbler, Eastern Bristlebird, Crested Shrike-tit, Pheasant Coucal, Eastern Barn Owl, Noisy Pitta, White-fronted Chat, and the introduced Nutmeg Mannikin and Common

Greenfinch. Powerful Owls, however, appear to be expanding their Sydney urban population with Lane Cove River forest providing key roosting, nesting and foraging habitat.

4.1.2 The Noisy Miner conquest

The most abundant and successful of the 'urban adaptees' are the Noisy Miner and Rainbow Lorikeet, followed by Spotted Dove and Red Wattlebird. The Noisy Miner is a colony-living 'honeyeater' that aggressively protects food sources and breeding territories, repelling intruders and competitors through mobbing behaviour. This species has rapidly colonised almost all urban greenspace types and their habitat niches across Sydney over at least the past decade (see Higgins et al. 2001; Parsons et al. 2003; French et al. 2005; Parsons et al. 2006). In doing so, Noisy Miners may have either pushed out other species or taken over habitat niches vacated by species during earlier rounds of extinction, although further work is needed to confirm this.

In the study area, species that may have been adversely affected by the Noisy Miner could include smaller honeyeaters such as Yellow-faced Honeyeater, Eastern Spinebill and White-plumed Honeyeater (the latter species has not been recorded during the River to River Corridors Project), small shrub and canopy-foraging insectivores – Striated Pardalote, Brown Thornbill, Golden Whistler, Striated Thornbill and Brown Gerygone, and the once-common introduced House Sparrow and Common Blackbird. One lone blackbird was detected at Mary Street urban neighbourhood site near upper Tarban Creek Reserve. The House Sparrow was not recorded in any of the River to River Corridors Project surveys. Competition for food and nest sites from Spotted Dove, Common Myna and Common Starling, predation by Grey Butcherbird, Pied Currawong and Australian Raven and mammalian carnivores, and a reduction in the amount of suitable nest sites may have been other key factors implicated in the apparent decline of these two species across suburban Sydney. It is also feasible that the relatively low numbers of Willie Wagtail recorded in this study may reflect these combined pressures of competition from Noisy Miners and predation by avian and mammalian carnivores, although further work would be needed to confirm this. The Willie Wagtail is an indigenous, open-nesting, ground-foraging insectivore usually considered to be resilient and relatively well adapted to urban life.

Habitats offering open canopies, nectar-rich plants such as grevillea cultivars, banksia, callistemon, strelitzia and camellia, dense foliage supplying nest sites and insects (e.g. eucalypts, paperbark, camellia and brush box – especially pruned brush box street trees that produce prolific flowers and attract insects and have many multiple branches with dense foliage), supplementary food and water supplies (often from houses and parks), and plenty of edge habitat have contributed to the success of the Noisy Miner in Sydney and other highly urbanised landscapes such as Melbourne (see, e.g., White et al. 2005) and Brisbane (see Catterall 2004; Garden et al. 2006). Where these conditions are less favourable, such as in the more closed and continuous canopies of Lane Cove NP and Field of Mars Reserve (Wildlife Refuge), Noisy Miners are absent or confined to the edges. Strategic management of urban greenspace for biodiversity conservation should, if possible, utilise this knowledge of Noisy Miner ecology.

The broadening of Noisy Miner diet to include grain-based food scraps available from outdoor café tables, rubbish bins and footpaths (A.H. pers obs) suggests that this species is fast acquiring omnivore status in suburban Sydney. Consequently, Noisy Miners are able to directly

compete for food with the introduced Common Myna and Common Starling, although nest site preferences differ markedly between these species. Co-existence rather than exclusion, however, seems the more likely long-term outcome for these three species in this landscape.

In these ways, Noisy Miners may be viewed as potential 'engineers' of structural change in Sydney's urban bird communities. Their ability to readily and frequently (up to 3-4 clutches per season) breed in and thus rapidly colonise urban habitats, broaden their diet and adapt their foraging strategy, and potentially displace other indigenous and exotic species, from within and possibly outside their foraging guild, has established the Noisy Miner, together with the Rainbow Lorikeet, as the dominant bird species in suburban Sydney. This has important implications for the strategic conservation management of other avifauna and their habitat, and indeed overall biodiversity values, in Ryde-Hunter's Hill and neighbouring LGAs.

4.1.3 Interseasonal changes in bird communities

Variation in the number, species richness, and structure of terrestrial bird communities surveyed between spring 2011 and autumn 2012 can be attributed to potential interaction between a suite of factors. These include variability in climate and its impact on the availability, amount and quality of food, competition and predation pressure, species-specific traits and habitat preferences, landscape effects, human-mediated impacts, and sampling effects.

Autumnal decreases in bird abundance and species richness and consequent changes in foraging guild structure happened in bushland remnant and revegetated parkland sites. This may have occurred in response to interseasonal variation in local climate and food supplies in these remnants and planted sites. Fine-scale variation in the timing, magnitude and spatial distribution of rainfall, temperature and humidity can strongly influence the amount, availability and quality of avian food supplies such as invertebrates and nectar (Ford 1989). This, in turn, can affect the timing, duration and success of bird breeding behaviour. For example, early or late eucalypt flowering times mediated by rainfall and temperature fluxes can affect the numbers of blossom-nomad Noisy Friarbird and part-migratory Yellow-faced Honeyeater. Both of these species were recorded in the first (2010) but not second (2011) spring survey and only one Yellow-faced Honeyeater was detected in the autumn 2012 survey – although surveying in winter might reveal more of this latter species following its autumnal migration north from higher areas to the south and along the Great Dividing Range. When combined with potential increases in competition for food, shelter and nest sites from other bird species and possibly increased predation by cats and foxes, particularly on ground and shrub insectivores, this could account for these changes to the bird species composition of bushland remnants and planted sites.

Conversely, autumn 2012 increases in bird abundance that occurred in urban neighbourhood and open parkland sites are more likely to have reflected human-mediated impacts. These include supplementary feeding, provision of watering points, and planting of shrub and tree species in home gardens, street verges and public reserves that produce almost year-round supplies of nectar, insects and other food. Invariably, these were the resilient, adaptable species that readily exploit human-created suburban habitats – ground granivores, some omnivores, carnivores, and a small group of ground insectivores and nectarivores/insectivores.

Species-specific traits including dispersal, migration and habitat selection patterns may help explain the autumn 2012 decline in abundance and species richness in the bushland remnants.

Migratory species that breed in spring/summer in southern Australian forests and woodlands and have headed north by around late March – Rufous Fantail, Black-faced Monarch, Dollarbird, Eastern Koel, Shining Bronze-cuckoo, Channel-billed Cuckoo and Sacred Kingfisher – were recorded in spring 2011 but not autumn 2012. Local climatic variation, availability of more attractive alternative foraging and nesting habitat in other remnants near the study area such as Lane Cove River valley or within the region – i.e. national parks to Sydney's north, and delays in departure from northern wintering habitats are factors possibly implicated in the observed result. Behavioural mechanisms operating at the species and individual levels may also have been implicated in the autumn 2012 outcome in bushland remnants. These include, for example, avian utilisation of experience-based knowledge of patch quality and threats to preferentially select breeding territories and nest sites. Older birds are often more adept in deploying this knowledge and consequently may achieve higher reproductive success rates (see Huggett 2000). However, more information on the age-related structure of and microhabitat selection by breeding bird populations in the bushland remnants of the study area is needed.

Landscape effects or how what happens within the study area's broader landscape affects the organisms that live in it may also be implicated in the observed results. Local and regional variation in the amount, quality, configuration and connectivity of habitat has been well recognised as an important potential determinant of bird abundance, species diversity and community structure in highly fragmented landscapes such as Sydney (see, e.g., Parsons et al. 2006; InSight Ecology 2008, 2011b; Crates et al., 2011). Reductions in the number of birds and species in bushland remnants in autumn 2012 may have been influenced by an increased availability of alternative habitat in other remnants within the landscape. Increased autumn 2012 bird abundance in urban neighbourhood and open parkland sites may have been partly due to birds such as Rainbow Lorikeet, Noisy Miner and especially Common Myna and Common Starling moving in from neighbouring urban, parkland and smaller bushland sites to find food as the weather cooled and other sources such as supplementary feeding and scraps were more readily available.

Human-mediated impacts also most likely contributed to the observed changes between both seasons. An example was evident at the small Betts Park bushland remnant where native foreshore trees and shrubs had been removed in 2011 to presumably improve waterscape views for an adjacent property. This site provided important local foraging and most likely breeding habitat for Variegated Fairy-wren and White-browed Scrubwren. Other pertinent impacts include predation by feral and domestic cats and habitat disturbance by dogs and humans. Ongoing incursion of cats and dogs into core forest habitats in bushland remnant sites at Lane Cove NP, Field of Mars Reserve (Wildlife Refuge), Tarban Creek north bank, Bedlam Bay, and Putney Point was noted during the surveys.

Sampling effects may also have been implicated in the observed changes in bird communities between spring and autumn. These relate to the difficulty in sampling highly mobile organisms such as birds over specific areas and habitats and repeating this effort over ensuing seasons. Changes in the number, diversity and structure of and habitat use by bird communities are difficult to accurately detect over time. Surveys need to be replicated over several years and seasons in order to detect clear trends of change in these attributes. The set of four River to River Corridors Project surveys have, however, been designed to sample change in relative abundance, species richness, foraging guild composition and habitat use by bird communities present in the study area. This is providing valuable baseline information on the nature and quality of bird communities before the planting of new corridors take place. This will allow

assessment of the contribution of these corridors to re-connecting isolated bush bird populations over time in the study area.

Interseasonal changes in the structure of terrestrial bird communities surveyed in the study area also occur in other bird communities in Melbourne, Adelaide and Sydney (see, for example, White et al. 2005; Tait et al. 2005; InSight Ecology 2008, 2011a,b). These are also driven by spatial and temporal fluctuations in food supply, habitat quality, amount, configuration and connectivity, predation, fire, interspecific and intraspecific competition for mates, nest sites and shelter, autecological factors such as resilience and adaptive capacity, population size and fecundity and behavioural characteristics, and landscape-scale factors (see InSight Ecology 2011b).

4.2 Urban greenspace as bird habitat in the study area

4.2.1 Habitat connectivity: the importance of greenspace networks

The bushland remnants of the study area provide a diverse suite of habitats for bird assemblages that are richer in species composition and community structure than many of their counterparts in nearby local government areas such as Canada Bay, Strathfield, Auburn and Burwood. They support insectivores which can be considered to be at risk of local extinction given the high level of habitat fragmentation and isolation in this landscape and pressure on key foraging, refuge and breeding resources from competitors, predators and humans. Alleviation of this pressure warrants continued conservation action in the study area, as does the protection of remnants against threats and improvement of the condition of their habitats.

The impetus for reducing pressure on these resources is already available in parts of the study area. A combination of established Allocasuarina, paperbark, eucalypt and shrub-based other plantings along Tarban Creek at Riverglade Reserve, in Boronia Park Reserve and at Gladesville Reserve will, in time, establish denser understorey vegetation to help reduce the attractiveness of these areas for Noisy Miner invasion. Although, for this to be effective dense understorey plantings are needed across a larger scale and should be strategically integrated with existing bushland patches. Best-practice bush regeneration (including staged removal of heavily weed-infested areas) of existing dense ground cover vegetation in Mallee and Tyagarah Reserves is also needed to minimise any impact of weed removal on small breeding Variegated Fairy-wren and White-browed Scrubwren populations.

Enhancing and re-establishing habitat connectivity in the study area for particularly dispersal-limited avifauna is the focus of the River to River Corridors Project. This will target key points within the two identified potential wildlife corridors with strategic revegetation and habitat rehabilitation and protection activities.

4.2.2 Revegetated parkland: valuable bird habitat or Noisy Miner utopia?

Revegetated parkland provided foraging habitat for 38.2% of all bird species observed during the survey. However, most of these species were aggressive, resilient, invasive or predatory birds - Noisy Miner, Rainbow Lorikeet, Red Wattlebird, Pied Currawong, and Grey Butcherbird. These species are commonly associated with structurally simpler, more open canopy habitats characterised by substantial amounts of edge and flowering tall trees and shrubs.

Only a small suite of remaining woodland/forest species appeared able to exploit the food, shelter and nesting resources of revegetated parkland. This was largely because of the high numbers of edge-affiliated species present, particularly Noisy Miner and, to a lesser extent, Red Wattlebird and the young age of many plantings. The latter species has become a relatively recent colonist of this type of greenspace in Sydney. Other factors included the number of nest predators present (Grey Butcherbird, Pied Currawong, Australian Raven), stage of growth (many stands were less than 10 years old), narrow width and moderate-high angularity of stands, lack of stand structural complexity, poor habitat condition (weed-invaded, fire-affected), minimal or little connectivity between revegetation patches, and frequent disturbance by humans, cats and dogs.

The real value of the revegetated parkland of Ryde-Hunter's Hill lies in its potential to connect highly isolated remnants, riparian habitat and urban neighbourhood vegetation across the local landscape. In doing so, plantings will contribute to restoring habitat linkages and potential wildlife corridors at the local *and* regional scale. If focus is given to increasing the structural complexity of habitats - especially creating wide, denser understorey plantings to exclude Noisy Miners - and the variety of microhabitats while also improving their condition, then these plantings should help restore a level of ecological function to the study area. More direct interventions may also need to be considered.

4.2.3 Urban neighbourhood habitats: looking beyond footpath and fence

Ryde and particularly Hunter's Hill are older established Sydney suburbs. Successive phases of planting of native and introduced vegetation have occurred along the streets and in residential front and rear yards since this time, culminating in the insertion and maintenance of brush box, paperbark tea-tree, elms and oaks as the main street tree species present today. As a result, urban neighbourhoods are well foliaged and appear to provide food and suitable foraging, nesting and refuge habitats for a range of birds, bats and insects. Proximity to, and some connections with, old established parks and newer, bush-regenerated open space could theoretically enhance these functions.

The ornithological and ecological reality, however, is that urban neighbourhood habitats in the study area mostly cater for a cohort of resilient, urban-adapted species. With the exception of Superb Fairy-wren and occasionally Silvereye and Spotted Pardalote, small bush birds are usually excluded from these sites. This reflects, in part, the lack of structural complexity of habitats available for exploitation by these smaller species. Competitive and predatory interactions between species and disturbance and predation by cats, rats, dogs and humans are also implicated. Supplementary feeding and water provisioning of birds by residents (see Plate 25) and planting of grevillea, callistemon and other high nectar-producing species in gardens have also favoured the colonisation of urban neighbourhood habitats by larger birds, especially the Noisy Miner, Red Wattlebird and Rainbow Lorikeet and regular visitation by the carnivorous Laughing Kookaburra and Grey Butcherbird. Landscape attributes such as distance from nearest remnant or revegetation patch and poor habitat connectivity may also be factors that have contributed to this dearth of small native birds in urban areas.

There is a need to view urban neighbourhood habitats as more than just streetscape vegetation, without devaluing the contribution of street trees to the structure of Australian urban bird communities (see Young et al. 2007). The role and function of front and rear yard habitats in providing viable foraging, breeding and shelter habitat for birds need to be properly

understood. These habitats include mown lawns, cultivated garden beds, planted ground cover, shrubs and trees, individual remnant trees, and garden ornaments such as ponds, fountains and birdbaths. How do these habitats function to facilitate the movement of small birds into and through urban neighbourhoods? Would they perform better in this role if species such as the Noisy Miner and Pied Currawong were present in fewer numbers? What specific actions would represent best value for money and effort invested in helping to re-connect previously isolated Eastern Yellow Robin, White-browed Scrubwren, Variegated Fairy-wren and Superb Fairy-wren populations? These are examples of the types of questions that need to be addressed prior to planning and implementing bush revegetation for small birds on publicly and privately owned urban neighbourhood habitats.

Potential therefore exists to provide suitable habitat to attract some small bush birds back into urban neighbourhoods in Ryde-Hunter's Hill. The building blocks of interstitial or 'stepping stone' habitat are there, at least for species capable of foraging in, moving through, and possibly breeding in planted garden hedges, shrubs and lawns such as the Superb Fairy-wren and possibly White-browed Scrubwren. Some of this important work is already underway through the Ryde-Hunter's Hill Small Bird Network and now the River to River Corridors Project partners. However, a long-term (10 years+) community-based program is needed to plan and implement the strategic revegetation of key parts of this landscape for other bushland bird species. This remains a key goal of the current initiative - it will require further funding beyond the life of this project.

4.3 Conservation targets – focusing management action

A cornerstone of best-practice ecosystem management involves identifying and protecting, through strategic intervention, species, communities and habitats of conservation significance. Several opportunities exist to enhance current biodiversity conservation management activities and protect bird communities and their habitats in the study area. The emphasis is on protecting small bush birds because they appear to have declined markedly in Australian urban landscapes over the past two decades (Recher and Serventy 1991; Sewell and Catterall 1998; Barrett et al. 2003; Parsons et al. 2006; InSight Ecology 2010). However, other bird species with intermediate sensitivities to the loss of habitat size, shape, connectivity and condition would also be benefited by these actions.

Protection of the condition and ecological integrity of the three key larger bushland remnants in the study area against degrading impacts should be of high priority and continued to be pursued through existing bushland management plans. This will require reduction of threats to birds and other fauna posed by feral and domestic cats, rats, dogs and foxes, weed reduction and management, fire protection, and management of human incursions such as removal of native vegetation, rubbish dumping and trailbike use, e.g. as still occurs at Gladesville Reserve and Putney Point. Strategic planting and best-practice bush regeneration will be needed to improve the ecological condition and, where feasible, the connectivity of smaller bushland remnants.

The restoration of riparian habitats and strategic revegetation of parkland are other opportunities to improve the quality, connectivity and functional value of these greenspace types for small bush birds in the study area. Here the emphasis is on improving the structural complexity and floristic diversity of local indigenous plantings (including denser plantings), widening revegetation strips to reduce the amount of edge habitat for the Noisy Miner and

other invasive species, filling gaps between plantings to improve connectivity at the local and landscape scales, and considering direct control of Noisy Miner numbers. Some of this new work is already underway or being proposed for the area as part of the River to River Corridors Project.

Conservation targets in urban neighbourhood and open parkland habitats should complement those pursued in adjoining revegetated parkland and bush remnants. These focus on targeting the linkage of 'stepping stones' or 'corridors' for small birds through new and existing strategic plantings in streets and home gardens, adoption of small bird-friendly practices - garden re-design, pet management (especially cat and dog control), reduction of watering points and reduction of supplementary feeding, and coordination with adjoining councils as part of the larger and interconnected urban landscape. Some progress has been made on these fronts through planning and early implementation of the community education and engagement component of the River to River Corridors Project and associated initiatives at City of Ryde and Hunter's Hill Council.

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Appendix

Appendix 1: All individual birds recorded by InSight Ecology during the 10-17 April 2012 survey of the study area
* introduced species

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
1	Chestnut Teal	*Anas castanea*	140412	0750-0825	29	Riverglade Reserve	0	7	0	0	foraging	2 adults + 5 ducklings on Waruda Pond
2	Chestnut Teal	*Anas castanea*	160412	1530-1630	25	Gladesville Reserve	0	4	0	0	foraging	2 adults and 2 ducklings
3	Pacific Black Duck	*Anas superciliosa*	140412	0750-0825	29	Riverglade Reserve	0	1	0	0	foraging	lone duckling with Chestnut Teal family on Waruda Pond
4	Rock Dove *	*Columba livia*	110412	0815-0900	14	Beazley Street	0	0	0	10	calling, foraging, flying, perching	at Beazley St flats onto upper balconies suggesting supplementary feeding
5	Rock Dove *	*Columba livia*	110412	0940-1005	16	Eltham Street	0	0	0	6	foraging, calling	
6	Rock Dove *	*Columba livia*	130412	1525-1550	5	Holy Cross College	0	0	2	0	foraging	on top oval
7	Rock Dove *	*Columba livia*	150412	1630-1700	17	Abigail Street	0	0	0	2	foraging	
8	Rock Dove *	*Columba livia*	160412	1035-1105	19	Hillcrest Avenue	0	0	0	7	foraging, perching, calling	
9	Rock Dove *	*Columba livia*	170412	0940-0955	28	Tennyson Road	0	0	0	16	perching	on 6 Teemer St rooftop
10	Rock Dove *	*Columba livia*	170412	1000-1030	27	Western Crescent	0	0	0	45	perching, preening	preening and drying on rooftop of 71 Morrison Rd (cnr Western Cr

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
												& Morrison Rd) - some may have been counted at Tennyson Rd site (6 Teemer St rooftop)?
11	Spotted Dove *	*Streptopelia chinensis*	110412	0815-0900	14	Beazley Street	0	0	0	12	foraging, flying	
12	Spotted Dove *	*Streptopelia chinensis*	110412	0910-0930	15	Monash Road	0	0	0	5	foraging, perching	
13	Spotted Dove *	*Streptopelia chinensis*	110412	0940-1005	16	Eltham Street	0	0	0	5	foraging, perched, calling	
14	Spotted Dove *	*Streptopelia chinensis*	130412	1030-1050	12	Badajoz Road	0	0	0	4	foraging, calling	
15	Spotted Dove *	*Streptopelia chinensis*	160412	0940-0955	36	Stanley Street	0	0	0	1	calling	
16	Spotted Dove *	*Streptopelia chinensis*	160412	1035-1105	19	Hillcrest Avenue	0	0	0	2	foraging, calling	
17	Spotted Dove *	*Streptopelia chinensis*	170412	0905-0935	32	Mallee and Tyagarah Reserves	2	0	0	0	foraging, calling	
18	Spotted Dove *	*Streptopelia chinensis*	170412	1000-1030	27	Western Crescent	0	0	0	2	perching, preening	on TV antenna drying after light shower (14 Western Cr)
19	Crested Pigeon	*Ocyphaps lophotes*	100412	1615-1650	1	Moncrieff Drive	0	0	0	3	foraging, resting	
20	Crested Pigeon	*Ocyphaps lophotes*	100412	1655-1715	34	Buffalo Creek Reserve	0	2	0	0	foraging	
21	Crested Pigeon	*Ocyphaps lophotes*	110412	0910-0930	15	Monash Road	0	0	0	6	foraging, perching	
22	Crested Pigeon	*Ocyphaps lophotes*	110412	1650-1710	10	Westminster Road	0	0	0	5	foraging, perched	
23	Crested Pigeon	*Ocyphaps lophotes*	130412	1525-1550	5	Holy Cross College	0	0	1	0	foraging	top oval

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
24	Crested Pigeon	*Ocyphaps lophotes*	140412	0930-0945	21	Tarban Creek Reserve	1	0	0	0	flyover	
25	Crested Pigeon	*Ocyphaps lophotes*	160412	0755-0840	37	Morrison Bay Park	0	0	31	0	foraging	3 flocks - on Fields 2,3 & 6
26	Crested Pigeon	*Ocyphaps lophotes*	160412	0940-0955	36	Stanley Street	0	0	0	1	flyover	to Morrison Bay Park
27	Crested Pigeon	*Ocyphaps lophotes*	160412	1530-1630	25	Gladesville Reserve	0	2	0	0	foraging	
28	Crested Pigeon	*Ocyphaps lophotes*	170412	0940-0955	28	Tennyson Road	0	0	0	2	perching	on TV antenna rooftop of 21A Tennyson rd
29	Crested Pigeon	*Ocyphaps lophotes*	170412	1000-1030	27	Western Crescent	0	0	0	10	foraging, perching, preening	on antenna (Ross st flats & 12 Western Cr - preening after light shower)
30	White-faced Heron	*Egretta novaehollandiae*	170412	0825-0845	40	Bremner Park	0	3	0	0	foraging	oval edge
31	Australian White Ibis	*Threskiornis molucca*	100412	1655-1715	34	Buffalo Creek Reserve	0	5	0	0	foraging, perched, preening	playground area and around carpark pooled water and guard rails (pics)
32	Australian White Ibis	*Threskiornis molucca*	110412	1715-1730	2	Blaxland Street	0	0	0	1	foraging	in leaf litter along Pittwater Rd verge
33	Australian White Ibis	*Threskiornis molucca*	130412	1735-1745	9	Park Road	0	0	0	3	flyover & roosting	1 roosting in bunya pine rear 2 Gaza pl & 2 f/o Boronia Pk
34	Australian White Ibis	*Threskiornis molucca*	140412	0720-0745	30	Riverglade Reserve	0	0	1	0	flyover	
35	Australian White Ibis	*Threskiornis molucca*	140412	0950-1005	23	Tarban Creek Reserve	0	1	0	0	foraging	
36	Australian White Ibis	*Threskiornis molucca*	160412	0755-0840	37	Morrison Bay Park	0	0	1	0	foraging	
37	Australian White Ibis	*Threskiornis molucca*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	1	0	flyover	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
38	Australian White Ibis	*Threskiornis molucca*	170412	0825-0845	40	Bremner Park	0	5	0	0	foraging	oval edge nr WF Heron
39	Australian White Ibis	*Threskiornis molucca*	170412	1000-1030	27	Western Crescent	0	0	0	2	flyover	to Morrison Bay Park
40	White-bellied Sea-Eagle	*Haliaeetus leucogaster*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	1	0	flyover	mobbed by Aust Raven, headed west up Parramatta River
41	Brown Goshawk	*Accipiter fasciatus*	130412	0820-0935	11	Field of Mars Reserve Site A	1	0	0	0	foraging, mobbed	mobbed by Noisy Miner and Pied Currawong nr NW edge of reserve
42	Masked Lapwing	*Vanellus miles*	130412	1525-1550	5	Holy Cross College	0	0	2	0	foraging	lawn near new school vege patch
43	Galah	*Eolophus roseicapillus*	130412	1525-1550	5	Holy Cross College	0	0	4	0	flyover	
44	Galah	*Eolophus roseicapillus*	130412	1600-1620	33	Wallumatta NR	2	0	0	0	perching, calling	
45	Galah	*Eolophus roseicapillus*	160412	0755-0840	37	Morrison Bay Park	0	0	2	0	foraging	in mixed feeding flock (kikuyu corms etc) with Long-billed and Little Corellas
46	Galah	*Eolophus roseicapillus*	170412	0940-0955	28	Tennyson Road	0	0	0	4	perching	on TV antenna rooftop of 19 & 21 Bayview St
47	Long-billed Corella	*Cacatua tenuirostris*	130412	1735-1745	9	Park Road	0	0	0	2	flyover	to Lane Cove River
48	Long-billed Corella	*Cacatua tenuirostris*	150412	1630-1700	17	Abigail Street	0	0	0	3	foraging, calling, perching	on roof & feeding backyard flowering shrubs @ 13 Martin St, with Little Corella
49	Long-billed Corella	*Cacatua tenuirostris*	160412	0755-0840	37	Morrison Bay Park	0	0	9	0	foraging	on Frank Downing Sportsground &

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
												nr main carpark entrance off Frances Rd - in larger flock of Little Corella
50	Little Corella	*Cacatua sanguinea*	150412	1630-1700	17	Abigail Street	0	0	0	3	foraging, calling, perching	on roof & feeding backyard flowering shrubs @ 13 Martin St, with Long-billed Corella (photos)
51	Little Corella	*Cacatua sanguinea*	160412	0755-0840	37	Morrison Bay Park	0	0	44	0	foraging	in mixed flock with Long-billed Corella & Galah
52	Little Corella	*Cacatua sanguinea*	160412	1530-1630	25	Gladesville Reserve	0	8	0	0	foraging	
53	Little Corella	*Cacatua sanguinea*	170412	0940-0955	28	Tennyson Road	0	0	0	1	flyover	to Morrison Bay Park
54	Sulphur-crested Cockatoo	*Cacatua galerita*	110412	0815-0900	14	Beazley Street	0	0	0	14	foraging, flying, calling	flock of 14 - half were eating unripe oranges fr tree frontyard 3 Irvine Cr (pics); flying between backyard & street eucs Irvine Cr & Beazley street
55	Sulphur-crested Cockatoo	*Cacatua galerita*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	1	0	0	0	flyover	
56	Sulphur-crested Cockatoo	*Cacatua galerita*	150412	1630-1700	17	Abigail Street	0	0	0	3	foraging, calling, flying	
57	Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	4	0	0	0	foraging, calling, flying	feeding on green radiata pine cones in Villa Maria midslopes (pics)

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
58	Rainbow Lorikeet	*Trichoglossus haematodus*	100412	1615-1650	1	Moncrieff Drive	0	0	0	27	calling, flyover	from/to Field of Mars
59	Rainbow Lorikeet	*Trichoglossus haematodus*	100412	1655-1715	34	Buffalo Creek Reserve	0	7	0	0	foraging, calling	
60	Rainbow Lorikeet	*Trichoglossus haematodus*	110412	0815-0900	14	Beazley Street	0	0	0	27	calling, foraging, flying	rear yard eucs, Callistemon (street verge) & pink ironbark @ 33 irvine Cr
61	Rainbow Lorikeet	*Trichoglossus haematodus*	110412	0910-0930	15	Monash Road	0	0	0	15	foraging, flying, calling	eg. in backyard flowering Callistemon 2 College St
62	Rainbow Lorikeet	*Trichoglossus haematodus*	110412	0940-1005	16	Eltham Street	0	0	0	5	foraging, calling	in flowering grevillea 72 Pittwater Rd (rearyard)
63	Rainbow Lorikeet	*Trichoglossus haematodus*	110412	1650-1710	10	Westminster Road	0	0	0	22	foraging, calling, flying	in flowering street verge old paperbarks & flowering umbrella tree opp 46 Thompson st
64	Rainbow Lorikeet	*Trichoglossus haematodus*	110412	1715-1730	2	Blaxland Street	0	0	0	12	foraging, calling, flying	
65	Rainbow Lorikeet	*Trichoglossus haematodus*	120412	1525-1625	6	Lane Cove NP north	4	0	0	0	flyover, calling	
66	Rainbow Lorikeet	*Trichoglossus haematodus*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	8	0	0	0	flyover, calling	
67	Rainbow Lorikeet	*Trichoglossus haematodus*	130412	0820-0935	11	Field of Mars Reserve Site A	10	0	0	0	calling, foraging, flying	
68	Rainbow Lorikeet	*Trichoglossus haematodus*	130412	0945-1020	13	Field of Mars Reserve Site B	4	0	0	0	flyover	
69	Rainbow Lorikeet	*Trichoglossus haematodus*	130412	1030-1050	12	Badajoz Road	0	0	0	17	foraging, calling,	in flowering salmon pink

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
											flying	ironbark (John Miller Pk), camellias (8 Callaghan st)
70	Rainbow Lorikeet	*Trichoglossus haematodus*	130412	1525-1550	5	Holy Cross College	0	0	8	0	foraging, flyover	
71	Rainbow Lorikeet	*Trichoglossus haematodus*	130412	1600-1620	33	Wallumatta NR	16	0	0	0	foraging, flyover	
72	Rainbow Lorikeet	*Trichoglossus haematodus*	130412	1625-1640	7	Boronia Park	0	0	4	0	foraging, calling	
73	Rainbow Lorikeet	*Trichoglossus haematodus*	130412	1650-1730	8	Boronia Park	12	0	0	0	calling, pre-roosting	in large blackbutts in Brickmakers Ck gully
74	Rainbow Lorikeet	*Trichoglossus haematodus*	130412	1735-1745	9	Park Road	0	0	0	4	flyover	
75	Rainbow Lorikeet	*Trichoglossus haematodus*	140412	0720-0745	30	Riverglade Reserve	0	0	4	0	flyover	to Villa Maria area
76	Rainbow Lorikeet	*Trichoglossus haematodus*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	16	0	0	0	foraging, calling, flyover	
77	Rainbow Lorikeet	*Trichoglossus haematodus*	140412	0930-0945	21	Tarban Creek Reserve	4	0	0	0	foraging, feeding young	incl 1 fledgling in blackbutt
78	Rainbow Lorikeet	*Trichoglossus haematodus*	140412	0950-1005	23	Tarban Creek Reserve	0	3	0	0	foraging, flying, calling	in pink flowering ironbark off Reserve St
79	Rainbow Lorikeet	*Trichoglossus haematodus*	150412	1630-1700	17	Abigail Street	0	0	0	18	foraging, calling, flying	
80	Rainbow Lorikeet	*Trichoglossus haematodus*	150412	1705-1735	18	Mary Street	0	0	0	24	foraging, calling, flying	in thick exotic shrubs and hedges

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
81	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	0755-0840	37	Morrison Bay Park	0	0	12	0	foraging, calling, flying	
82	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	0850-0915	38	Putney Point	2	0	0	0	foraging	in old blackbutt
83	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	0920-0935	39	Putney Park	0	5	0	0	foraging, flying	
84	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	0940-0955	36	Stanley Street	0	0	0	20	foraging, flying, calling	in flowering street verge callistemon
85	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	1015-1030	20	Kelly Street	0	0	0	5	foraging, flying, calling	in frontyard flowering grevillea & callistemon
86	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	1035-1105	19	Hillcrest Avenue	0	0	0	17	foraging, calling, flying	in budding tallowwood 10 Prince Edward & camellia street verge outside Prince Edward st tennis courts
87	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	1530-1630	25	Gladesville Reserve	0	13	0	0	foraging, calling, flyover	
88	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	1640-1705	24	Betts Park	3	0	0	0	foraging, calling	
89	Rainbow Lorikeet	*Trichoglossus haematodus*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	10	0	flyover	
90	Rainbow Lorikeet	*Trichoglossus haematodus*	170412	0720-0735	31	Olympic Park	0	2	0	0	flyover	
91	Rainbow Lorikeet	*Trichoglossus haematodus*	170412	0905-0935	32	Mallee and Tyagarah Reserves	3	0	0	0	calling, flying	
92	Rainbow Lorikeet	*Trichoglossus haematodus*	170412	0940-0955	28	Tennyson Road	0	0	0	12	foraging, calling, flying	in rearyard eucs 12,14 & 19B Bayview St &

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
												flying to/from Morrison Bay Park
93	Rainbow Lorikeet	*Trichoglossus haematodus*	170412	1000-1030	27	Western Crescent	0	0	0	26	foraging, calling, flying, perching	in grevillea (39 Morrison) & balcony of units Ross st (supplementary feeding?)
94	Musk Lorikeet	*Glossopsitta concinna*	120412	1525-1625	6	Lane Cove NP north	2	0	0	0	flyover, calling	
95	Australian King-Parrot	*Alisterus scapularis*	110412	1650-1710	10	Westminster Road	0	0	0	2	perched, chased off	mobbed by Rainbow Lorikeet from planted Turpentine & ironbark strip at bus stop Thompson st
96	Australian King-Parrot	*Alisterus scapularis*	130412	1735-1745	9	Park Road	0	0	0	1	flyover	from Boronia Park
97	Australian King-Parrot	*Alisterus scapularis*	140412	0720-0745	30	Riverglade Reserve	0	0	2	0	flyover	to Villa Maria area
98	Australian King-Parrot	*Alisterus scapularis*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	1	0	0	0	calling, flying	adult female
99	Australian King-Parrot	*Alisterus scapularis*	140412	0930-0945	21	Tarban Creek Reserve	1	0	0	0	perching	flew fr Gladesville Rd bridge and perched in blackbutt in this reserve @ 0933
100	Eastern Rosella	*Platycercus eximius*	130412	1600-1620	33	Wallumatta NR	2	0	0	0	perching, calling	
101	Fan-tailed Cuckoo	*Cacomantis flabelliformis*	130412	0820-0935	11	Field of Mars Reserve Site A	1	0	0	0	foraging	10 m in off Kunzea Track

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
102	Powerful Owl	*Ninox strenua*	130412	1650-1730	8	Boronia Park	2	0	0	0	roosting	in Brickmakers Ck gully north bank 4-5 m up in small rainforest tree (observed 1705-1715)
103	Laughing Kookaburra	*Dacelo novaeguineae*	110412	1650-1710	10	Westminster Road	0	0	0	1	flying	flew from across High St adjoining Field of Mars
104	Laughing Kookaburra	*Dacelo novaeguineae*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	1	0	0	0	calling	
105	Laughing Kookaburra	*Dacelo novaeguineae*	130412	0945-1020	13	Field of Mars Reserve Site B	2	0	0	0	foraging, calling	
106	Laughing Kookaburra	*Dacelo novaeguineae*	130412	1650-1730	8	Boronia Park	2	0	0	0	calling, flying	Brickmakers Ck gully
107	Laughing Kookaburra	*Dacelo novaeguineae*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	1	0	0	0	calling	
108	Laughing Kookaburra	*Dacelo novaeguineae*	140412	0930-0945	21	Tarban Creek Reserve	3	0	0	0	perching	mobbed by 2 noisy miners in norfolk island pine
109	Laughing Kookaburra	*Dacelo novaeguineae*	160412	0920-0935	39	Putney Park	0	1	0	0	foraging	
110	Laughing Kookaburra	*Dacelo novaeguineae*	170412	0940-0955	28	Tennyson Road	0	0	0	1	perching	on rooftop TV antenna of 115 Morrison Rd
111	White-throated Treecreeper	*Cormobates leucophaea*	120412	1525-1625	6	Lane Cove NP north	4	0	0	0	foraging, calling	upper and lower (riparian) slopes
112	White-throated Treecreeper	*Cormobates leucophaea*	130412	0820-0935	11	Field of Mars Reserve Site A	1	0	0	0	foraging, calling	
113	Superb Fairy-wren	*Malurus cyaneus*	100412	1655-1715	34	Buffalo Creek Reserve	0	3	0	0	foraging, calling	in weedy main walking trail edge along creek

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
114	Superb Fairy-wren	*Malurus cyaneus*	140412	0750-0825	29	Riverglade Reserve	0	6	0	0	foraging, calling	2 grps of adults & juveniles in Phragmites & sheoaks (side tributary nr carpark) & dry rush pond in middle section
115	Superb Fairy-wren	*Malurus cyaneus*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	4	0	foraging, calling, roosting	pre-roosting in young fig beside sealed access road at boatshed
116	Variegated Fairy-wren	*Malurus lamberti*	120412	1525-1625	6	Lane Cove NP north	4	0	0	0	foraging	2 males and 2 females; in dense regrowth nr same site as Oct 2011 survey
117	Variegated Fairy-wren	*Malurus lamberti*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	5	0	0	0	foraging, calling	adult male and females and 2 juveniles; strong cat urine odour in bush off main track
118	Variegated Fairy-wren	*Malurus lamberti*	130412	0820-0935	11	Field of Mars Reserve Site A	9	0	0	0	foraging, calling	2 groups - 3 and 6 birds respectively incl adult male along Sand Track section
119	Variegated Fairy-wren	*Malurus lamberti*	160412	1530-1630	25	Gladesville Reserve	0	3	0	0	foraging	along weedy bank below main oval
120	Variegated Fairy-wren	*Malurus lamberti*	160412	1640-1705	24	Betts Park	4	0	0	0	foraging, calling	in usual thick groundcover area below drain fr road & down to water's edge
121	Variegated Fairy-wren	*Malurus lamberti*	170412	0825-0845	40	Bremner Park	0	5	0	0	foraging, calling, flying	grp of 3 females, 1x50%-coloured male, 1x10% coloured male; flew from

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
												creek into lomandra slopes nr toilet block then along planted slope above car park - likely part of group recorded in Mallee & Tyagarah Reserves
122	Variegated Fairy-wren	*Malurus lamberti*	170412	0905-0935	32	Mallee and Tyagarah Reserves	4	0	0	0	foraging, calling	grp of 1 full colour male, 2 adult females, 1 juv male - obs in creekline nr sewer main cement cap & later along cement walking path on E side of reserve, i.e. 80 m upslope of first sighting
123	White-browed Scrubwren	*Sericornis frontalis*	120412	1525-1625	6	Lane Cove NP north	3	0	0	0	calling, foraging, flying	1 adult male, 1 adult female, 1 juvenile
124	White-browed Scrubwren	*Sericornis frontalis*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	2	0	0	0	foraging, calling, bathing	one adult pair & at small rock pool nr main track
125	White-browed Scrubwren	*Sericornis frontalis*	130412	0820-0935	11	Field of Mars Reserve Site A	4	0	0	0	foraging, calling	two adult pairs
126	White-browed Scrubwren	*Sericornis frontalis*	130412	0945-1020	13	Field of Mars Reserve Site B	5	0	0	0	foraging, calling	2 pairs plus juvenile
127	White-browed Scrubwren	*Sericornis frontalis*	140412	0750-0825	29	Riverglade Reserve	0	8	0	0	foraging, calling	3 groups of adults and juveniles - 1 group in each of the three planted pond/tributary

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
												sections
128	White-browed Scrubwren	*Sericornis frontalis*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	4	0	0	0	foraging, calling	2 groups of 2 adult pairs along ck and lantana lower slopes, strong territory calls
129	White-browed Scrubwren	*Sericornis frontalis*	160412	0850-0915	38	Putney Point	3	0	0	0	foraging	2 males and 1 female; cat fr adjacent 86 Pellisier Rd obs stalking in this remnant
130	White-browed Scrubwren	*Sericornis frontalis*	160412	1530-1630	25	Gladesville Reserve	0	2	0	0	foraging, calling	nr VFW along weedy bank below main oval
131	White-browed Scrubwren	*Sericornis frontalis*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	2	0	foraging, calling	along eastern weedy edge
132	White-browed Scrubwren	*Sericornis frontalis*	170412	0905-0935	32	Mallee and Tyagarah Reserves	2	0	0	0	foraging, calling	one adult pair along creek in dense weedy cover upstream of footbridge
133	Brown Gerygone	*Gerygone mouki*	120412	1525-1625	6	Lane Cove NP north	2	0	0	0	foraging	near riverbank
134	Brown Gerygone	*Gerygone mouki*	130412	0945-1020	13	Field of Mars Reserve Site B	2	0	0	0	foraging	in weedy lower-mid slope along Buffalo Creek
135	Brown Thornbill	*Acanthiza pusilla*	120412	1525-1625	6	Lane Cove NP north	2	0	0	0	foraging	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
136	Brown Thornbill	*Acanthiza pusilla*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	4	0	0	0	foraging, calling	
137	Brown Thornbill	*Acanthiza pusilla*	130412	0820-0935	11	Field of Mars Reserve Site A	4	0	0	0	foraging, calling	
138	Brown Thornbill	*Acanthiza pusilla*	130412	1650-1730	8	Boronia Park	4	0	0	0	foraging, calling	
139	Spotted Pardalote	*Pardalotus punctatus*	120412	1525-1625	6	Lane Cove NP north	2	0	0	0	foraging	
140	Spotted Pardalote	*Pardalotus punctatus*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	2	0	0	0	foraging, calling	male provisioning female
141	Spotted Pardalote	*Pardalotus punctatus*	130412	0820-0935	11	Field of Mars Reserve Site A	3	0	0	0	foraging, calling	
142	Spotted Pardalote	*Pardalotus punctatus*	130412	0945-1020	13	Field of Mars Reserve Site B	1	0	0	0	foraging, calling	
143	Spotted Pardalote	*Pardalotus punctatus*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	2	0	0	0	calling	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
144	Striated Pardalote	*Pardalotus striatus*	100412	1615-1650	1	Moncrieff Drive	0	0	0	2	calling, foraging	tall eucs behind Moncrieff Dr backing onto Field of Mars
145	Eastern Spinebill	*Acanthorhynchus tenuirostris*	120412	1525-1625	6	Lane Cove NP north	2	0	0	0	foraging, calling, flying	
146	Eastern Spinebill	*Acanthorhynchus tenuirostris*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	1	0	0	0	bathing	at small rock pool beside main track
147	Eastern Spinebill	*Acanthorhynchus tenuirostris*	130412	0820-0935	11	Field of Mars Reserve Site A	3	0	0	0	foraging, calling, flying	in flowering Lambertia formosa and Banksia spinulosa
148	Yellow-faced Honeyeater	*Lichenostomus chrysops*	130412	0820-0935	11	Field of Mars Reserve Site A	1	0	0	0	calling	
149	Noisy Miner	*Manorina melanocephala*	100412	1545-1605	4	Magdala Park	0	0	2	0	foraging	in western section's planted Callistemon nr playground
150	Noisy Miner	*Manorina melanocephala*	100412	1615-1650	1	Moncrieff Drive	0	0	0	34	calling, foraging, flying	incl 3 grps of dependent juveniles and fledglings = total 6 young;

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
												foraging in budding Tas Blue Gum street trees (Melba Drive), flowering paperbark tea-tree & Banksia in verge/frontyards
151	Noisy Miner	*Manorina melanocephala*	100412	1655-1715	34	Buffalo Creek Reserve	0	6	0	0	foraging, calling	incl 2 fledglings
152	Noisy Miner	*Manorina melanocephala*	110412	0815-0900	14	Beazley Street	0	0	0	27	calling, foraging, flying	incl 2 dependent juveniles; feeding in creamy pink flowering ironbark 33 Irvine Cr, azalea (596 Vic Rd), crepe myrtle, eucs & callistemon
153	Noisy Miner	*Manorina melanocephala*	110412	0910-0930	15	Monash Road	0	0	0	26	foraging, flying, calling	incl 6 dependent juveniles and fledglings
154	Noisy Miner	*Manorina melanocephala*	110412	0940-1005	16	Eltham Street	0	0	0	23	foraging, perched, calling	incl 10 dependent juveniles; in flowering callistemon outside 35 & 37 Eltham, camellia hedge Pittwater Rd, rearyard old eucalypts
155	Noisy Miner	*Manorina melanocephala*	110412	1650-1710	10	Westminster Road	0	0	0	23	foraging, calling, flying	incl 4 dependent juveniles

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
156	Noisy Miner	*Manorina melanocephala*	110412	1715-1730	2	Blaxland Street	0	0	0	20	foraging, calling, flying	incl 2 dependent juveniles
157	Noisy Miner	*Manorina melanocephala*	130412	1030-1050	12	Badajoz Road	0	0	0	31	foraging, calling, flying	6 groups of total 17 dependent juveniles and recent fledglings; in flowering street callistemon, frontyard spotted gum and peppermint, camellia hedge (24 Badajoz rd), tall backyard eucs (17 Quarry)
158	Noisy Miner	*Manorina melanocephala*	130412	1525-1550	5	Holy Cross College	0	0	14	0	foraging, calling, flying	4 grps of fledglings = total 5 young
159	Noisy Miner	*Manorina melanocephala*	130412	1600-1620	33	Wallumatta NR	13	0	0	0	foraging, calling, feeding young	3 groups of total 6 dependent juveniles and recent fledglings
160	Noisy Miner	*Manorina melanocephala*	130412	1625-1640	7	Boronia Park	0	0	6	0	foraging, calling	incl 1 fledgling
161	Noisy Miner	*Manorina melanocephala*	130412	1735-1745	9	Park Road	0	0	0	17	foraging, calling, roosting	incl 5 recent fledglings
162	Noisy Miner	*Manorina melanocephala*	140412	0720-0745	30	Riverglade Reserve	0	0	2	0	foraging	on breadcrumbs provided by a park visitor @ 0725
163	Noisy Miner	*Manorina melanocephala*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	14	0	0	0	foraging, calling, mobbing	incl 3 nestlings in Angophora 15m fr Richmond Cr edge

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
164	Noisy Miner	*Manorina melanocephala*	140412	0930-0945	21	Tarban Creek Reserve	5	0	0	0	foraging, calling	swaths of privet removed to make way for cycling path
165	Noisy Miner	*Manorina melanocephala*	140412	0950-1005	23	Tarban Creek Reserve	0	15	0	0	foraging, flying, calling	incl 4 dependent juveniles, in pink-flowering planted ironbark off Reserve St
166	Noisy Miner	*Manorina melanocephala*	150412	1630-1700	17	Abigail Street	0	0	0	17	foraging, calling, flying	incl 4 dependent juveniles, in flowering callistemon, grevillea, banksia & eucs
167	Noisy Miner	*Manorina melanocephala*	150412	1705-1735	18	Mary Street	0	0	0	33	foraging, calling, flying	incl 11 fledglings, in street verge crepe myrtle (4 Augustine), tas blue gum (11 Augustine), grevilleas (8 Paul)
168	Noisy Miner	*Manorina melanocephala*	160412	0755-0840	37	Morrison Bay Park	0	0	16	0	foraging, calling, flying	incls 2 dependent juveniles, in flowering callistemon & paperbark beside walk/cycle path and in NW sector
169	Noisy Miner	*Manorina melanocephala*	160412	0850-0915	38	Putney Point	6	0	0	0	foraging, calling	incl 2 dependent juveniles in river-edge blackbutt

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
170	Noisy Miner	*Manorina melanocephala*	160412	0920-0935	39	Putney Park	0	20	0	0	foraging, flying, calling, mobbing	incl 5 dependent juveniles, in flowering paperbark, mobbed ravens
171	Noisy Miner	*Manorina melanocephala*	160412	0940-0955	36	Stanley Street	0	0	0	13	foraging, flying, calling	all adults
172	Noisy Miner	*Manorina melanocephala*	160412	1015-1030	20	Kelly Street	0	0	0	17	foraging, flying, calling	incl 8 dependent juveniles in street verge brushbox & callistemon (11 William St) & rearyard eucs @ 32, 34, 36 & 38 Dick St
173	Noisy Miner	*Manorina melanocephala*	160412	1035-1105	19	Hillcrest Avenue	0	0	0	22	foraging, calling	incl 6 dependent juveniles & 4 recent fledglings = total 10 young, in rear & frontyard old eucs (34 Hillcrest), flowering asters (4 Sunnyside), tall budding tallowwood front & rear yd (10 Prince Edward)
174	Noisy Miner	*Manorina melanocephala*	160412	1530-1630	25	Gladesville Reserve	0	18	0	0	foraging, calling	incl 4 dependent juveniles
175	Noisy Miner	*Manorina melanocephala*	160412	1640-1705	24	Betts Park	8	0	0	0	foraging, calling, flying	incl 2 dependent juveniles

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
176	Noisy Miner	*Manorina melanocephala*	170412	0720-0735	31	Olympic Park	0	8	0	0	foraging, calling, feeding young	incl 2 dependent juveniles
177	Noisy Miner	*Manorina melanocephala*	170412	0755-0810	35	Tyagarah Reserve	0	0	5	0	foraging, feeding young, calling	feeding insects to 2 recent fledglings
178	Noisy Miner	*Manorina melanocephala*	170412	0825-0845	40	Bremner Park	0	16	0	0	foraging, calling, flying	incl 3 recent fledglings, in flowering planted blackbutt
179	Noisy Miner	*Manorina melanocephala*	170412	0905-0935	32	Mallee and Tyagarah Reserves	2	0	0	0	foraging, calling	edges only & tallowwoods
180	Noisy Miner	*Manorina melanocephala*	170412	0940-0955	28	Tennyson Road	0	0	0	10	foraging, calling, flying	all adults, in flowering camellia and vine-laden privacy screen between 83A&B Tennyson Rd
181	Noisy Miner	*Manorina melanocephala*	170412	1000-1030	27	Western Crescent	0	0	0	24	foraging, calling, flying, mobbing	incl 6 dependent juveniles & recent fledglings; mobbed ravens on power pole; feeding in grevilleas & fig (rear 55 Morrison)

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
182	Red Wattlebird	*Anthochaera carunculata*	100412	1615-1650	1	Moncrieff Drive	0	0	0	1	foraging	street verge Banksia, paperbarks
183	Red Wattlebird	*Anthochaera carunculata*	110412	0815-0900	14	Beazley Street	0	0	0	3	calling, foraging, flying	in backyard old euc (poss E. citriodora budding up) @ 9 Irvine Cr
184	Red Wattlebird	*Anthochaera carunculata*	110412	0910-0930	15	Monash Road	0	0	0	1	calling, foraging	in budding old euc rear dental centre cnr College St & Monash Rd
185	Red Wattlebird	*Anthochaera carunculata*	120412	1525-1625	6	Lane Cove NP north	1	0	0	0	foraging	along riverbanks
186	Red Wattlebird	*Anthochaera carunculata*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	2	0	0	0	foraging, calling	
187	Red Wattlebird	*Anthochaera carunculata*	130412	0820-0935	11	Field of Mars Reserve Site A	4	0	0	0	calling, foraging, chasing	
188	Red Wattlebird	*Anthochaera carunculata*	130412	0945-1020	13	Field of Mars Reserve Site B	2	0	0	0	foraging, calling	
189	Red Wattlebird	*Anthochaera carunculata*	130412	1650-1730	8	Boronia Park	1	0	0	0	calling	
190	Red Wattlebird	*Anthochaera carunculata*	160412	1035-1105	19	Hillcrest Avenue	0	0	0	1	calling	nr reserve backing to upper Tarban Ck area

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
191	Red Wattlebird	*Anthochaera carunculata*	160412	1640-1705	24	Betts Park	2	0	0	0	foraging, calling	
192	Red Wattlebird	*Anthochaera carunculata*	170412	0720-0735	31	Olympic Park	0	1	0	0	foraging, calling	
193	Eastern Whipbird	*Psophodes olivaceus*	120412	1525-1625	6	Lane Cove NP north	3	0	0	0	foraging, calling	2 adult males and 1 adult female - males competing
194	Eastern Whipbird	*Psophodes olivaceus*	130412	0820-0935	11	Field of Mars Reserve Site A	3	0	0	0	foraging, calling, flying	1 adult male & female, 1 sub-adult male
195	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	130412	0820-0935	11	Field of Mars Reserve Site A	2	0	0	0	foraging, calling	obs with a phasmid
196	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	130412	0945-1020	13	Field of Mars Reserve Site B	2	0	0	0	calling, foraging	
197	Golden Whistler	*Pachycephala pectoralis*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	2	0	0	0	foraging, calling	in red bloodwood on s/st outcrop & black ash (E. sieberi) on lower slopes
198	Golden Whistler	*Pachycephala pectoralis*	130412	0820-0935	11	Field of Mars Reserve Site A	2	0	0	0	calling	2 young males (no female response) competing for

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
												territory/mate - one calling in NW section nr cemetery boundary and other fr main (Kunzea) trail
199	Australasian Figbird	*Sphecotheres vieilloti*	170412	0825-0845	40	Bremner Park	0	1	0	0	flyover	to large Port Jackson Figs (fruiting) N edge Morrison Bay Pk opposite reserve
200	Grey Butcherbird	*Cracticus torquatus*	110412	0815-0900	14	Beazley Street	0	0	0	1	calling	
201	Grey Butcherbird	*Cracticus torquatus*	110412	0940-1005	16	Eltham Street	0	0	0	1	calling	
202	Grey Butcherbird	*Cracticus torquatus*	110412	1650-1710	10	Westminster Road	0	0	0	1	perched	
203	Grey Butcherbird	*Cracticus torquatus*	110412	1715-1730	2	Blaxland Street	0	0	0	1	calling	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
204	Grey Butcherbird	*Cracticus torquatus*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	1	0	0	0	foraging	juvenile
205	Grey Butcherbird	*Cracticus torquatus*	130412	0820-0935	11	Field of Mars Reserve Site A	1	0	0	0	calling	
206	Grey Butcherbird	*Cracticus torquatus*	130412	1625-1640	7	Boronia Park	0	0	1	0	foraging	adult foraging on Oval 1 grass
207	Grey Butcherbird	*Cracticus torquatus*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	2	0	0	0	calling	
208	Grey Butcherbird	*Cracticus torquatus*	140412	0930-0945	21	Tarban Creek Reserve	1	0	0	0	perched	adult in blackbutt
209	Grey Butcherbird	*Cracticus torquatus*	140412	0950-1005	23	Tarban Creek Reserve	0	1	0	0	calling	
210	Grey Butcherbird	*Cracticus torquatus*	160412	0755-0840	37	Morrison Bay Park	0	0	1	0	foraging	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
211	Grey Butcherbird	*Cracticus torquatus*	160412	0920-0935	39	Putney Park	0	1	0	0	foraging, calling	adult
212	Grey Butcherbird	*Cracticus torquatus*	160412	0940-0955	36	Stanley Street	0	0	0	1	foraging	adult
213	Grey Butcherbird	*Cracticus torquatus*	160412	1530-1630	25	Gladesville Reserve	0	1	0	0	foraging, calling	adult
214	Grey Butcherbird	*Cracticus torquatus*	160412	1640-1705	24	Betts Park	1	0	0	0	foraging	adult monitored and swooped nr fairy-wrens
215	Australian Magpie	*Cracticus tibicen*	100412	1545-1605	4	Magdala Park	0	0	13	0	foraging	incl 5 juveniles
216	Australian Magpie	*Cracticus tibicen*	100412	1615-1650	1	Moncrieff Drive	0	0	0	2	foraging	
217	Australian Magpie	*Cracticus tibicen*	100412	1655-1715	34	Buffalo Creek Reserve	0	4	0	0	foraging	incl 2 juveniles
218	Australian Magpie	*Cracticus tibicen*	110412	0815-0900	14	Beazley Street	0	0	0	13	foraging, perched, calling	incl 3 juveniles
219	Australian Magpie	*Cracticus tibicen*	110412	0910-0930	15	Monash Road	0	0	0	1	foraging	
220	Australian Magpie	*Cracticus tibicen*	110412	0940-1005	16	Eltham Street	0	0	0	2	foraging	
221	Australian Magpie	*Cracticus tibicen*	110412	1650-1710	10	Westminster Road	0	0	0	2	foraging	
222	Australian Magpie	*Cracticus tibicen*	110412	1715-1730	2	Blaxland Street	0	0	0	1	foraging	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
223	Australian Magpie	*Cracticus tibicen*	130412	0945-1020	13	Field of Mars Reserve Site B	1	0	0	0	foraging	
224	Australian Magpie	*Cracticus tibicen*	130412	1525-1550	5	Holy Cross College	0	0	5	0	foraging	on top oval
225	Australian Magpie	*Cracticus tibicen*	130412	1735-1745	9	Park Road	0	0	0	2	foraging	lawn street verge & frontyard
226	Australian Magpie	*Cracticus tibicen*	150412	1630-1700	17	Abigail Street	0	0	0	3	foraging	
227	Australian Magpie	*Cracticus tibicen*	150412	1705-1735	18	Mary Street	0	0	0	6	foraging, calling	
228	Australian Magpie	*Cracticus tibicen*	160412	0755-0840	37	Morrison Bay Park	0	0	4	0	foraging	incl 2 independent juveniles
229	Australian Magpie	*Cracticus tibicen*	160412	0920-0935	39	Putney Park	0	1	0	0	foraging, calling	
230	Australian Magpie	*Cracticus tibicen*	160412	0940-0955	36	Stanley Street	0	0	0	2	foraging	adults
231	Australian Magpie	*Cracticus tibicen*	160412	1530-1630	25	Gladesville Reserve	0	1	0	0	foraging	
232	Australian Magpie	*Cracticus tibicen*	170412	0755-0810	35	Tyagarah Reserve	0	0	4	0	foraging	
233	Australian Magpie	*Cracticus tibicen*	170412	0825-0845	40	Bremner Park	0	3	0	0	foraging	
234	Australian Magpie	*Cracticus tibicen*	170412	0940-0955	28	Tennyson Road	0	0	0	4	foraging, perching	incl 1 juvenile & on TV antenna
235	Australian Magpie	*Cracticus tibicen*	170412	1000-1030	27	Western Crescent	0	0	0	1	foraging	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
236	Pied Currawong	*Strepera graculina*	110412	0815-0900	14	Beazley Street	0	0	0	5	foraging, calling	
237	Pied Currawong	*Strepera graculina*	110412	0940-1005	16	Eltham Street	0	0	0	5	foraging, calling	
238	Pied Currawong	*Strepera graculina*	110412	1650-1710	10	Westminster Road	0	0	0	3	foraging, calling, flying	
239	Pied Currawong	*Strepera graculina*	110412	1715-1730	2	Blaxland Street	0	0	0	2	foraging	
240	Pied Currawong	*Strepera graculina*	120412	1525-1625	6	Lane Cove NP north	2	0	0	0	foraging	
241	Pied Currawong	*Strepera graculina*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	2	0	0	0	foraging, calling	
242	Pied Currawong	*Strepera graculina*	130412	0820-0935	11	Field of Mars Reserve Site A	2	0	0	0	foraging, calling	
243	Pied Currawong	*Strepera graculina*	130412	0945-1020	13	Field of Mars Reserve Site B	1	0	0	0	foraging	
244	Pied Currawong	*Strepera graculina*	130412	1525-1550	5	Holy Cross College	0	0	1	0	foraging	
245	Pied Currawong	*Strepera graculina*	130412	1600-1620	33	Wallumatta NR	2	0	0	0	foraging, calling	
246	Pied Currawong	*Strepera graculina*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	3	0	0	0	foraging, calling	
247	Pied Currawong	*Strepera graculina*	140412	0930-0945	21	Tarban Creek Reserve	2	0	0	0	perching	mobbed by noisy miners
248	Pied Currawong	*Strepera graculina*	150412	1630-1700	17	Abigail Street	0	0	0	1	perching, calling	
249	Pied Currawong	*Strepera graculina*	150412	1705-1735	18	Mary Street	0	0	0	6	perching, calling, flying	
250	Pied Currawong	*Strepera graculina*	160412	1035-1105	19	Hillcrest Avenue	0	0	0	1	calling	
251	Pied Currawong	*Strepera graculina*	160412	1530-1630	25	Gladesville Reserve	0	2	0	0	foraging, calling	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
252	Pied Currawong	*Strepera graculina*	160412	1640-1705	24	Betts Park	1	0	0	0	perching, foraging	
253	Pied Currawong	*Strepera graculina*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	2	0	flyover	
254	Pied Currawong	*Strepera graculina*	170412	0825-0845	40	Bremner Park	0	1	0	0	foraging	
255	Pied Currawong	*Strepera graculina*	170412	0940-0955	28	Tennyson Road	0	0	0	1	perching	in large deodar (exotic cedar) frontyard of 118 Morrison Rd
256	Grey Fantail	*Rhipidura albiscapa*	120412	1525-1625	6	Lane Cove NP north	1	0	0	0	foraging	
257	Grey Fantail	*Rhipidura albiscapa*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	2	0	0	0	foraging, bathing	bathing at small rock pool nr main track (one bird only)
258	Grey Fantail	*Rhipidura albiscapa*	130412	1650-1730	8	Boronia Park	1	0	0	0	foraging	
259	Willie Wagtail	*Rhipidura leucophrys*	100412	1545-1605	4	Magdala Park	0	0	2	0	foraging	
260	Willie Wagtail	*Rhipidura leucophrys*	120412	1525-1625	6	Lane Cove NP north	1	0	0	0	calling	along riverbank
261	Willie Wagtail	*Rhipidura leucophrys*	140412	0720-0745	30	Riverglade Reserve	0	0	1	0	foraging	on mown oval surface
262	Willie Wagtail	*Rhipidura leucophrys*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	1	0	0	0	foraging, calling	
263	Australian Raven	*Corvus coronoides*	100412	1655-1715	34	Buffalo Creek Reserve	0	1	0	0	foraging	
264	Australian Raven	*Corvus coronoides*	110412	0815-0900	14	Beazley Street	0	0	0	3	foraging, contesting food	contesting kerbside & lawn food scraps with magpies
265	Australian Raven	*Corvus coronoides*	110412	0910-0930	15	Monash Road	0	0	0	1	foraging	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
266	Australian Raven	*Corvus coronoides*	110412	1650-1710	10	Westminster Road	0	0	0	1	foraging	
267	Australian Raven	*Corvus coronoides*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	2	0	0	0	foraging, calling	
268	Australian Raven	*Corvus coronoides*	130412	0820-0935	11	Field of Mars Reserve Site A	1	0	0	0	foraging	
269	Australian Raven	*Corvus coronoides*	130412	0945-1020	13	Field of Mars Reserve Site B	1	0	0	0	perching	
270	Australian Raven	*Corvus coronoides*	130412	1600-1620	33	Wallumatta NR	1	0	0	0	perching	
271	Australian Raven	*Corvus coronoides*	130412	1735-1745	9	Park Road	0	0	0	1	calling, flying	
272	Australian Raven	*Corvus coronoides*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	1	0	0	0	calling	
273	Australian Raven	*Corvus coronoides*	150412	1705-1735	18	Mary Street	0	0	0	1	calling	
274	Australian Raven	*Corvus coronoides*	160412	0920-0935	39	Putney Park	0	2	0	0	foraging, calling	mobbed by noisy miners
275	Australian Raven	*Corvus coronoides*	160412	0940-0955	36	Stanley Street	0	0	0	2	flyover	
276	Australian Raven	*Corvus coronoides*	160412	1015-1030	20	Kelly Street	0	0	0	2	flyover	
277	Australian Raven	*Corvus coronoides*	160412	1035-1105	19	Hillcrest Avenue	0	0	0	1	foraging	
278	Australian Raven	*Corvus coronoides*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	1	0	flyover & mobbing	mobbed WB Sea-Eagle

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
279	Australian Raven	*Corvus coronoides*	170412	0720-0735	31	Olympic Park	0	1	0	0	flyover	
280	Australian Raven	*Corvus coronoides*	170412	0940-0955	28	Tennyson Road	0	0	0	8	flyover	
281	Australian Raven	*Corvus coronoides*	170412	1000-1030	27	Western Crescent	0	0	0	3	perching, foraging	mobbed by miners on power pole (46 Morrison) & in grevilleas (39 Morrison)
282	Leaden Flycatcher	*Myiagra rubecula*	160412	0850-0915	38	Putney Point	1	0	0	0	foraging, feeding	caught dragonfly in pittosporum @ 0855 (photo), cat nearby
283	Magpie-lark	*Grallina cyanoleuca*	100412	1545-1605	4	Magdala Park	0	0	6	0	foraging	
284	Magpie-lark	*Grallina cyanoleuca*	140412	0720-0745	30	Riverglade Reserve	0	0	4	0	provisioning nestlings, calling	both parents obs taking grass insects from oval surface to nest (2 nestlings in mangrove at edge of reserve)
285	Magpie-lark	*Grallina cyanoleuca*	160412	0755-0840	37	Morrison Bay Park	0	0	4	0	foraging	
286	Eastern Yellow Robin	*Eopsaltria australis*	120412	1525-1625	6	Lane Cove NP north	1	0	0	0	calling	along riverbank
287	Eastern Yellow Robin	*Eopsaltria australis*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	2	0	0	0	foraging, bathing	at small rock pool beside main track
288	Eastern Yellow Robin	*Eopsaltria australis*	130412	0820-0935	11	Field of Mars Reserve Site A	2	0	0	0	foraging	pair trackside Kunzea Trail & 30 m E side of gully crossing @

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
												0930
289	Silvereye	*Zosterops lateralis*	100412	1655-1715	34	Buffalo Creek Reserve	0	2	0	0	foraging, calling	main trail edge along creek
290	Silvereye	*Zosterops lateralis*	130412	0945-1020	13	Field of Mars Reserve Site B	6	0	0	0	eating, calling	eating ripe Pittosporum fruit along Buffalo Creek banks
291	Silvereye	*Zosterops lateralis*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	5	0	foraging, calling	in flowering lantana fringe east of oval
292	Silvereye	*Zosterops lateralis*	170412	0905-0935	32	Mallee and Tyagarah Reserves	4	0	0	0	foraging, calling	in flowering lantana of creekline
293	Welcome Swallow	*Hirundo neoxena*	100412	1545-1605	4	Magdala Park	0	0	10	0	foraging, calling	
294	Welcome Swallow	*Hirundo neoxena*	100412	1615-1650	1	Moncrieff Drive	0	0	0	5	foraging, calling	
295	Welcome Swallow	*Hirundo neoxena*	100412	1655-1715	34	Buffalo Creek Reserve	0	2	0	0	foraging, calling	
296	Welcome Swallow	*Hirundo neoxena*	110412	0815-0900	14	Beazley Street	0	0	0	2	foraging, calling	
297	Welcome Swallow	*Hirundo neoxena*	110412	0910-0930	15	Monash Road	0	0	0	3	foraging	
298	Welcome Swallow	*Hirundo neoxena*	110412	0940-1005	16	Eltham Street	0	0	0	2	foraging, calling	
299	Welcome Swallow	*Hirundo neoxena*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	3	0	0	0	foraging, calling	
300	Welcome Swallow	*Hirundo neoxena*	130412	1030-1050	12	Badajoz Road	0	0	0	3	foraging, calling	
301	Welcome Swallow	*Hirundo neoxena*	130412	1525-1550	5	Holy Cross College	0	0	8	0	foraging, calling, perching	

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
302	Welcome Swallow	*Hirundo neoxena*	140412	0720-0745	30	Riverglade Reserve	0	0	2	0	flyover	
303	Welcome Swallow	*Hirundo neoxena*	140412	0750-0825	29	Riverglade Reserve	0	2	0	0	foraging	
304	Welcome Swallow	*Hirundo neoxena*	150412	1630-1700	17	Abigail Street	0	0	0	2	foraging, calling	
305	Welcome Swallow	*Hirundo neoxena*	160412	0755-0840	37	Morrison Bay Park	0	0	2	0	foraging	
306	Welcome Swallow	*Hirundo neoxena*	160412	0920-0935	39	Putney Park	0	2	0	0	foraging, calling	
307	Welcome Swallow	*Hirundo neoxena*	160412	0940-0955	36	Stanley Street	0	0	0	2	foraging, calling	
308	Welcome Swallow	*Hirundo neoxena*	160412	1715-1745	26	Bedlam Bay (Parramatta Regional Park)	0	0	2	0	foraging, calling	
309	Welcome Swallow	*Hirundo neoxena*	170412	0720-0735	31	Olympic Park	0	15	0	0	foraging, calling	hilltopping' - foraging low over high point (small hill)
310	Welcome Swallow	*Hirundo neoxena*	170412	0755-0810	35	Tyagarah Reserve	0	0	2	0	foraging, calling	
311	Welcome Swallow	*Hirundo neoxena*	170412	1000-1030	27	Western Crescent	0	0	0	1	foraging	
312	Tree Martin	*Petrochelidon nigricans*	120412	1650-1740	3	Lane Cove NP at Sugarloaf Point	3	0	0	0	foraging, calling	
313	Red-whiskered Bulbul *	*Pycnonotus jocosus*	130412	0945-1020	13	Field of Mars Reserve Site B	4	0	0	0	foraging, calling	
314	Red-whiskered Bulbul *	*Pycnonotus jocosus*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	3	0	0	0	foraging, calling	along north bank and in tall blackbutt, mobbed by miners

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
315	Red-whiskered Bulbul *	*Pycnonotus jocosus*	170412	0905-0935	32	Mallee and Tyagarah Reserves	2	0	0	0	foraging, calling	
316	Common Blackbird *	*Turdus merula*	150412	1705-1735	18	Mary Street	0	0	0	1	foraging	elusively on footpath then back into exotic tall hedge outside set 3 older units (8 Auburn Street), backs onto upper Tarban Ck Reserve
317	Common Starling *	*Sturnus vulgaris*	100412	1545-1605	4	Magdala Park	0	0	4	0	foraging	
318	Common Starling *	*Sturnus vulgaris*	110412	0815-0900	14	Beazley Street	0	0	0	24	foraging	incl flock 20 foraging on lawn front former Royal Ryde Rehab Hospital (now 'Putney Hill Apartments')
319	Common Starling *	*Sturnus vulgaris*	140412	0720-0745	30	Riverglade Reserve	0	0	2	0	foraging	on mown oval surface
320	Common Starling *	*Sturnus vulgaris*	160412	0755-0840	37	Morrison Bay Park	0	0	5	0	foraging	
321	Common Myna*	*Sturnus tristis*	110412	0815-0900	14	Beazley Street	0	0	0	25	calling, foraging, flying	flock of 20 foraging on lawns @ Putney Hill residential development; concentrations around rubbish-strewn street verges eg. @ 11 & 14 Beazley St.
322	Common Myna*	*Sturnus tristis*	110412	0940-1005	16	Eltham Street	0	0	0	5	foraging, calling	incl 2 fledglings

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
323	Common Myna*	*Sturnus tristis*	110412	1650-1710	10	Westminster Road	0	0	0	2	foraging	
324	Common Myna*	*Sturnus tristis*	110412	1715-1730	2	Blaxland Street	0	0	0	2	foraging	
325	Common Myna*	*Sturnus tristis*	130412	1030-1050	12	Badajoz Road	0	0	0	12	foraging, calling, flying	concentrated around shop cnr Callaghan St & Badajoz Rd
326	Common Myna*	*Sturnus tristis*	140412	0720-0745	30	Riverglade Reserve	0	0	20	0	foraging	2 flocks - one on breadcrumbs provided by a park visitor @ 0725 and second nr Tarban Ck footbridge
327	Common Myna*	*Sturnus tristis*	160412	0755-0840	37	Morrison Bay Park	0	0	1	0	foraging	
328	Common Myna*	*Sturnus tristis*	160412	1015-1030	20	Kelly Street	0	0	0	1	foraging	lawn street verge & frontyard
329	Common Myna*	*Sturnus tristis*	160412	1035-1105	19	Hillcrest Avenue	0	0	0	2	foraging	
330	Common Myna*	*Sturnus tristis*	170412	1000-1030	27	Western Crescent	0	0	0	8	foraging, calling, flying	on front lawns of 53 & 55 Morrison Rd
331	Red-browed Finch	*Neochmia temporalis*	130412	0945-1020	13	Field of Mars Reserve Site B	3	0	0	0	foraging, calling	along grassed banks of Buffalo Creek
332	Red-browed Finch	*Neochmia temporalis*	130412	1650-1730	8	Boronia Park	11	0	0	0	foraging	flock foraging in seeding grasses beside access track

Record No.	Common Name	Scientific Name	Date	Time	Site No.	Site Name	Bushland Remnant	Revegetated Parkland	Open Parkland	Urban Neighbour-hood	Behaviour	Comments
333	Red-browed Finch	*Neochmia temporalis*	140412	0750-0825	29	Riverglade Reserve	0	2	0	0	foraging, calling	
334	Red-browed Finch	*Neochmia temporalis*	140412	0840-0920	22	Tarban Creek north bank incl Villa Maria	6	0	0	0	foraging, calling, flying	feeding in lantana and cotoneaster edge of north bank at Villa Maria